Revista Española de Educación Médica

Teaching digital competence in Health Sciences teachers

Competencia digital docente en profesores de Ciencias de la Salud

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Received: 2/6/24 Accepted: 3/15/24; Posted: 3/18/24

Summary: Digital competence is essential to practice current university teaching and improve the quality of the teaching-learning process, in accordance with the advances in information and communication technologies. The objective of the study was to identify the level of digital teaching competence of health sciences teachers according to age, sex, profession, academic degree, years of experience and time of use of ICTs. An analytical investigation was carried out with 183 participants of both sexes, selected by consecutive sampling, who agreed to participate in the study and responded to the "DigCompEdu Check-In" instrument through a Google form. 52.45% of participants are female and 47.54% are male. 50.3% are psychologists, 43.2% are doctors and 6.5% are nutritionists. It was observed that 55.9% of teachers have an intermediate level of digital competence and the pioneer (44.3%) and leader (36.6%) categories predominate. The logistic regression test shows that digital competence stands out at the integrative and expert levels while age, sex and academic degree were not predictor variables of digital competence. The use of ICTs < 1 year and from 1 to 3 years had a negative impact on digital competence. There are significant differences in the area "professional commitment" in relation to academic degree and years of teaching experience. Regarding the time of use of ICTs, there were significant differences in all competency areas. It is concluded that the intermediate level of digital competence predominates and the time of use of ICTs is a predictor variable of digital competence. The time of ICT use is not influenced by the sex or age of the teachers.

Keywords: Teaching digital competence, information technology, higher education, university professors, higher education

Resumen: La competencia digital es imprescindible para ejercer la docencia universitaria actual y mejorar la calidad del proceso de enseñanza aprendizaje, acorde a los avances de las tecnologías de la información y comunicación. El objetivo del estudio fue identificar el nivel de competencia digital docente de los profesores de ciencias de la salud según edad, sexo, profesión, grado académico, años de experiencia y tiempo de uso de las TICs. Se realizó una investigación analítica con 183 participantes de ambos sexos, seleccionados por muestreo consecutivo, quienes aceptaron participar del estudio y respondieron al instrumento "DigCompEdu Check-In" a través de un formulario Google. El 52,45% de participantes son de sexo femenino y el 47,54% de sexo masculino. El 50,3% son psicólogos, un 43,2% médicos y 6,5% nutricionistas. Se observó que el 55,9 % de profesores tiene un nivel intermedio de competencia digital y predominan las categorías pionero (44,3%) y líder (36,6%). La prueba de regresión logística muestra que la competencia digital destaca en los niveles integrador y experto mientras la edad, sexo y grado académico, no fueron variables predictoras de la competencia digital. El uso de las TICs < 1 año y de 1 a 3 años incidió de manera negativa en la competencia digital. Existen diferencias significativas en el área "compromiso profesional" con relación al grado académico y años de experiencia docente. En cuanto al tiempo de uso de las TICs,

hubo diferencias significativas en todas las áreas competenciales. Se concluye que predomina el nivel intermedio de competencia digital y el tiempo de uso de las TICs, es una variable predictora de la competencia digital. El tiempo de uso de las TICs no se ve influenciado por el sexo ni la edad de los profesores.

Palabras clave: Competencia digital docente, tecnología de la información, educación superior, profesores universitarios, enseñanza superior

1. Introduction

The technological changes of recent decades have generated the need to use information and communication technologies (ICTs) in all universities (1), which is why they promote the training of teachers and students in these technologies (1-2). Digital competence (DC) is one of the professional competences (2) and is defined as knowledge about ICTs and the ability to apply them in teaching work (3). The CD has allowed digital literacy and its application in the development of classes, as well as migrating from a traditional teaching-learning model to a more dynamic and interactive model (4). Teaching digital competence (CDD) has five areas: information and digital literacy, communication and collaboration, creation of digital content, security and resolution of technical problems (5), use of ICTs (6-8) and facilitating planning, development and evaluation of subjects, as well as the promotion of self-managed study, virtual tutoring and support for students (8).

A fundamental aspect of CDD is working in flexible, collaborative, scientific virtual environments, which in addition to promoting the generation of knowledge, allow teachers and students to update themselves in new ICTs (9). The use of digital tools favors active learning, time management of teachers and students, and offers innovative techniques (10). Among the most used, the use of educational platforms, blogs, wikis, gamification tools, tools to create collaborative content, interactive content, preparation of surveys, recording and editing of videos predominates (11), so universities have to manage technological innovation (12-13). The CDD has in common the dimensions: use or mastery of ICTs, communication, pedagogy and didactics, educational management and articulation of ICTs to research; however; The use of ICTs in teaching is not necessarily related to the level of CDD development since the results refer to a low (1) or intermediate (4) level of digital competence; or that teachers recognize the importance of ICTs but do not always apply them (1).

CDD has been studied based on variables such as gender, age, time of use of ICTs (6, 14) and years of teaching experience to identify the statistical relationship. Some studies report that teachers in the 30-49 age group have a positive attitude, greater interest in their training and greater mastery of CDD than teachers in other age groups, that teaching experience from 4-14 years is related to greater CDD and that The greater the experience in using ICT, the greater the mastery of CDD (14). Other studies refer to the correlation between age and the ability to learn technological skills,(15) age and application of CD (16).

Instruments have been designed to evaluate CDD, including the Digital Teaching Competence Questionnaire that evaluates the five competence dimensions (16). The most used CDDs are related to search, production, use of information, communication and access to the virtual classroom, classified as basic digital competencies. (12, 17) while security, information and information literacy require further development (16). In the Peruvian case, there are descriptive studies in which no relationship is found between CDD and age, sex, level of education and teaching experience (6), but nevertheless there are gaps in the way in which these technologies are applied in the classroom, and other aspects of implementation

of digital competence. Therefore, the objective of this research is to identify the level of CDD that health sciences teachers have and whether age, sex, academic degree and time of use of ICT are predictor variables of CDD.

2. Methods

An analytical investigation (18) was developed in a population of teachers from the Faculty of Health Sciences of the César Vallejo University of Trujillo, in Peru. The sample consisted of 183 health professionals who agreed to participate in the study and responded to the CDD survey. The Faculty of Health Sciences has degrees in Medicine, Psychology, Nutrition and Nursing. The inclusion criteria were: having a teaching load in the 2023-I semester, signing the informed consent and answering the survey. Those who were not working during the data collection phase, professors of care practice in hospitals and health centers, as well as professionals from the School of Nursing were excluded, because the management of said school did not disseminate the survey among its members. teachers. The selection of teachers was carried out with consecutive non-probabilistic sampling.

A Google form was used to facilitate contact with teachers, which contained the research objectives, informed consent and the DigCompEdu Check-In questionnaire to identify the level of digital competence of each participant. This DigCompEdu Check-In questionnaire translated and adapted for the Spanish university context (16), has also been used in Latin America (18), and is valid and reliable to be applied in the Peruvian university context (19). It consists of 22 items corresponding to the 6 competency areas: professional commitment, digital resources, pedagogy, evaluation and feedback, student empowerment and facilitating students' digital competence. Each item has five alternatives from which the teacher selects the one that best describes his or her teaching practice: no commitment (0 points), partial knowledge (1 point), occasional use (2 points), increasing use (3 points) and systematic use. integral (4 points), being able to obtain a maximum of 88 points (16).

There was some restriction in obtaining information since contact with the participants was virtual. The Google form was sent to the teachers' email and they waited a month for the response, after which it was shared in a WhatsApp group in order to obtain greater participation. The responses were waited two weeks and the data collection phase was closed. The response rate by professional school was: Medicine 30.15%, Psychology 76% and Nutrition 33.36%. The information collected was organized in tables and graphs for descriptive analysis using averages and standard deviation and in the inferential analysis, logistic regression was applied to evaluate whether age, sex, profession, academic degree, teaching experience and time of use of ICTs , are predictor variables of teaching digital competence; the Kruskal Wallis test to evaluate the differences in digital skills according to the aforementioned variables and post hoc tests to identify homogeneous subsets. We worked with a significance level of 0.05.

The research has Opinion 004-CEI-EPM-UCV-2023 from the Ethics Committee of the School of Medicine. The principle of autonomy was respected, through the acceptance of informed consent, respect for confidentiality and veracity of the data collected during the course of the study, which are presented faithfully (20). Authorship contributions and transparency in conflicts of interest were reported. Authorization was obtained from the Vice-Rector's Office for Research to carry out the study.

3. Results

The results of 183 health professionals who participated in the study are shown. There were 87 males (47.54%) and 96 females (52.45%), of which 79 were doctors (43%), 12 nutritionists (6.7%) and 92 psychologists (50.3%). Table 1 shows that the predominant level

of digital competence in teachers is the medium level (55.7%) and high level (41%). Regarding dimensions of the CDD, the highest level is achieved in the area "empowering students" (48.6% high level and 44.8% medium level). Table 2 shows that digital competence was more frequent in teachers with the Pioneer category (44.3%) and Leader category (36.6%). Regarding the dimensions of the CDD, it is observed that teachers in the Leader category use digital resources more and facilitate student competence (40.4% and 32.8% respectively), while those in the Pioneer category stand out. in the use of digital pedagogy (37.2%), evaluation and feedback (34.4%) and empowering students (48.6%). The significance value was 0.997 ($p > 0.05$), calculated with Pearson's chi-square. Therefore, in accordance with the contrast rules, it is considered that the logistic regression model used for these analyzes is sufficient to explain the prediction of the independent variables over the dependent one. Table 3 shows that there was significance in the digital competence variable, highlighting the Integrator and expert levels (p1=0.000 and p2= 0.000 respectively). Therefore, the time of use of ICT has a negative impact on digital competence, when the time of use of ICT is < 1 year ($p = 0.007$) and from 1 to 3 years ($p = 0.002$). Likewise, with the Nagelkerke coefficient, an 18.1% incidence of ICT use time is determined, at the integrative and expert levels. Table 4 shows that significant differences were found in the area of professional commitment in relation to academic degree and years of teaching experience ($p < 0.05$). Regarding the time of use of ICTs, there were significant differences in all competency areas ($p < 0.05$), but not with respect to the age of the teachers ($p > 0.05$). In table 5, Dunn's post hoc test shows that work commitment is greater in teachers with a doctorate degree, with more than 15 years of use of ICTs and with teaching experience of 4 - 5 years and 20 or more. years.

Table 1. Level of digital teaching competence in health sciences teachers.

Competence area		n	%
Professional commitment	Low	12	6.6
	Average	131	71.6
	High	40	21.9
Digital resources	Low	eleven	6.0
	Average	137	69.4
	High	Four. Five	24.6
Digital pedagogy	Low	7	3.8
	Average	107	58.5
	High	79	37.7
Evaluation and feedback	Low	8	4.4
	Average	113	61.7
	High	62	33.9
Empower students	Low	12	6.6
	Average	82	44.8
	High	89	48.6
Facilitate student competence	Low	13	7.1
	Average	97	53.0
	High	73	39.9
Digital skills	Low	6	3.3
	Average	102	55.7
	High	75	41.0

Table 2. Dimensions of digital competence according to competence level in health sciences teachers.

Variable and Dimensions	Competency level					
	Rookie	Explorer	Integrator	Expert	Leader	Pioneer
Digital resources	-	4	19	42	74	44
	-	2.2%	10.4%	23.0%	40.4%	24.0%
Digital pedagogy	-	2	10	Four. Five	58	68
	-	1.1%	5.5%	24.6%	31.7%	37.2%
Evaluation and feedback	-	1	22	46	51	63
	-	0.5%	12.0%	25.1%	27.9%	34.4%
Empower students	2	3	twenty-one	3. 4	3. 4	89
	1.1%	1.6%	11.5%	18.6%	18.6%	48.6%
Facilitate student competence	2	1	twenty	47	60	53
	1.1%	0.5%	10.9%	25.7%	32.8%	29.0%
Digital competence	-	-	5	30	67	81
	-	-	2.7%	16.4%	36.6%	44.3%

Table 3. Estimation of logistic regression parameters for the analysis of digital skills.

		Estimate	Dev.	Wald	df	Next.	95% confidence interval	
							Lower limit	Upper limit
Threshold	Comp. Digital= Integrator]	-5,165	.886	33,953	1	,000	-6,902	-3,428
	Comp. Digital = Expert	-2,892	.773	14,002	1	,000	-4,407	-1,377
	Comp. Digital= Leader	-.984	.747	1,735	1	.188	-2,448	.480
Location	Age=25 – 29	1,275	.891	2,048	1	.152	-.471	3,021
	Age=30 – 39	.388	.671	.335	1	,563	-.927	1,704
	Age=40 – 49	.566	.604	.879	1	.348	-.617	1,750
	Age=50 – 59	-.093	,597	.025	1	.876	-1,263	1,076
	Age=60 or more	0 [to]	.	.	0	.	.	.
	Sex = F	-.080	.305	.069	1	.793	-.678	,518
	Sex= M	0 [to]	.	.	0	.	.	.
	Degree =Bachelor	-.529	.631	.704	1	.402	-1,765	.707
	Grade=Master	-.388	.444	.763	1	.382	-1,257	.482
	Degree=Doctor	0 [to]	.	.	0	.	.	.
	Experience < 1 year	-1,170	1,146	1,041	1	.307	-3,417	1,077
	Experience = 1 -3	.401	.759	.279	1	,597	-1,087	1,890
	Experience = 4 – 9	.745	.738	1,017	1	,313	-.703	2,192
	Experience =10 - 19	,116	.620	.035	1	.852	-1,099	1,331
	Experience >20 years	0 [to]	.	.	0	.	.	.
	Use time < 1 year	-2,462	.910	7,328	1	.007	-4,245	-.680
	Usage time = 1 -3	-2,260	.714	10,014	1	.002	-3,660	-.860
	Usage time = 4 – 9	-1,341	.715	3,514	1	.061	-2,742	.061
	Usage time =10 - 19	-.966	.719	1,803	1	.179	-2,376	.444
	Use time =20 years	0 [to]	.	.	0	.	.	.

Table 4 . Areas of teaching digital competence according to age, academic degree, experience and time of use of ICTs.

CDD area	Age		Academic degree		Years of experience		Time of use of ICTs	
	Kruskal-Wallis H	Sig	Kruskal-Wallis H	Sig.	Kruskal-Wallis H	Sig.	Kruskal-Wallis H	Sig.
Professional commitment	1,657	0.798	8,440	0.015	17,501	0.008	18,476	0.005
Digital resources	4,282	0.369	5,464	0.065	9,869	0.13	19,206	0.004
Digital pedagogy	3,148	0.533	2,754	0.252	7,003	0.321	13,317	0.038
Evaluation and feedback	9,033	0.060	2,326	0.313	3,503	0.744	16,824	0.01
Empower students	7,945	0.094	1,229	0.541	7,679	0.263	25,084	<.001
Facilitate student competence	8,487	0.075	3,016	0.221	8,762	0.187	15.98	0.014
Digital competence	5,200	0.267	3,288	0.193	10,144	0.119	22,538	<.001

Table 5 . Dunn's post hoc test for professional commitment according to academic degree, years of experience and time of use of ICT by Health Sciences teachers,

Homogeneous subsets based on academic degree			
		Subset	
		1	2
Example	Bachelor	84,450	
	Teacher	87,406	
	Doctor		117,400
Test statistic		.063	.b
Sig. (two-sided test)		.802	.
Adjusted sig. (two-sided test)		.802	.
Homogeneous subsets based on years of teaching experience			
		Subset	
		1	2
Example	<1 year	21.8	
	1 to 3 years	84.29	84.29
	6 to 9 years	90,867	90,867
	10 to 14 years	91,407	91,407
	15 to 19	91,932	91,932

	years		
	20 or more		107.55
	4 to 5 years		116.26
Test statistic		8,756	8,502
Sig. (two-sided test)		0.067	0.131
Adjusted sig. (two-sided test)		0.093	0.131
Homogeneous subsets based on time of ICT use			
		Subset	
		1	2
Example a	<1 year	69,455	
	1 to 3 years	75.53	
	10 to 14 years	93,548	93,548
	4 to 5 years	97,817	97,817
	6 to 9 years	101.5	101.5
	20 or more		121,692
	15 to 19 years		139,909
Test statistic		8,005	9.32
Sig. (two-sided test)		0.091	0.054
Adjusted sig. (two-sided test)		0.126	0.074

Homogeneous subsets are based on asymptotic significances. The significance level is .05.

a. Each box shows the sample range of average academic degree, teaching experience and time of use of ICTs.

b. It cannot be calculated because the subset only contains one sample.

4. Discussion

The development of the teaching function requires knowledge and practice of digital competence (1, 21), necessary for the development of the teaching-learning process and for the creation of content, use of virtual platforms, management of digital resources and empowerment of students. students to facilitate their insertion into the digital world (9, 10, 16). During the confinement due to the COVID-19 pandemic, a radical change occurred in the development of the teaching-learning process, since educational digitalization was imposed abruptly when face-to-face activities were suspended (12, 17). Teachers, independently or at the initiative of the university, were trained to acquire or improve digital competence (13, 17) and the Peruvian reality was no exception.

In the present investigation, it was observed that more than half of the health sciences teachers studied have a medium level in all areas of the CD and within the areas that make up the CDD, the highest level is obtained by "empowering to students" unlike other studies, in which training and facilitating digital competence in students are the least mentioned. Other studies describe that the majority of teachers have an intermediate level of CDD (4, 22), followed by an advanced level (22). Similar results were obtained when teachers from universities in Argentina, Brazil, Colombia, Chile, Peru, Mexico and Portugal were evaluated, where 69% of teachers had an intermediate level of digital competence, evaluated with the DigCompEdu questionnaire (23). As can be seen, there is similarity in the level of achievement of the CDD, regardless of the country of study. When evaluating teachers from

a Spanish university, an intermediate level of CDD was also found (the majority were at the integrative and expert levels) (16). The studies emphasize that ongoing teacher training is necessary to improve or develop their digital competence and that the medium level of CDD is the most frequent because ICTs are in continuous transformation and improvement (15).

The DigCompuEdu Check In instrument has been designed for the teacher to carry out self-assessment of the areas that need to be strengthened in terms of digital competence (16). Regarding the level and competency progression of the CDD, this instrument evaluates three macro levels: basic, intermediate and advanced. The basic level includes the novice and explorer categories, the intermediate level includes the integrator and expert categories, and the advanced level includes the leader and pioneer categories. These six categories are progressive in achieving CDD (16, 23, 24). In the health sciences teachers evaluated, it is seen that the majority of teachers reach the "pioneer" level followed by the "leader" level. Those in the pioneer category stand out in the use of digital pedagogy, evaluation and feedback, and empowering students (16), while those in the leader category use digital resources more and facilitate student competence. Teachers who are at the leader level can serve as a guide to other teachers, using multiple options when including technology in their classes and adapting the tools they have available to the context (17, 24, 25). It is inferred that teachers who master the CDD and apply it in the development of classes are capable of undertaking innovative procedures and collaborative work with other teachers and their students (23), so it would be important to evaluate the application of the CDD in the classroom. classroom and take into account the opinions of the students, since they perceive that they have better digital skills than their teachers (21).

When the goodness of fit test was carried out to verify the application of the logistic regression model for the analysis of digital competence, it was found that the significance value was 0.997 ($p > 0.05$), which indicates that this model yes it is sufficient to explain the prediction of the independent variables. When evaluating the global CDD, statistical significance was found in the integrator and expert categories. It was found that the variables age, sex and academic degree are not predictive variables of CDD, but the logistic regression showed that when the time of use of ICTs is < 1 year and from 1 to 3 years, digital competence is lower. . In another study, it was shown that CDD is lower in teachers with less than 3 years of use of ICTs and that it increases notably from the fourth year onwards (14). Regarding the aforementioned variables and the areas of the CDD: professional commitment, digital resources, digital pedagogy, evaluation and feedback, empowering and facilitating digital competence in students, significant differences were found in the area of professional commitment in which refers to the academic degree, years of teaching experience and time of use of ICTs. All other competency areas show significant differences with the time of use of ICTs. No significant difference was observed when comparing the CDD according to the sex, age and academic degree of the teachers.

These results are in line with studies that indicate that the level of digital competence does not depend on gender (14, 24). Regarding age and years of teaching experience, it is expected that the older the age and experience, the longer the time spent using ICTs (14, 26); However, other studies report that young teachers or those with few years of experience have more developed CDD (27, 28), but with more superficial use (14). Likewise, it is reported that teachers between 30 and 49 years old have a better attitude for the use of ICTs and greater digital competence (14) and that the higher the CDD, the better the attitude and predisposition for online teaching (29).

Unlike this research, the results of a Spanish study show that the areas most valued by university teachers are "digital pedagogy" and "digital resources", which would allow teachers to design and plan the use of ICTs in development. and evaluation of courses, as

well as creating and distributing digital resources (26). These results could respond to the transformation of virtual educational practices, since it became imperative to apply new learning techniques that guarantee the acquisition of digital skills in both teachers and students (26, 11, 24) to achieve effective integration. of technological competencies where teaching and learning processes are fundamental (24). It is also important to promote and continue the training of teachers in ICTs, so we consider that this research has practical implications for the management of the Faculty of Health Sciences in regards to teacher training. in ICT.

Limitations of the study

When using the Google form for the surveys, the response of the entire target population was not achieved, so we only worked with the information obtained. Likewise, there was no support for disseminating the survey in the School of Nursing. Although the survey contained a question about the status of being appointed or hired, the results were not analyzed taking this information into account.

5. Conclusions

- Most health sciences teachers have an intermediate level of CDD.
- The time of use of ICTs is a predictor variable of CDD.
- Age, sex and years of teaching experience are not predictive variables of CDD.

Supplementary material: None
Funding: The work was funded by the Vice-Rector for Research of the César Vallejo University, Resolution No. 192-2023-VI-UCV.
Acknowledgments: To the César Vallejo University, for the facilities provided for the development of this research.
Declaration of conflict of interest: The authors declare that they have no conflict of interest.
Author contributions : EGR: Preparation of the project, analysis of the information, writing of the article and approval of the final version; NMO: Preparation of the project, analysis of the information, writing of the article; AMCG: Preparation of the project, analysis of the information and writing of the article; NIGG: Preparation of the project, analysis of the information and writing of the article; JEVV: Preparation of the instrument – statistical analysis

References

1. Barbazan Capéans D, Ben Abdellah KDM, Montes Hoyos CM. DIGITAL TEACHING COMPETENCE IN HIGHER EDUCATION: STATE OF THE ART IN SPAIN AND LATIN AMERICA. Étic@ net 2021;21(2):267–82. http://dx.doi.org/10.30827/eticanet.v21i2.208377
2. Prendes Espinosa, MP, Gutiérrez Porlán, I., & Martínez Sánchez, F. (2018). Digital competence: a need for university professors in the 21st century. Distance Education Magazine (RED), 18(56). http://www.um.es/ead/red/56/prendes_et_al.pdf
3. Montero Delgado JA, Merino Alonso FJ, Monte Boquet E, Ávila De Tomás JF, Cepeda Díez JM. Key digital competencies of healthcare professionals. Medical Education 2020; 21(5):338-44. https://linkinghub.elsevier.com/retrieve/pii/S1575181319300956
4. Cepeda, MP, & Paredes García, ML (2020). ICT competencies in teachers of a Health Sciences Program in Bogotá. Edutec. Electronic Journal of Educational Technology, (73), 157-173. https://doi.org/10.21556/edutec.2020.73.1607
5. Riquelme-Plaza, Irma, Cabero-Almenara, Julio, & Marín-Díaz, Verónica. Validation of the digital teaching competence questionnaire in Chilean university teachers. Educare Electronic Magazine 2022; 26(1), 165-179. https://dx.doi.org/10.15359/ree.26-1.9
6. Sánchez Trujillo M de los Á, Rodríguez Flores EA. Digital competence in Health Sciences teachers at a private university in Lima. Higher Medical Education 2021; 35(1). http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S0864-21412021000100005&lng=es&nrm=iso&tlng=es
7. UNESCO ICT Competency Framework for Teachers. 2023. https://www.unesco.org/es/digital-competencies-skills/ict-cft

8. Ojeda O and Fernández M. Digital Teaching Competencies for the Design and Management of Quality Virtual Classrooms in subjects of the Faculty of Medicine – Universidad Nacional del Nordeste. In: XVII Congress of Technology in Education & Technology Education, June 2022, p. 90-100. http://sedici.unlp.edu.ar/bitstream/handle/10915/139918/Documento_completo.%20Ojeda%20y%20Fern%C3%A1ndez-%20Competencias%20Digitales%20.pdf-PDFA.pdf?sequence=1&isAllowed= and
9. Vargas-Murillo G. Digital skills and their integration with technological tools in higher education. Hospital de Clínicas Notebooks 2019; 60(1):88-94. http://www.scielo.org.bo/scielo.php?script=sci_abstract&pid=S1652-67762019000100013&lng=es&nrm=iso&tlng=es
10. Carcaño Bringas E. Digital tools for the development of learning. Vinculando Magazine. Published - 04-28-2021. https://vinculando.org/educacion/herramientas-digitales-para-el-desarrollo-de-aprendizajes.html
11. García Martín, J., & García Martín, S. Use of digital tools for teaching in Spain during the COVID-19 pandemic. Spanish Journal of Comparative Education 2021; (38), 151–173. https://doi.org/10.5944/reec.38.2021.27816
12. Agreda Montoro, M., Hinojo Lucena, MA, & Sola Reche, JM (2016). Design and validation of an instrument to evaluate the digital competence of teachers in Spanish Higher Education. Pixel-Bit. Journal of Media and Education, (49), 39–56. https://recyt.fecyt.es/index.php/pixel/article/view/61713
13. Fernández Márquez E, Leiva-Olivencia JJ, López-Meneses E. Digital competencies in Higher Education teachers. Digital Journal of Research in University Teaching 2023; 213-31. https://revistas.upc.edu.pe/index.php/docencia/article/view/558
14. Cabero-Almenara J, Barroso-Osuna J, Palacios-Rodríguez A. Study of teaching digital competence in Health Sciences. Its relationship with some variables. Medical Education 2021;22(2):94-8. https://linkinghub.elsevier.com/retrieve/pii/S1575181320301959
15. Aiastui EB. A systematic review of the literature on the level of digital competencies defined by DigCompEdu in higher education. Open Classroom 2021; 50(4):841-50. https://reunido.uniovi.es/index.php/AA/article/view/16307
16. Cabero-Almenara J, Palacios-Rodríguez A. European Framework for Digital Teaching Competence «DigCompEdu». Translation and adaptation of the «DigCompEdu Check-In» questionnaire. EDMETIC 2020; 9(1):213-34. https://www.uco.es/ucopress/ojs/index.php/edmetic/article/view/12462
17. Ocaña-Fernández Y, Valenzuela-Fernández L, Morillo-Flores J. Digital competence in university teachers. Purposes and Representations March 10, 2020 [cited November 24, 2023];8(1):e455-e455. https://revistas.usil.edu.pe/index.php/pyr/article/view/455
18. Manterola C, Quiroz G, Salazar P, García N. Methodology of the types and study designs most frequently used in clinical research. Las Condes Clinical Medical Journal 2019; 30(1):36-49. https://linkinghub.elsevier.com/retrieve/pii/S0716864019300057
19. Gallardo-Echenique E, Tomás-Rojas A, Bossio J, Freundt-Thurne Ú. Evidence of validity and reliability of the DigCompEdu CheckIn in teachers of a private Peruvian university. Publications 2023; 53(2):49-88. https://revistaseug.ugr.es/index.php/publicaciones/article/view/26817
20. WMA - The World Medical Association-WMA Declaration of Helsinki – Ethical principles for medical research involving human beings 2017. https://www.wma.net/es/policies-post/declaracion-de-helsinki-de-la -amm-ethical-principles-for-medical-research-in-human-beings/
21. Bordas Beltrán JL, Arras Vota AMDG, Gutiérrez Diez MDC, Sapien Aguilar AL. Digital skills and training needs of e-students at the Autonomous University of Chihuahua. RIDE 2020;10(20). https://www.ride.org.mx/index.php/RIDE/article/view/677
22. Aretio LG. COVID-19 and digital distance education: pre-confinement, confinement and post-confinement. RIED-Ibero-American Journal of Distance Education 2021;24(1):09-32. https://revistas.uned.es/index.php/ried/article/view/28080
23. Inamorato dos Santos A, Chinkes E, Carvalho M. The digital competence of academics in higher education: is the glass half empty or half full? International Journal of Educational Technology in Higher Education 2023;(20):23. https://dialnet.unirioja.es/servlet/articulo?codigo=8949915
24. Serrano Hidalgo M, Llorente Cejudo M del C. The DIGCOMPEDU model as a basis for teaching digital competence in the context of a Latin American university. EDMETIC 2023;12(2):1-17. https://dialnet.unirioja.es/servlet/articulo?codigo=9068314

25. Garzón Artacho E, Sola Martínez T, Trujillo Torres JM, Rodríguez García AM. Teaching digital competence in adult education: a study in a Spanish context. Pixel Bit 2021;(62):209–34. http://dx.doi.org/10.12795/pixelbit.89510
26. Cabero-Almenara J, Barroso-Osuna J, Rodríguez-Gallego M, Palacios-Rodríguez A. Teaching Digital Competence. The case of Andalusian universities. Aula Abierta 2020;49(4):363-72. http://156.35.33.189/index.php/AA/article/view/15112
27. López EP, Tosina RY. The digital competence of university teachers during the transition to emergency remote teaching. Distance Education Magazine (RED) 2023;23(72). https://revistas.um.es/red/article/view/540121
28. Cabero-Almenara J, Barroso-Osuna J, Palacio-Rodríguez A, Llorente-Cejudo C. Evaluation of university t-MOOC on teaching digital competencies through expert judgment according to the DigCompEdu Framework. Distance Education Magazine (RED) 2021; 21(67). https://revistas.um.es/red/article/view/476891
29. Alieto E, Abequibel-Encarnacion B, Estigoy E, Balasa K, Eijansantos A, Torres-Toukoumidis A. Teaching inside a digital classroom: A quantitative analysis of attitude, technological competence and access among teachers across subject disciplines. Heliyon 2024; 10(2):e24282. http://dx.doi.org/10.1016/j.heliyon.2024.e24282