Self-Perception of Digital Competences Among Peruvian Teachers

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Abstract

The study analyzes teachers' self-perceived digital competence at a private university in Lima, Peru. A non-experimental comparative level design was used through non-parametric techniques. The DigCompEdu CheckIn tool of 25 items was applied with a Likert scale. The results indicate the need to (a) validate the questionnaire and have a measure of the construct with solid and stable psychometric properties; (b) compare these findings with those found in other MetaRed Peru institutions, as a point of contrast, to develop strategies that encourage teachers to continue their digital literacy; and (c) identify which interventions in informal settings help teachers develop their digital competence.

Keywords

Digital competence, Self-perception, Teachers, Higher Education

1. Introduction

The crisis caused by the COVID-19 pandemic, which originated in early 2020, has impacted, and continues to affect, the development of higher education in several respects [1]. While before the pandemic, the world faced various social, economic, and political challenges, the pandemic has brought with it new demands and challenges in terms of teaching and learning, such as the shift from classroom to remote teaching [1], [2]. This has involved not only an exhaustive review of human relationships but also the need to redesign multiple educational activities and experiences that went from being face-to-face to being carried out through digital platforms [3]. The duration of the pandemic has meant that several actors, traditionally excluded from the use and development of digital technologies, have been forced to incorporate them and recognize them as indispensable in their teaching work [3], confirming the possibility of a new normal in the education field [1].

In this context, the importance that digital technologies have come to hold means that digital competence—one of the eight key competences for lifelong learning that all teachers must have—is recognized as essential for their active and systematic participation in the post-pandemic society [4], [5]. Digital competence is a key function for teacher to appropriately integrate digital technologies, which have now acquired an unprecedented role [6], [7]. Digital competence is defined "as the safe, critical and creative use of information and communication technology to achieve objectives related to work, employability, learning, leisure, inclusion, and/or participation in society" [6, p. 90]. Therefore, teachers' digital competence consists of a set of knowledge, skills, and attitudes that supports the critical, responsible, and creative use of digital technologies. This not only strengthens and improves their teaching and learning strategies but also contributes to their professional development and interactions with colleagues, students, parents, and other actors [8].

The significance of educational technology has grown during the pandemic, and the digital transformation of educational institutions has accelerated; thus, education has been reinvented globally.

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The vast supply of online technological resources can overwhelm unprepared teachers [3], facing the challenge of teaching remotely without adequate guidance, training, or access to necessary resources [2]. However, it is this same health emergency context that has become an excellent opportunity to build a more natural, close, and effective relationship with various digital technologies, thus facilitating teaching and educational practice, [1], [9], [10]. The aim of this study is to analyze teachers' self-perceived digital competence at a private university in Lima, Peru.

Educators' Digital Competence (DigCompEdu)

For several years, various self-assessment frameworks and tools have been developed internationally to describe facets of teachers' digital competence [8], [11], including the European Framework for the Digital Competence of Educators (DigCompEdu), whose purpose is to guide policies for the implementation of tools and programs for teacher competence training [8], [12]. This framework is part of a project by the European Commission on learning and skills for the digital age [12]. The DigCompEdu framework "is aimed at educators at all educational levels, from early childhood education to higher and adult education, including general and vocational training, education for students with special needs, and non-formal learning contexts" [8, p. 9]. Its objective is to collect and describe the digital competences of teachers.

The DigCompEdu framework includes six levels of progression in digital teaching competence: (1) Professional engagement, (2) Digital resources, (3) Teaching and learning, (4) Assessment, (5) Empowering learners, and (6) Facilitating learners' digital competence [8]. The competence development process consists of "six levels of aptitude used by the Common European Framework of Reference for Languages (CEFR), ranging from A1 to C2" [8] (See Table 1).

Table 1
Levels of Aptitude

Level	Description	To Level Up
Novices (A1)	They have very little contact with digital tools.	They need guidance to expand their repertoire.
Explorers (A2)	They have started using digital tools without following a comprehensive or coherent approach.	They need inspiration to expand their competences.
Integrators (B1)	They experiment with digital tools for a variety of purposes, trying to understand which digital strategies work best based on the context.	They need a little more time for experimentation and reflection, complemented by encouraging collaboration and knowledge sharing.
Level	**Description**	**Achievement**
Experts (B2)	They use a range of digital tools confidently, creatively, and critically to improve and expand their repertoire of practice.	They are the backbone of any educational organization when it comes to innovative practices.
Leaders (C1)	They have a wide repertoire of flexible, complete, and effective digital strategies from which they know how to choose the most appropriate one for a given situation.	They are a source of inspiration for others, with whom they share their experience.
Pioneers (C2)	They question contemporary digital and pedagogical practices, of which they themselves are leaders.	They lead innovation and are role models for younger teachers.

Note: Adapted from Redecker and Punie (2020).

Using this framework, Redecker and Punie developed a self-assessment tool—DigCompEdu CheckIn—for teaching digital competence provisionally [11]. The tool has been adapted to various

languages and teaching profiles [12], [13]. Its design is the result of various proposals and experiences at the international level in different congresses, conferences, and discussions, as well as consultation with professors, researchers, experts, and professionals from the European Community [8], [12], [14], who were invited to comment on the items and test the survey. To avoid additional comments or observations, this review process was repeated several times [14]. DigCompEdu establishes 22 competences organized in 6 areas. The competences are explained in six different skill levels (A1, A2, B1, B2, C1, C2), which aim to promote digital teaching competence and drive innovation in education [8], [15]. Currently, the CheckIn tool is being tested among educators from the different Member States of the European Community and around the world [13].

In March 2018, the initial version of DigCompEdu CheckIn was published in English in Morocco after being validated by 160 teachers [16]. That same year, it was translated into German and validated by 22 teachers of German nationality [14]. In October 2018, after being validated by 335 German teachers, a new version was published in German and English [14]. Recently, it has been validated by 2,180 higher education teachers for the Spanish context [17].

Methodology

A non-experimental comparative level design was used. This study is part of MetaRed Peru in collaboration with the Joint Research Center (JRC) of the European Commission. The current data was obtained from it. Peruvian universities can freely use the DigCompEdu CheckIn tool, developed by the JRC [18]. The adapted version, called Self-assessment of Teachers' Digital Competences was applied [19] for the field of Peruvian higher education using a Likert-type response scale, which included three items related to the use of open resources based on the OpenEdu framework [20], resulting in a total of 25 questions. Notably, these three items did not count in the overall score of the self-assessment. Therefore, it was not mandatory to answer these questions.

The study was carried out at a private university in Lima, Peru. For context, for some years now, the institution has been implementing teaching–learning experiences based on real case studies and problems, supported by the use of technology in a complete digital environment. Further, it has specialized streams (e.g., Curricular Development and Evaluation, Psychopedagogical Guidance, and Teaching Development and Management) whose objective is to ensure the optimization of the teaching–learning process and the emotional development of the educational community. The instrument was distributed in April 2021 by email to all teachers (more than 4,000). They were informed of the nature of the questionnaire and that their participation was completely voluntary and anonymous, without causing any academic or professional damage. A total of 1,218 professors responded it from different areas of that institution, including art, sciences, social sciences, legal sciences, engineering and architecture, health sciences, and humanities.

The data were then organized, coded, and analyzed using the statistical calculation program IBM SPSS 25. From this, the means, percentages, frequencies, and standard deviations of the items were calculated. The main data analysis techniques were descriptive and comparative. Comparisons were made using non-parametric techniques. The variables of age, seniority, and teaching areas were analyzed using the Kruskal–Wallis statistical test [21] for three or more groups. Further, a comparison was made between the participants according to sex using the Mann–Whitney U test for two independent samples. To calculate the effect size, the probability of superiority and the epsilon coefficient were applied.

Results

Table 2 compares the scores obtained in relation to teachers' digital competences according to sex. Both the average of the women and that of the men place both groups at the "expert" level of competence (50–65 points). No statistically significant differences were found ($p > .05$). Further, when analyzing the effect size, determined by the probability of superiority, this aspect does not have any effect [22]. Thus, the digital competences of the women surveyed do not present a real superiority compared to the digital competences of men. Digital competences today are part of the standard competences that everyone must develop if they are committed to the new educational literacy. Notably,

women obtained a slightly higher average than men in the self-perception of digital competences, although this is not statistically significant.

Table 2

Comparisons of digital competences according to sex

Sex	M	SD	U	Z	P	PS
Female	58.33	13.57	172185	−0.597	0.550	0.490
Male	57.70	14.66	109.05			

Note: *M* = Median, *DE* = Standard deviation, *U* = Mann–Whitney U, Z = Z Test, *p* = Level of statistical significance, *PS* = Probability of superiority.

Table 3 compares the scores obtained in teachers' digital competences according to age. The means of the different age groups place all of them at an "expert" level of competence (50–65 points). Regarding age, statistically significant differences were found ($p < .05$). However, when analyzing the effect size, determined by the epsilon-squared coefficient [23], this does not have any effect. In other words, the proportion of variability in digital competences that can be attributed to a teacher's age is low. Notably, at first glance, the 40–49 age groups obtained the highest average in digital competences.

The fact that age does not result in a variable that influences digital competences breaks the myth relating young people to greater competence and familiarity with the languages of digital technologies. A non-specialized analysis shows that the group of teachers between 40 and 49 years old stand out the most, with a higher average (59.97) of digital competences. Through systematic updating, this group would be demonstrating its commitment to the new educational dynamics and a greater concern and desire to maintain their work. We must remember that with regard to respondents over 40 years old, face-to-face attendance is no longer viable, considering the impact of age among older adults. The figures obtained are not sufficient for the group in question to move from the Expert level (B2) to that of Leader (C1) or Pioneer (C2).

Table 3

Comparisons of digital competences according to age

Age	M	SD	H	P	E^2
25 or under	56.59	15.48	15.33	0.009	0.013
25–29	55.76	16.12			
30–39	56.65	14.66			
40–49	59.97	13.56			
50–59	58.98	13.63			
60 or above	56.09	13.61			

Note: *M* = Median, *DE* = Standard deviation, *H* = Kruskal–Wallis H, *p*= Level of statistical significance, E^2 = Epsilon-squared.

In Table 4, the scores obtained in teachers' digital competences are compared according to seniority. The means of the different seniority groups place all of them at an "expert" level of competence (50–65 points). Statistically significant differences ($p < .05$) were found according to seniority. However, when analyzing the effect size, determined by the epsilon-squared coefficient [23], there was no effect. In other words, the proportion of variability in digital competences that can be attributed to a teacher's seniority is low.

Notably, it is after 6 years of professional experience that the teachers who participated in the research perceived themselves as more competent (Table 3: 6–9 years of seniority: 59.67; 10–14 years of seniority: 59.47%; 15–19 years of seniority: 61.04, and over 20 years: 61.11). Even those who have more than 20 years of experience in teaching, although they stand out, do not reach the level of Leaders (C1) or Pioneers (C2). Thus, it is clear that number of years does not result in an attribute that allows us to confirm that years of seniority in teaching play a fundamental role when referring to greater digital competence.

Table 4
Comparisons of digital competences according to seniority

Seniority	M	SD	H	p	E^2
1–3 years	53.60	14.63			
4–5 years	56.91	13.67			
6–9 years	59.67	13.85			
10–14 years	59.47	13.41	53.90	0.000	0.044
15–19 years	61.04	13.67			
More than 20 years	61.11	13.39			

Note: *M* = Median, *DE* = Standard deviation, *H* = Kruskal–Wallis H, *p*= Level of statistical significance, E^2 = Epsilon-squared.

In Table 5, the scores obtained in teachers' digital competences are compared according to teaching area. The means of the different teaching area groups place all of them at an "expert" level of competence (50–65 points). Statistically significant differences were found ($p < .05$) based on the teaching area. However, when analyzing the effect size, determined by the epsilon-squared coefficient [23], this aspect does not have any effect. In other words, the proportion of variability of digital competences that can be attributed to a teacher's teaching area is low.

Table 5
Comparisons of digital competences according to teaching area

Teaching area	M	SD	H	p	E^2
Art	58.98	13.40			
Sciences	57.16	14.10			
Social Sciences	60.99	12.96			
Legal sciences	51.41	16.27	17.19	0.016	0.014
Engineering and Architecture	56.84	14.66			
Health Sciences	58.27	12.92			
Humanities	59.34	14.51			

Note: *M* = Median, *DE* = Standard deviation, *H* = Kruskal–Wallis H, *p* = Level of statistical significance, E^2 = Epsilon-squared.

Discussion and Conclusions

The objective of this study was to analyze teachers' self-perceived digital competence at a private university in Lima, Peru. In a scenario dominated by digital technologies and where educators experience a new dynamic in how they practice their profession, the university teacher becomes the key piece in the comprehensive development of their students, both in terms of personal and professional aspects [20]. Therefore, it is necessary to be committed to incorporating a series of competences, including digital competence, because this will allow them to face challenges posed by multiple environments, among which the educational environment stands out [5], [8]. While this study's objective is to facilitate the knowledge of the level of development of teachers compared to their digital competences, it also intends to propose improvement plans and personal, institutional, and inter-institutional growth. However, in light of the instrument originally proposed, as well as of the results obtained, for the moment, the objective is ambitious.

The results obtained from teachers' digital competence have a series of implications, as given below:

a) The need to validate the questionnaire and have a measurement of the construct with solid and stable psychometric properties. This suggestion is in line with previous studies conducted by Ghomi and Redecker in Germany [14], Cabero et al. [17], [24] in Spain, and Benali et al. [16] in Morocco.

b) Creating a rubric for each of the six areas and levels suggested and not only be based on self-perception, considering that the means of receiving the results should be through evidence, such as how many teachers use which specific digital tools. The authors agree with Cabero et al. [17] who suggest

avoiding labels such as Novices (A1), Explorers (A2), Integrators (B1), Experts (B2), Leaders (C1), and Pioneers (C2) but maintaining the codes, considering that labels loaded with meaning could influence educators' decisions.

c) Developing a measurement instrument that adapts to the characteristics of the regional and local context of different Latin American countries, considering that they are multilingual, multicultural, and multiethnic countries [25], [26]; available resources; and diversity of institutional frameworks in higher education.

d) Evaluating, in a subsequent measurement, whether the participants level up and whether they exceed those who are at higher levels, as well as investigating factors that influenced these changes considering hours of training received, characteristics of the various platforms requested by educational institutions, availability of technical support services, teacher advice and support, among others.

e) Expanding the scope of the evaluation to teachers of higher technological and pedagogical education institutions, as well as basic education teachers, considering the technological resources available to them.

f) Comparing and contrasting these findings with those found in other MetaRed Peru institutions and developing strategies so that the process itself encourages and supports teachers to continue in their training and digital literacy for authentic competence development in line with the post-pandemic society [27].

g) Evaluating the perception that students have on the management of their teachers' digital competences to establish a correlation between the two.

h) Considering that the educator works with a complex reality, with variables (e.g., health, sociocultural, and political factors) that have an impact far beyond the classroom. Therefore, it is suggested to identify which interventions in informal settings contribute to teachers developing digital competences.

A limitation of this study is that the DigCompEdu CheckIn was prepared before the pandemic and that the questionnaire was applied to teachers in the second semester (April 2021), when many of them were already immersed in the virtual world and doing remote work. Notably, the first two items of the six areas were designed for classroom activities. Therefore, it is possible that teachers immersed in remote work did not assess these items correctly, which may have affected their final self-assessment.

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