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Revista Tempos e Espaços em Educação, vol. 14, núm. 33, e15527, 2021

Universidade Federal de Sergipe, Brasil

Disponível em: <https://www.redalyc.org/articulo.oa?id=570272348032>

DOI: <https://doi.org/10.20952/revtee.v14i33.15527>

Revista Tempos e Espaços em Educação 2021

Revista Tempos e Espaços em Educação 2021



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Publicação Contínua

Digital teaching skills: comparative study in higher education


Habilidades de ensino digital: estudo comparativo no ensino
superior

Habilidades de enseñanza digital: estudio comparativo en
educación superior

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Revista Tempos e Espaços em Educação,
vol. 14, núm. 33, e15527, 2021

Universidade Federal de Sergipe, Brasil

Recepción: 21 Enero 2021
Aprobación: 12 Abril 2021
Publicación: 25 Abril 2021

DOI: <https://doi.org/10.20952/revtee.v14i33.15527>

Redalyc: <https://www.redalyc.org/articulo.oa?id=570272348032>

Abstract: Research entitled Comparative study of the teacher's digital competencies since the perception of students from four Senati locations, Lima-2020 was intended to establish the significant differences in digital competences between teachers of the different senati headquarters, located in Lima Metropolitana and Callao; the work followed the quantitative methodology, descriptive, comparative and explanatory level; the population was 4440 students with a random sample stratified of 354; the instrument was subjected to the reliability and validity of both content and construct. The main results established that at least two population means are different, as indicated by the p value (0,000) and F (11,819). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters.

Keywords: Digital skills, Perception, Teaching, Teaching skills.

Resumo: A pesquisa intitulada Estudo comparativo das competências digitais do professor desde a percepção de alunos de quatro localidades do Senati, Lima-2020 teve como objetivo estabelecer as diferenças significativas nas competências digitais entre professores das diferentes sedes senati, localizadas em Lima Metropolitana e Callao; o trabalho seguiu a metodologia quantitativa, descritiva, comparativa e nível explicativo; a população foi de 4440 alunos com uma amostra aleatória estratificada de 354; o instrumento foi submetido à confiabilidade e validade de conteúdo e construto. Os principais resultados estabeleceram que pelo menos duas médias populacionais são diferentes, conforme indicado pelo valor de p (0,000) e F (11,819). A sede de Lima

Cercado também apresentou um desempenho melhor em comparação com as outras sedes.

Palavras-chave: Ensino, Habilidades de ensino, Habilidades digitais, Percepção.

Resumen: La investigación titulada Estudio comparativo de las competencias digitales del docente desde la percepción de estudiantes de cuatro sedes del Senati, Lima-2020 tuvo como objetivo establecer las diferencias significativas en competencias digitales entre docentes de las distintas sedes del Senati, ubicadas en Lima Metropolitana y Callao; el trabajo siguió la metodología cuantitativa, nivel descriptivo, comparativo y explicativo; la población fue de 4440 estudiantes con una muestra aleatoria estratificada de 354; el instrumento se sometió a la confiabilidad y validez tanto de contenido como de constructo. Los principales resultados establecieron que al menos dos medias poblacionales son diferentes, como lo indican el valor p (0,000) y F (11,819). La sede de Lima Cercado también mostró un mejor desempeño en comparación con las otras sedes.

Palabras clave: Docencia, Habilidades digitales, Habilidades docentes, Percepción.

INTRODUCTION

Globally, governments have been developing comprehensive strategies and plans for standardization, quality and excellence in teaching throughout the education process from the pre-kindergarten to the higher level; Over the past 20 years, technology has redesigned the way we work in society, how we communicate, how we learn, and how we teach.

In a digital context, educational institutions face one of the most complicated, fortuitous and difficult times, as globalization implies the possibility and need to seize meaningful opportunities; but also complicated challenges and problems in relation to the future. In this sense, the top-level teacher faces a novel reality where he must have the necessary skills, which will be evident in his teaching sessions. However, few actions related to the use of the computer where teachers are considered right-handed; it is therefore necessary to train highly trained teachers for the management, development of new information and the transmission of such knowledge.

Within the teaching skills, digital competence is fundamental for those who exercise teaching and, in this way, can enhance their classes in a highly digital society; such competence must allow the construction, processing, evaluation and classification of topics taught in a classroom. The term "competence" has been defined as the progressive and dynamic development of skills and/or capacities for the sole purpose of achieving systemic and holistic development throughout life (Tobón, 2008; Lopez, 2014). In this regard, it is appropriate to design appropriate programmes that allow higher education institutions to be convinced that teachers have achieved them; for this reason, the levels of digital skills held by teachers should be specified when they enter their classrooms; from this baseline, adequate teaching can be certified to the current requirements; having the necessary digital skills will help the academic process, accepting that the work environment is currently a highly digital environment; it is then important and necessary for educational institutions to ensure the achievement of these competences in all their teachers, since otherwise we would be facing traditional sessions, behavioural and without the necessary teaching strategies to achieve the desired objectives (Villa &

Poblete, 2007). In addition, a publication was made on the competencies of the teacher observing the particularities of the students and the courses assigned to teachers in the semester; it was concluded that these teachers did not have the necessary profile to develop the established courses (Hirsh, 2014).

Peru is no stranger to this reality, as it still maintains concepts of learnings of yesteryear that, today, are not adequate; these learnings drag students into passive, non-independent and repetitive learning. Unfavourable decision-making in the educational field, focusing on some material aspects and not on human capital which is the most important thing, the lack of teacher updating in active methodologies, as well as the lack of notion in the selection and appointment of competent teachers show that many do not have pedagogical training because they come from other professions; much of the classroom teachers are the result of questioned behavioral training. The way of teaching cannot be based on simple repetition or memorization of lessons, the skills and competencies required in the digital age are four: knowing how to search and synthesize information, compare ideas, apply what is found in new situations, as well as create and innovate. In this sense, academic institutions have platforms where the teacher must upload tasks, videoconferences, forums; however, an uns positive condition prevails for these entities: unskilled teachers in digital skills.

This situation has been observed in Senati, a higher technical education institution, which offers more than 30 careers with a teaching population of 2,100 at the Lima-Callao level. In which 60% of those who teach do not have pedagogical training; there is also a significant percentage of teachers who do not yet have the digital skills needed to teach virtual classes, highlighting monotonous, exhibition and unused classes of technological tools; thus, students are able to observe and make value judgments about their classes and their teachers, their opinions are valued as legitimate, because those students are constantly approaching technologies and can publicize their opinions about the development of their classes with the use of new technologies (Oviedo, 2004).

Therefore, teaching skills are aspects of interest in today's academic world, where institutions establish actions that seek education appropriate to the current context and with highly trained teachers, equipped with technological and didactic tools. Information on this issue needs to be lifted; it is also relevant to analyse this issue and lay the groundwork for further research. Given the considerations set out, the problem arises through the following question: What are the levels of the teacher's digital skills since the perception of students from four Senati locations, Lima-2020?

THEORETICAL FRAMEWORK

Teacher training schemes focus on student performance and the articulation between student learning and the competence of the student. In this regard, Vasquez (2018) indicated a high level of perception about

teaching skills by students, who rate the competence of their teachers as excellent; the students noted that their teachers show a high level of knowledge, attitudes and skills necessary to perform as educators; on the other hand, the positive results also correspond to the perception of responsibility of the university professor. In the same context, Mortis, Valdés, Angulo, García y Cuevas (2015) addressed teachers' perception of their digital competencies with socio-labor, academic and access to technologies; concluded that teachers self-evaluated as good at using technologies and not very good at using methodology, reacting negatively to poor access to the use of technological tools and trainings received; for Perez (2019), the results indicated that teachers have a high level in the use of basic digital tools; but, in advanced-level computing content, they present learning difficulties, a fact that is linked to the non-acquisition of new knowledge in digital resources.

At the same time, studies conducted by Esteban, Laínez, Menjívar, Monroy and Quan (2015), Cardoso, Cerecedo and Ramos (2014) as well as that of Villarreal, García, Hernández and Steffens (2018) concluded that teachers need constant training to improve the development of their classes and make use of computer tools; respondents agreed that their teachers should improve their skills in the use of information technologies, and also require significant support in the management and design of ICT activities as they do not have the tools to develop modern and creative classes.

The studies of Durán, Gutiérrez and Prendes (2016) found a number of common and different elements in the models of digital competences, which included dimensions of the generic concept of digital competence both technical, informational and communicative to which they will incorporate specific ones such as the ability to exploit the educational potential of ICT in the teaching processes; in the same line, Gallardo, Minelli, Marqués and Esteve (2015) agreed that digital competence is the sum of skills, knowledge and attitudes not only in technological aspects; but also information, multimedia and application, necessary for teaching staff in higher education, whom the authors call technological multiple literacy.

In addition, Steve (2015) concluded that everyone involved in the educational process is able to handle basic technological tools; there were some shortcomings in the process of teaching, deficiency in the use of active methodology, and they also presented problems and lack of attitude when using digital tools; in the same line, Lores, Sánchez and García (2019) found that teachers show a deficit of digital training and that teacher training in technological skills based on information management and participatory learning is urgent. Indeed, the student perspective is valid as learning teaching activities are moderately favourable, because theoretical and practical content is not adequately articulated, as far as academic content is properly articulated, it is clear that teachers do not have a mastery of digital skills, teaching strategies and didactics when it comes to imparting knowledge during their classes (Palomino, 2018).

In this regard, the study of Castellanos, Nieto and Parra (2018) showed that there is minimal mastery in ICT by teachers and students for the benefit of meaningful learning; it was confirmed that there is a separation between reality and what we want to have, between the scheduled and the actual fulfillment of activities; then it is necessary to train teachers when using this instrument, in this way, better results will be achieved. For Casas (2017), there is a high degree of correspondence with the mastery of the assigned subject matter, management, evaluation and use of digital technologies.

From this perspective, the educational work currently demands the need to develop new skills in teachers, considering that these skills enrich the teacher and his work carried out in the classroom in a highly digital environment; therefore, it is crucial for the teacher's performance. Competence in the field of education is acquired on a regular basis and is in permanent progression. Perrenoud (2004) noted that competition is the ability to effectively face countless similar facts, working in an agile, timely manner, making use of various teaching resources in the classroom; For his part, Cano (2008) indicated that it is the cohesion of knowledge, skills and attitudes to carry out executions of the domain, in addition it is contextualized, dynamic and with autonomy.

Teaching competence is understood as a pool of knowledge and skills needed to drive and develop an active and lively class. The student teacher link is the idea strength in teaching activity where you seek to make your mark on students, beyond time. In addition, the teaching competence includes a series of social, cognitive, cultural, affective, labor and productive skills founded on the internal motivations of each person (Labajos, 2014; Ticona, 2014; Torres et al., 2014; Zabalza, 2014)

The definition of digital literacy was raised by Glister (1997) who affirmed the innovative role that technology has played, recognizing the student who is digitally literate as the one who has a set of skills and skills very well related to the management and development of information through networks. Therefore, digital competence is part of the set of competencies that anyone must develop to achieve the goals related to work, employability, learning, inclusion and contribution to society, where the work of the teacher turns out to be important in the development of skills of his students by using strategies in the teaching-learning process and promoting meaningful learning in a digital world.

The insertion of ICTs into the educational process includes considerable growth of new spaces and learning scenarios: semi-presence, remote or online, as well as the development and strengthening of learning with the use of Flipped Classroom, Learning Analytics, Bring Your Own Device, the Internet of Things, big data, augmented reality, programming and robotics (Johnson et al., 2016). Indeed, Adell (2010) considered five dimensions of digital competence: (a) information literacy: it is the ability to work with information so that it can be managed, evaluated, created and communicated to the digital society, (b) technological literacy: we consider the ability to make use of digital tools from a cell phone to the most modern devices with skill and skill,

(c) multiple literacy: today, we are in a digital age where everything is audiovisual; it is necessary to interpret, communicate, express and create multimedia messages so it is necessary to know how to use audiovisual tools in the teaching career, (d) cognitive competence: which encloses high-level skills such as the analysis, synthesis and evaluation of information as well as the ability to solve problems and (e) digital citizenship: considering that every day changes our way of life, work, relating, etc.; therefore, one must have an ethical, thoughtful and responsible attitude about the use of technologies, know how to be a critical and responsible citizen in the digital field.

For Caccuri (2016), the digital teaching competence is the development of cognitive, procedural and attitudinal skills that will benefit the realization of both personal and social in a specific environment such as a classroom; to teach in a digital world, it is important to develop digital skills to perform and recognize the new ways in which information circulates; It also sized it into six: (a) information and information literacy: it is based on the ability to ask questions, identify, analyze and discriminate reliable sources of information creatively and ethically, know how to browse Google, Kiddle and Bing search engines being the last two search engines for children with access to parents and teachers; (b) communication and collaboration: is the ability that shows the suitability to share information through networks, connect with other digital members with ethics and digital awareness, save information in the cloud such as Google Drive, Onedrive with access only for members of a group, use of platforms that allow sharing of information such as Edmodo, Symbaloo, Wetransfer or Mindmeister that allows you to create conceptual maps online; (c) creation of content: it is the aptitude to express yourself through digital written language, produce and program computer content with respect to intellectual property, one of the most used tools are Canva and Genial.ly; (d) security: considers the security and responsible use of information, protection of personal information and individual identity closely related to psychological and social issues; also know the risks and benefits that exist in the use of the Internet; (e) problem solving and critical thinking: today, it takes effect and is considered as the foundations of learning, having the ability to reason in an inductive and deductive way, issuing value judgments, making decisions in complex situations and solving problems creatively and (f) pedagogical competencies: it contemplates being able to include ICTs in curriculum design, to the roadmap and apply them through teaching forms, creative and innovative so it is necessary to learn multimedia, hypertextuality, think of the classroom as an open field where technology enriches the teaching process.

In this sense, the overall objective is to determine and compare the levels of the teacher's digital skills from the perception of students from four Senati locations, Lima-2020. The general hypothesis is also determined: There are significant differences in comparing the levels of the teacher's digital skills since the perception of students from four Senati locations, Lima-2020.

METHODOLOGY

The study was of the applied rate, because it aims to solve a problematic situation of the real context in terms of the deficiencies that exist in the teacher's digital competencies. He knew (2013) that this type of study is intended to provide some alternative solution in a current context of individuals or groups of people and, to do so, has to intervene. It is also comparatively descriptive in nature, because the descriptive data of the digital skills variable of teachers at four Senati locations seen from the perception of students was compared. In this regard, Sánchez y Reyes (2015) indicated that comparative descriptive research details and evaluates in an orderly manner the facts and the parts that make up it in a given time.

The investigative method applied was hypothetical-deductive, because, from the beginning, a hypothesis was raised whose veracity was proven. The design addressed was of the non-experimental, descriptive comparative, transsectal type, because a single measurement was made at the student level in order to know their perception of the digital skills of their teachers. Kerlinger (2002) noted that, in any non-experimental study, variable manipulation is impossible. In addition, transferal since he conducted the survey at any given time.

Sánchez y Reyes (2015) outlined the type of comparative descriptive design for four populations, which is then presented:

n_1 ----- O_1

n_2 ----- O_2

n_3 ----- O_3

n_4 ----- O_4

$$O_1 \neq O_2 \neq O_3 \neq O_4$$

$$= \quad = \quad =$$

Where: n = samples; n1 = sample of the headquarters of Lima Cercado; n2 = sample of the headquarters of San Juan de Lurigancho; n3 = sample of The Window headquarters; n4 = sample of the headquarters of Villa El Salvador; O = observation of samples; ≠ = symbol of inequality and symbol of equality.

Teacher digital competence is the teacher's ability to generate added value in the courses he teaches; it also creates a meaningful learning environment for students in today's digital age. A 40-item instrument was developed, establishing an ordinal scale in which the variable is quantified for measurement from a Likert, ordinal scale: 5 is Always; 4, Almost always; 3, Sometimes; 2, Almost never and 1, Never.

Table 1
Operationalization of the digital competence variable.

Dimensions	Indicators	Items	Measuring scale	Levels and ranges
D1: Information and information literacy	Search, Evaluation and analysis, Storage and recovery, Integration and creation.	1 to 7		
D2: Communication and collaboration	Interaction using digital technologies, Share through digital technologies, Ethics and citizen participation, Collaboration, Digital identity management.	8-15		
D3: Creating content	Development of digital content, Integration of digital content, Copyright and licensing, Programming.	16 to 24		
D4: Security	Protection of devices and digital content, Protection of personal data and digital identity, Health and wellness protection.	25 to 31		
D5: Problem solving and critical thinking	Troubleshooting, Identification of technological needs and responses, Innovation and use of digital technology creatively.	32 to 34		
D6: Pedagogical skills	Planning, Content development, Communicate the contents, Selection, Value Criteria.	35 to 40		

The population consisted of 4440 students from the four senati headquarters, Lima-2020. In this regard, Carrasco (2017) argued that the population becomes the total of the elements corresponding to the spatial context where the study is to be executed.

Table 2
Study population.

Occupational families	Headquarters			
	Lima Cercado	Saint John of Lurigancho	Window	Villa El Salvador
Business administration	650	450	350	160
Graphic arts	80	90	160	130
Automotive mechanic	130	70	90	95
Electrical	80	70	100	95
Food industries	170	130	140	120
Information technology	90	100	140	60
Metalworking	50	60	70	80
Textiles and clothing	70	90	110	160
Total, by family	1320	1060	1160	900
Total, population	4440			

The exhibition was probabilistic in type and consisted of 1140 students from the four senati headquarters, Lima-2020. On the other hand, the sample is probabilistic when all participants of the population are likely to be randomly appointed (Hernández, Fernández and Baptista, 2014).

To establish the sample of the four senati headquarters, Fisher's formula was applied, for the headquarters of Lima Cercado, which had a population of 1320 students:

$$n = \frac{Z^2 \cdot p \cdot q \cdot N}{(N-1)E^2 + Z^2 \cdot p \cdot q}$$

Table 3
Study sample.

Occupational families	Headquarters			
	Lima Cercado	San Juan Lurigancho	Window	Villa El Salvador
Total per family	85	85	92	73
Total, shows	354			

Sampling was of a random probabilistic type, i.e. all participants were randomly chosen. For this, random sampling was performed in an Excel file, taking into account the headquarters of Lima Cercado. The same procedure was then continued for the next three locations until sampling was completed. According to Quezada (2015), it consists of the segmentation of the population into groups in which they are understood to be homogeneous in relation to the characteristics to be studied, randomly choosing all the elements that will be part of the sample by random numbers.

The technique was the survey, which has 40 items, distributed in the six dimensions of digital competencies. The instrument was validated by the expert judgment method, which verified the definition of the variable and dimensions, in addition to the indicators, determining their relevance, relevance and clarity, referring to the instrument's measure of what the variable indicates.

Reliable control of the instrument was carried out using the Cronbach Alpha statistic, for which a pilot test was carried out with 45 students surveyed, obtaining a value of 0.829. Subsequently, the test was performed with the entire sample obtaining a reliability of 0.946, indicating an excellent level of reliability of the instrument.

For comparative descriptive analysis, it was found that the information obtained from the four Senati headquarters has similar, equal or different levels. In this sense, students were given a survey to mark one of the alternatives of the Likert ordinal scale, according to their perception. For the procedure, participants were requested to assist in filling out the survey. Monitoring and control was done for the entire duration of the survey. At the end of the survey, they were thanked for their participation and indicated that an absolute reservation of the recorded data would be kept and that it would only serve the research process.

The normality test was performed to determine whether the data scores came from a normal distribution or not; and with the Anova test the hypotheses for inferential analysis was tested, this test allowed to compare

the variance of the four samples of the Senati headquarters in the period 2020.

This investigation respected the rules and procedures established by the institution where it was applied. This applied instrument kept the participants' sense of confidentiality, as codes were used for each participant. The autonomy of the participants was respected, their participation voluntarily opted in, prior to this informed consent was applied. It remains an absolute reserve of the results obtained by each participant; results will also not be taken into account for the evaluation and/or 16-monthly qualification of study subjects. Similarly, the authorship of APA sources and standards was respected.

RESULTS

Descriptive result

Analysis of descriptive data on the digital skills of teachers perceived by students in Lima Callao indicated that 13.6% are in process and 86.4%, in achieved; at Lima Cercado headquarters, 2.4% are in process and 97.6% are in progress; at the headquarters of San Juan de Lurigancho, it was observed that 20.0% is in process and 80.0%, in achieved; at Ventanilla's headquarters, 20.7% are in process and 79.3%, in achieved and, at the headquarters of Villa El Salvador, 13.7% are in process and 86.3%, in achieved. The results indicated that the headquarters of Lima Cercado has better results than the other headquarters.

Table 4
Digital competencies in Senati Lima-Callao.

	Senati Lima - Callao		Lima Fenced Headquarters		St. John of Lurigancho Headquarters		Window Headquarters		Headquarters Villa El Salvador	
	F	%	F	%	F	%	F	%	F	%
Home	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Process	48	13.6	2	2.4	17	20.0	19	20.7	10	13.7
Achieved	306	86.4	83	97.6	68	80.0	73	79.3	63	86.3
Interest	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	354	100.0	85	100.0	85	100.0	92	100.0	73	100.0

General hypothesis test

The hypothesis raised used the anova stenographer, presents: $H_0: .1 .2$; H_i : At least two population means are different.

Various samples were established from each location subject to comparison, where the anova (.000) and F (11,819) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado is different with San Juan de Lurigancho (SJL), with Ventanilla - Callao (VC) and Villa El Salvador (VES); they also indicated that the difference in mean in greater between

LC and V. In reference to SJL and the other locations, this difference is with LC and the like with VS; in reference to VC, the difference in with LC and the like with SJL and VC; in reference to VES, it is different with LC and similar with the other locations.

Table 5
General hypothesis test.

Multiple comparisons: Teacher's digital competencies

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Gis.	95% confidence interval	
						Lower limit	Upper limit
		Saint John of Lurigancho	11,88515*	2,44471	,000	5,0176	18,7527
	Lima Cercado	Window - Callao	11,93810*	2,39276	,000	5,2165	18,6597
		Villa El Salvador	10,71587*	2,56378	,001	3,5139	17,9179
		Lima Cercado	-11,88515*	2,44471	,000	-18,7527	-5,0176
	Saint John of Lurigancho	Window - Callao	,05294	2,52080	1,000	-7,0283	7,1342
		Villa El Salvador	-1,16928	2,68367	,979	-8,7081	6,3695
Anova,000F11,819		Lima Cercado	-11,93810*	2,39276	,000	-18,6597	-5,2165
	Window- Callao	Saint John of Lurigancho	-,05294	2,52080	1,000	-7,1342	7,0283
		Villa El Salvador	-1,22222	2,63643	,975	-8,6283	6,1839
		Lima Cercado	-10,71587*	2,56378	,001	-17,9179	-3,5139
	Villa El Salvador	Saint John of Lurigancho	1,16928	2,68367	,979	-6,3695	8,7081
		Window - Callao	1,22222	2,63643	,975	-6,1839	8,6283

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

Specific hypothesis test 1

For this test, various samples were established from each location subject to comparison, where the anova (,000) and F (13,688) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado (LC) is different with SJL, with Ventanilla - Callao and Villa El Salvador; they also indicated that the difference in means is greater in LC with VS. With reference to SJL and the other headquarters, they made no significant difference; in reference to VC, the difference is LC; in reference to VES, it is different with LC and similar with the other locations.

Table 6
Specific hypothesis test 1.

Multiple comparisons: D1: Information and information literacy.

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Gis.	95% confidence interval	
						Lower limit	Upper limit
Anova,000F13,688	Lima Cercado	Saint John of Lurigancho	2,14062*	,66634	,017	,2688	4,0125
		Window - Callao	3,98064*	,65218	,000	2,1486	5,8127
		Villa El Salvador	3,08571*	,69880	,000	1,1227	5,0487
	Saint John of Lurigancho	Lima Cercado	-2,14062*	,66634	,017	-4,0125	-,2688
		Window - Callao	1,84003	,68708	,068	-,0901	3,7701
		Villa El Salvador	,94510	,73148	,644	-1,1097	2,9999
	Window - Callao	Lima Cercado	-3,98064*	,65218	,000	-5,8127	-2,1486
		Saint John of Lurigancho	-1,84003	,68708	,068	-3,7701	,0901
		Villa El Salvador	-,89493	,71860	,671	-2,9136	1,1237
	Villa El Salvador	Lima Cercado	-3,08571*	,69880	,000	-5,0487	-1,1227
		Saint John of Lurigancho	-,94510	,73148	,644	-2,9999	1,1097
		Window - Callao	,89493	,71860	,671	-1,1237	2,9136

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

Specific hypothesis test 2

For this test, various samples were established from each location subject to comparison, where the anova (,000) and F (7,206) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado is different with SJL and Villa El Salvador; they also noted that the average difference is greater between LC and VS. In reference to SJL and other headquarters, it has no significant difference, except LC; in reference to VC, there are no significant differences; in reference to VES, it is different with LC and similar with the other locations.

Table 7
Specific hypothesis test 2.

Multiple comparisons: D2: Communication and collaboration.

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Sig.	95% confidence interval	
						Lower limit	Upper limit
Anova,000F7,206	Lima Cercado	Saint John of Lurigancho	2,84706*	,75780	,003	,7183	4,9758
		Window- Callao	1,22609	,74170	,436	-,8575	3,3096
		Villa El Salvador	3,13611*	,79471	,002	,9037	5,3686
	Saint John of Lurigancho	Lima Cercado	-2,84706*	,75780	,003	-4,9758	-,7183
		Window- Callao	-1,62097	,78139	,232	-3,8160	,5741
		Villa El Salvador	,28905	,83188	,989	-2,0478	2,6259
	Window- Callao	Lima Cercado	-1,22609	,74170	,436	-3,3096	,8575
		Saint John of Lurigancho	1,62097	,78139	,232	-,5741	3,8160
		Villa El Salvador	1,91002	,81723	,143	-,3857	4,2057
	Villa El Salvador	Lima Cercado	-3,13611*	,79471	,002	-5,3686	-,9037
		Saint John of Lurigancho	-,28905	,83188	,989	-2,6259	2,0478
		Window- Callao	-1,91002	,81723	,143	-4,2057	,3857

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

Specific hypothesis test 3

For this test, various samples were established from each headquarters subject to comparison, where the anova (,000) and F (10,805) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado is different with SJL and VC; they also indicated that the difference in means is greater in LC with VC. In reference to SJL and other headquarters, it has no significant difference, except LC; in reference to VC, has no significant difference, except LC; in reference to VES, there are no significant differences.

Table 8
Specific hypothesis test 3.

Multiple comparisons: D3: Creating content

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Gis.	95% confidence interval	
						Lower limit	Upper limit
Anova,000F10,805	Lima Cercado	Saint John of Lurigancho	3,30140*	,73967	,000	1,2236	5,3792
		Window- Callao	3,71905*	,72395	,000	1,6854	5,7527
		Villa El Salvador	1,80238	,77569	,147	-,3766	3,9814
	Saint John of Lurigancho	Lima Cercado	-3,30140*	,73967	,000	-5,3792	-1,2236
		Window- Callao	,41765	,76269	,960	-1,7248	2,5601
		Villa El Salvador	-1,49902	,81197	,334	-3,7799	,7819
	Window- Callao	Lima Cercado	-3,71905*	,72395	,000	-5,7527	-1,6854
		Saint John of Lurigancho	-,41765	,76269	,960	-2,5601	1,7248
		Villa El Salvador	-1,91667	,79767	,125	-4,1574	,3241
	Villa El Salvador	Lima Cercado	-1,80238	,77569	,147	-3,9814	,3766
		Saint John of Lurigancho	1,49902	,81197	,334	-,7819	3,7799
		Window- Callao	1,91667	,79767	,125	-,3241	4,1574

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

Specific hypothesis test 4

For this test, various samples were established from each location subject to comparison, where the anova (,000) and F (2,192) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado there are no significant differences. In reference to SJL and the other headquarters, they do not differ significantly; in reference to VC, it has no significant difference; in reference to VES, there are no significant differences.

Table 9
Specific hypothesis test 4.

Multiple comparisons: D4: Security.

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Gis.	95% confidence interval	
						Lower limit	Upper limit
Anova,000F2,192	Lima Cercado	Saint John of Lurigancho	,77983	,68461	,730	-1,1433	2,7030
		Window - Callao	-,31863	,67006	,973	-2,2009	1,5637
		Villa El Salvador	-1,11151	,71795	,495	-3,1283	,9053
	Saint John of Lurigancho	Lima Cercado	-,77983	,68461	,730	-2,7030	1,1433
		Window- Callao	-1,09847	,70592	,491	-3,0815	,8846
		Villa El Salvador	-1,89134	,75153	,099	-4,0025	,2198
	Window - Callao	Lima Cercado	,31863	,67006	,973	-1,5637	2,2009
		Saint John of Lurigancho	1,09847	,70592	,491	-,8846	3,0815
		Villa El Salvador	-,79287	,73830	,764	-2,8669	1,2811
	Villa El Salvador	Lima Cercado	1,11151	,71795	,495	-,9053	3,1283
		Saint John of Lurigancho	1,89134	,75153	,099	-,2198	4,0025
		Window- Callao	,79287	,73830	,764	-1,2811	2,8669

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

Specific hypothesis test 5

For this test, various samples were established from each location subject to comparison, where the anova (,000) and F (2,091) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado there are no significant differences. In reference to SJL and the other headquarters, they do not differ significantly; in reference to VC, it has no significant difference; in reference to VES, there are no significant differences.

Table 10
Specific hypothesis test 5.

Multiple comparisons: D5: Problem solving and critical thinking

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Gis.	95% confidence interval	
						Lower limit	Upper limit
Anova,000F2,091	Lima Cercado	Saint John of Lurigancho	-,21232	,38758	,960	-1,3011	,8764
		Window - Callao	-,28458	,37934	,905	-1,3502	,7810
		Villa El Salvador	,67738	,40646	,428	-,4644	1,8192
	Saint John of Lurigancho	Lima Cercado	,21232	,38758	,960	-,8764	1,3011
		Window- Callao	-,07225	,39964	,998	-1,1949	1,0504
		Villa El Salvador	,88971	,42546	,226	-,3055	2,0849
	Window- Callao	Lima Cercado	,28458	,37934	,905	-,7810	1,3502
		Saint John of Lurigancho	,07225	,39964	,998	-1,0504	1,1949
		Villa El Salvador	,96196	,41797	,153	-,2122	2,1361
	Villa El Salvador	Lima Cercado	-,67738	,40646	,428	-1,8192	,4644
		Saint John of Lurigancho	-,88971	,42546	,226	-2,0849	,3055
		Window- Callao	-,96196	,41797	,153	-2,1361	,2122

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

Specific hypothesis test 6

For this test, various samples were established from each headquarters subject to comparison, where the anova (,000) and F (18,527) test, which is the ratio of the four locations, indicated that the results obtained from the populations under study are different and in addition most of the differences are significant. Thus, Lima Cercado there are significant differences, being greater with VES. In reference to SJL it is different with LC and, with the others, headquarters do not differ significantly; in reference to VC, it has no significant difference; in reference to VS, there are no significant differences.

Table 11
Specific hypothesis test 6.

Multiple comparisons: D6: Pedagogical competencies

Anova test	(I) Headquarters	(J) Headquarters	Difference in stockings (I-J)	Desv. Error	Gis.	95% confidence interval	
						Lower limit	Upper limit
Anova,000F18,527	Lima Cercado	Saint John of Lurigancho	3,02857*	,55661	,000	1,4650	4,5922
		Window- Callao	3,61553*	,54478	,000	2,0852	5,1459
		Villa El Salvador	3,12579*	,58372	,000	1,4861	4,7655
	Saint John of Lurigancho	Lima Cercado	-3,02857*	,55661	,000	-4,5922	-1,4650
		Window- Callao	,58696	,57393	,790	-1,0253	2,1992
		Villa El Salvador	,09722	,61101	,999	-1,6192	1,8136
	Window- Callao	Lima Cercado	-3,61553*	,54478	,000	-5,1459	-2,0852
		Saint John of Lurigancho	-,58696	,57393	,790	-2,1992	1,0253
		Villa El Salvador	-,48973	,60026	,881	-2,1759	1,1965
	Villa El Salvador	Lima Cercado	-3,12579*	,58372	,000	-4,7655	-1,4861
		Saint John of Lurigancho	-,09722	,61101	,999	-1,8136	1,6192
		Window- Callao	,48973	,60026	,881	-1,1965	2,1759

*The difference in means is significant at level 0.05.

*The difference in means is significant at level 0.05.

DISCUSSION

The contrast of the general hypothesis indicated that at least two population means are different; that is, the existence of differences in e-skills at the four Senati headquarters under study, the results of which showed that the proposed analysis model was relevant where the test explained that the four locations had different results as indicated by p value (,000) and F (11,819). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters. These results matched those of Vasquez (2018) in that digital competencies have high levels of perception on the part of students; but, unlike the research carried out, this had a better index at LC headquarters; however, for Esteban, Laínez, Menjívar, Monroy and Quan (2015), his studies showed that teachers require constant training to improve their digital skills and make appropriate use of the various ICT tools offered on the networks.

This indicates that the digital skills will enable the proposed pedagogical objectives to be achieved and, in this way, learning, inclusion in the society where the teacher becomes the engine of this process. Thus, both Zahonero and Martín (2012) and López (2014) stated that these competencies allow to carry out with efficiency and autonomy the work entrusted, in addition to accompanying the learning processes. It is important to note that Glister (1997) explained the innovative role of technology, recognizing that the person is digitally literate when he has skills and skills with information management and development across networks. These skills make up digital literacy, building knowledge from

other reliable sources and discriminating against its truthfulness, critically analyzing information, examining its validity and integrity.

The contrast of specific hypothesis 1 indicated that at least two population means are different; that is, the existence of differences in digital competences between the four venues, the results of which showed that the proposed analysis model was the relevant one where the test explained that the four locations had different results as indicated by p value (,000) and F (13,688). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters. These results are consistent with those of Mortis, Valdés, Angulo, García and Cuevas (2015) where the digital competencies associated with socio-labor, academic and access to technology variables demonstrate the good use of new technologies; Pérez (2019) also indicated that teachers have a high level in the use of basic digital tools, but, in advanced-level computer content, present learning difficulties, a fact that is linked to the non-acquisition of new knowledge in digital resources. Castellanos, Nieto and Parra (2018) stated that there is minimal mastery in ICT by teachers and students that reduces the development of meaningful learning; confirming that there is a separation between reality and what you want to have, between the scheduled and the actual fulfillment of activities. Thus, to consider yourself digital in a globalized world is to have the sum of skills to make proper use of technological tools and access new information in real time, as well as manage and evaluate resources to build new knowledge.

The contrast of specific hypothesis 2 indicated that at least two population means are different; that is, the existence of differences in teaching digital skills in the four locations, the results of which showed that the proposed analysis model was relevant where the test explained that the four locations had different results as indicated by p value (,000) and F (7,206). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters. These results are consistent with that of Cardoso, Cerecedo and Ramos (2014) which indicates that teachers are willing to train according to the courses they develop in the academic semester. It should be noted that there is a positive and committed predisposition on the part of teachers to update the face of technological changes. Johnson et al. (2016) noted that the insertion of ICTs into the educational process generates considerable growth of new spaces and learning scenarios.

The contrast of specific hypothesis 3 indicated that at least two population means are different; that is, the existence of differences in teaching digital skills in the four locations, the results of which showed that the proposed analysis model was relevant where the test explained that the four locations had different results as indicated by p value (,000) and F (10,805). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters. These results consistent with that of Villarreal, García, Hernández and Steffens (2018) which concluded that the use of proven, researched and analyzed patterns is optimal, reinforcing the training of teachers in this area since they require

significant support in the management and design of ICT activities since they do not have the necessary tools to develop modern and creative classes. Durán, Gutiérrez and Prendes (2016) also indicated that the digital competence and dimensions of the generic concept of digital competence, both technical, informational and communicative to which, demonstrate the capabilities to exploit the educational potential of ICT in the teaching processes.

For Casas (2017), there is a high degree of correspondence with the mastery of the assigned subject matter, management, evaluation and use of digital technologies. That is where teachers need to develop new skills, considering that these skills enrich the teacher and his work in the classroom in a highly digital environment; therefore, they are basic and necessary for the performance of the teacher.

The contrast of specific hypothesis 4 indicated that at least two population means are different; that is to say, the existence of differences in the digital skills of teachers in the different locations, the results of which showed that the proposed analysis model was the relevant one where the test explained that the four venues had different results as indicated by the p value (,000) and the F (2,192). It was also demonstrated that, in all four locations, there were no differences in performance compared to the other headquarters. These results consistent with those of Gallardo, Minelli, Marques and Esteve (2015) demonstrated that digital skills are the sum of skills, knowledge and attitudes, and not only in technological aspects; but also information, multimedia and application, necessary for teaching staff in higher education, whom the authors call technological multiple literacy. In addition, Perrenoud (2004) noted that it is the ability to effectively deal with a number of similar facts, making use of various teaching resources in the classroom. Cano (2008) also indicated that it was the cohesion of knowledge, skills and attitudes in order to carry out executions of the domain; contextualized, dynamic and autonomy.

The contrast of specific hypothesis 5 indicated that at least two population means are different; that is, the existence of differences in digital competences between deocnetes of senati's four headquarters, the results of which showed that the proposed analysis model was relevant where the test explained that the four sites had different results as indicated by p value (,000) and F (2,091). It was also demonstrated that, among the four headquarters, there were no differences in performance compared to the other headquarters. These results, consistent with Steve (2015), concluded that everyone involved in the educational process is able to handle basic technological tools; but they presented problems and lack of attitude when using digital tools. However, Lores, Sánchez and García (2019) demonstrated that teachers show a shortfall in digital training and that teacher training in technological skills based on information management and participatory learning is urgently needed.

Torres, Badillo, Valentín and Ramírez (2014) indicated that the teaching competence includes a series of social, cognitive, cultural, affective, labor and productive skills founded on the internal motivations

of each person. But, for Caccuri (2016), to be competent is to be able to infer, collate, evaluate and produce new information, which holds the idea of being competent in the development of current issues in the use of ICT.

The contrast of specific hypothesis 6 indicated that at least two population means are different; that is, the existence of differences in digital competences between the teachers of the different locations, the results of which showed that the proposed analysis model was relevant where the test explained that the four venues had different results as indicated by p value (,000) and F (18,527). It was also shown that there are significant differences in performance compared to other locations. These results were consistent with those of Caccuri (2016) who noted that digital teaching skills for the development of cognitive, procedural and attural skills emphasize that information and information literacy, communication and collaboration, content creation, security and problem solving and critical thinking are fundamental to learning with media development, hypertextuality in the teaching process.

CONCLUSION

The levels of the teacher's digital skills since the perception of students from four Senati locations, Lima-2020 indicated that at least two population averages are different as indicated by the p value (,000) and F (11,819). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters.

The levels of information and information literacy of the teacher's digital skills since the perception of students from four Senati locations, Lima-2020 indicated that at least two population averages are different; the test explained that the four locations had different results as indicated by p value (,000) and F (13,688). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters.

The levels of communication and collaboration of the teacher's digital skills since the perception of students from four Senati headquarters, Lima-2020, indicated that at least two population averages are different, the results of which showed that the proposed analysis model was relevant, as the test explained that the four locations had different results as indicated by the p value (.000) and F (7,206). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters.

The levels of content creation of the teacher's digital competencies since the perception of students from four Senati headquarters, Lima-2020 indicated that at least two population averages are different, the results of which showed that the proposed analysis model explained that the four locations had different results as indicated by p value (,000) and F (10,805). Lima Cercado's headquarters were also shown to perform better compared to the other headquarters.

The levels of security of the teacher's digital skills since the perception of students from four Senati headquarters, Lima-2020 indicated that

at least two population averages are different, the results of which showed that the analysis model the four locations had different results as indicated by p value (,000) and F (2,192). It was also shown that, in all four locations, there were no statistically significant differences in performance compared to the other headquarters.

The levels of problem solving and critical thinking of the teacher's digital skills since the perception of students from four Senati headquarters, Lima-2020 indicated that at least two population averages are different, the results of which showed that the four locations had different results as indicated by p value (,000) and F (2,091). It was also demonstrated that, in all four locations, there were no differences in performance compared to the other headquarters.

The levels of pedagogical skills of the teacher's digital skills since the perception of students from four Senati headquarters, Lima-2020 indicated that at least two population averages are different, the results of which showed that the four locations had different results as noted by p value (,000) and F (18,527). It was also shown that there are significant differences in performance compared to other locations.

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Información adicional

How to cite: Molina, G. M. T., Coronado, M. L. F., Falcon, C. F., Rivera-Zamudio, J., & Lira, L. A. N. (2021). Digital teaching skills: comparative study in higher education. *Revista Tempos e Espaços em Educação*, 14(33), e15527. <http://dx.doi.org/10.20952/revtee.v14i33.15527>

Authors' Contributions: Torres, G. M. T.: conception and design, acquisition of data, analysis and interpretation of data, drafting the article, critical review of important intellectual content; Coronado, M. L. F.: conception and design, acquisition of data, analysis and interpretation

of data, drafting the article, critical review of important intellectual content; Falcon, C. F.: conception and design, acquisition of data, analysis and interpretation of data, drafting the article, critical review of important intellectual content; Rivera-Zamudio, J.: conception and design, acquisition of data, analysis and interpretation of data, drafting the article, critical review of important intellectual content; Lira, L. A. N.: conception and design, acquisition of data, analysis and interpretation of data, drafting the article, critical review of important intellectual content. All authors have read and approved the final version of the manuscript.