

## Teaching competency in virtual education: Systematic review

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### ABSTRACT

This study arises as a need to recognize teaching competencies and their integration to become professionals who respond to current challenges aimed at improving learning achievements and comprehensive training of students. The objective of the research was to analyze and recognize teaching competencies in virtual education in higher education students. The study is important due to the direct relationship with student learning. The study was qualitative research, with a systematic design, followed the methodology proposed by the PRISMA declaration. Inclusion and exclusion criteria were applied to process the articles analyzed. A study was conducted based on 38 articles published in high impact scientific journals between 2019 and 2022. The results showed that teaching competencies in virtual education must be worked in an integrated manner: disciplinary, pedagogical, technological and research competencies that will translate into a real development of teaching-learning processes, better teaching performance and student performance. The studies determine that the disciplinary, pedagogical, technological, and investigative competence must be worked on in an interrelated manner, there is a need to integrate technology effectively, and it is important to promote research in students through experiments that allow building skills.

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## 1. INTRODUCTION

Higher education institutions are increasingly aware of the importance of offering quality education to meet the needs of a diversity of students facing different educational modalities in higher education in face-to-face, online or blended form. The teachers have a poor geospatial competence when they begin their preparation as future teachers. The concept of competencies suggests a set of capabilities, abilities and/or basic skills, which are found in essential learning for citizens in the framework of the information and knowledge society [1].

Teaching competence is the integration of four competences that the teacher knows about the subject they teach, the most appropriate pedagogical methods for the specific situation of the students, the most appropriate technology, the interest in investigating to reflect and improve the pedagogical practice. That is, the disciplinary, pedagogical, technological and investigative competencies [2]. Teaching skills allow students to respond to new and future professional skills so that they are autonomous, critical, cooperative and collaborative, allowing them to learn to learn, adapt or innovate in changing scenarios [3]. The management of teaching competencies allows the generation of a comprehensive teaching profile that

ensures educational quality, emphasizes the importance of interdisciplinary thinking, the promotion of holistic competencies and the management of the necessary skills for their development in educational environments [4]. It is important to highlight that teaching competencies constitute a control pattern of efficiency, to achieve educational quality in order to satisfy the basic learning needs of students [5].

Virtual education is not a new concept, it has been used for several years in many study and training centers; however, the prevalence of the COVID-19 pandemic allowed its expansion and mandatory adoption at all educational levels [6]. Virtual education is a privilege of quality education that can be accessed anywhere. Likewise, virtual education is a teaching method with greater use today, technology is used to educate remotely, eliminating the barrier of distance and time, it has different teaching and learning processes, from the way of access to class sessions, the teaching of didactic materials, the dynamics of participation and media, communication and forms of attention, monitoring and evaluation of the academic development of students [7]. The study of the information has made it possible to establish four basic skills that every teacher must have developed, in order to efficiently and effectively face the challenge of achieving the objectives of the teaching-learning process in a virtual context.

The pedagogical perspective is referred to the management of the teaching exercise related to methodological knowledge which covers the different ways for learning and management of curricular planning processes. Likewise, it implies communicational competence related to the treatment of students through effective communication, correct generation of a pleasant class climate and tutorial competence to be a tutor and establish interpersonal relationships that enhance the needs and interests of students [2]. Pedagogical competence is related to responsibility, class planning, transmission of knowledge, making evaluations more flexible, giving feedback [8]. On the other hand, it is considered to be the knowledge about teaching-learning methods, the use of pedagogy combined with the development of content in the search for understanding of various topics [9].

Disciplinary competence is related to the management and knowledge of the subject or discipline that is taught, mastery of the scientific content on the subject, also called academic rigor [2]. The competence is based on knowledge. It also called the epistemological dimension that the teacher manages, alluding to the discipline that he dominates and the management of practices with an emphasis on student learning [10].

It is the competence referred to the know-how of the teacher through the integration of technological resources and the application of information and communications technology (ICT) in the disciplinary, pedagogical and research field, this refers to the use of digital platforms, handling of technological tools, training and experience in multimodal and hybrid environments, research, academic production and scientific production [11], [12]. It is the set of skills to access the internet, search, manage and edit digital information, management of information networks and online communication, ability to use and evaluate digital resources, tools and services [13]. The use of ICT is a strength in the development of technological skills of the teacher, each country must adopt technological learning for online education and help build knowledge.

It is the competence referred to research that involves reflection on teaching practice [2]. This competence helps teachers to find ways to improve practice through permanent reflection, stimulating critical thinking [14]. There is little autonomy of the research teacher and limited acquisition of new skills, which affects their teaching performance [15].

The COVID-19 pandemic forced all teachers to a purely use online education. Teachers around the world experienced great changes due to the abrupt transfer to virtual education, requiring the transformation and improvement of teaching skills [16]. The metamorphosis experienced by teachers during the pandemic serves as a catalyst for the development of new capacities in training organizations of the 21st century.

Studies refer to the direct relationship between teaching skills and learning, which are mostly located in inadequate learning achievements: “teachers often find themselves with inadequate training and resources to face the challenges involved in adapting content and teaching formats” [17]. The specialists of the 2018 PISA International Student Assessment Program refer that “there is a growing gap between what students need to learn and what teachers teach” [18]. International studies refer that learning success can be achieved through teachers: “for students to learn, teachers have to teach effectively” [19]. In Peru, the education crisis is linked to teacher performance, and is corroborated in the Biennial Report on the Peruvian reality: “providing quality training must be one of the fundamental objectives of the teacher” [20]. Therefore, this research work is justified by the need to be clear about teaching skills in virtual education for reflection and proper management, so that they can develop adequate performance to create a learning environment that allows students learn and respond to the challenges of a competitive world.

It is urgent to rethink the background of didactic strategies and improve the ways of providing educational services through adequate teaching skills [14], [15], [21]. The role and substantial impact of teaching skills as a facilitator in the student learning process is vital. The objective of the article is to analyze and describe the teaching competencies in virtual education in higher education students. It is important to provide contributions to improve the behavior of educational community in improving student learning.

## 2. RESEARCH METHOD

This research corresponds to a systematic review of scientific articles between the years 2019-2022 with the theme of teaching competencies in virtual education, search criteria were used to select articles related to the research theme [22]. The technique was used of documentary analysis for bibliographic monitoring, organization, systematization of scientific articles. The review followed the methodology established in the PRISMA statement as indicated by its acronym in English (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) that allows to improve the investigations of systematic reviews and meta-analyses, through a clear process of methods and results [23], [24].

The goal period was from 2019 to 2022, which consisted of identification, screening, eligibility and inclusion, which was developed in six months. The following search criteria were included: “Teacher AND competence AND virtual”, “Teacher AND competences AND TPACK”, “Competences AND Technological AND Disciplinary AND pedagogical AND Research”, “Teacher AND competences AND Education”, “Teaching AND competence AND expertise”, “Teaching AND competence AND ability”. Documents from the Scopus, Ebsco, ProQuest, and Scielo databases were searched. During the information search process, 168 articles were collected, which followed the methodology process, were subjected to duplicity filters, inclusion and exclusion criteria of the investigation, reaching 38 scientific investigations as seen in Figure 1.

Inclusion criteria: quantitative, mixed articles for higher level students that address the use of teaching skills. Exclusion criteria: articles with titles, abstracts and keywords that did not show a relationship with the study variable, duplicates, investigations that did not consider the dimensions of the subject matter searched for in this investigation, empirical articles, review articles and qualitative articles. The information was evaluated according to the Scale to Evaluate Scientific Articles in Social and Human Sciences [25]. An information matrix was prepared with the purpose of organizing the most important data of the selected articles in which they took into consideration: Author/published year, country, indexing, construct, type of study, population and sample; as well as the most outstanding contributions of each investigation.

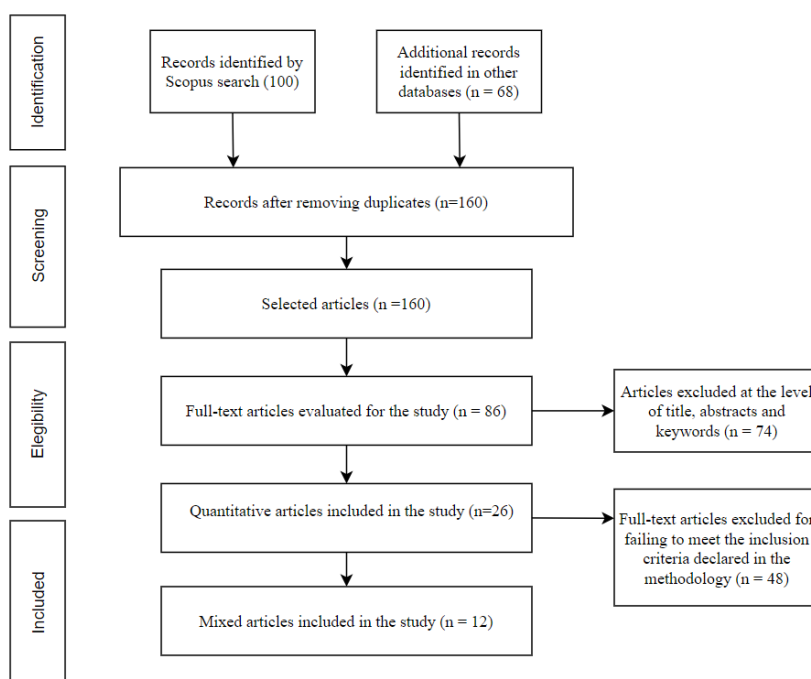


Figure 1. Adaptation of PRISMA flowchart [26]

## 3. RESULTS AND DISCUSSION

Table 1 presents the results of the search for analysis. The information has been organized taking into account the constructs related to teaching competence; having obtained 38 articles of which: 26 correspond to the disciplinary sub competence, of which 24 are associated with other categories. There were 26 belong to the pedagogical sub competence, of which 26 are associated with other dimensions. There were 29 correspond to the technological sub competence, of which 24 are associated with other dimensions. There are 12 related to the research sub-dimension, of which 10 are associated with other constructs. The analysis shows the largest number of detailed articles dealing with technological competition.

Table 1. Classification of the articles found

Ref.	Teaching competencies				Type of study	Methodology		Population/ sample	Contributions by category
	D	P	T	I		Instrument			
[1]	x	x	x		Mixed Exploratory Descriptive	Questionnaire	355/144 teachers	Develop digital skills and manage theories and principles to build enriched learning environments to access effective learning.	
[6]			x		Quantitative Descriptive	Questionnaire	232 teachers	The management of technological tools allows the administration of virtual classes and interact through online platforms.	
[7]	x	x	x		Quantitative	Test	1584/81 teachers	The teacher is empowered in the management of technology that allows him to adapt the teaching materials and the execution of the classes to a digital format.	
[21]	x	x	x	x	Quantitative	Questionnaire	762/205 teachers	Implement digital resources to promote active learning that facilitate learning, influencing teamwork, the appropriate relationship, feedback, the selection of strategies.	
[27]		x	x	x	Quantitative	Matrix analysis comparative	5650/41 teachers	Strengthen teaching skills for curricular planning, feedback, content, the use of digital tools and the use of research projects.	
[28]	x	x	x		Quantitative Descriptive	Test method	73 biology teachers Sample: 68 teachers	Understand teaching-learning methods and relevant educational media. Master strategies, techniques, educational materials and the evaluation process. Integrate learning content using technology.	
[29]			x		Quantitative Descriptive	Questionnaire	832 teachers	Improve the competence to locate, access, analyze and interpret data.	
[30]	x	x	x		Quantitative Descriptive	Questionnaire Rubric	1025/914 teachers	The methodologies allow the correct use of digital technology to build and share knowledge. However, teachers have a poor self-perception of digital competence.	
[31]	x	x	x	x	Mixed Quantitative Qualitative	Questionnaire	44 teachers and 219 students	Develop skills to plan learning activities, deliver lessons, and assessing technology. Teachers and students have to overcome digital connectivity barriers and closed curricula.	
[32]	x	x	x		Mixed Quantitative Qualitative	Questionnaire Standardized test	165/89 teachers	It is necessary to introduce new learning content, assign homework, provide feedback, select online materials and design assessment processes using ICT.	
[33]	x	x	x		Mixed Explanatory Exploratory	Questionnaire Interview	250/79 teachers	The teaching expertise allows the management of ICT tools, allows promoting their use and accessibility aligned with pedagogy.	
[34]	x	x	x		Mixed Quantitative Qualitative	Questionnaire	1000/738 medical teachers	Well-implemented learning with the use of instructional strategies and technical communication accelerates knowledge, encourages participation, motivation, feedback, and online assessment.	
[35]	x	x	x		Quantitative	Questionnaire	77 EFL teachers	Digitally adapt lesson plans and learning assessment to enhance student and teacher skills.	
[36]	x	x	x		Mixed Quantitative Correlational	Observation sheet	305 teachers	Teachers are trained to overcome the barrier of digital technology to improve teacher and student performance.	
[37]	x	x	x		Quantitative Descriptive Correlational	Questionnaire	Sample: 850 teachers	The performance is linked to the high level of the pedagogical content, materials, pedagogical strategies, didactics and active construction of knowledge.	
[38]				x	Quantitative	Questionnaire Interview	179 students	Students face problems in learning research skills and understanding empirical and theoretical scientific concepts.	
[39]	x	x	x		Quantitative Correlational	Questionnaire	338/80 teachers	A combination of technology, pedagogy, and content knowledge is desirable to enhance learning in a motivating environment.	
[40]	x	x	x		Mixed Quantitative Qualitative	Questionnaire Interview	Graduates of scientific disciplines/ 73 teachers	The teacher has the ability to integrate content, curriculum, teaching, organize learning situations, and determine learning strategies. To do this, he must handle technology and disciplinary strategies.	
[41]			x	x	Quantitative Descriptive	Questionnaire	500 teachers	The teacher must be trained in the use of digital tools for evaluation through the use of scales, digital applications and online questionnaires.	
[42]				x	Mixed Quantitative Qualitative	Questionnaire Interview	277 higher education teachers	Good digital skills related to the search for evidence in bibliographies or specialized sites, selection, storage, evaluation of information and support of proposals for changes are perceived.	
[43]	x	x	x		Quantitative	Questionnaire	329/320 teachers	The development of studies allows exploring roles and pedagogical practices and teaching skills in the teaching of the Arabic language with the use of audios and videos that facilitate speech skills.	

D=Discipline; P=Pedagogical; T=Technological; I=Investigative

Table 1. Classification of the articles found (*continued*)

Ref.	Teaching competencies				Type of study	Methodology		Contributions by category
	D	P	T	I		Instrument	Population/sample	
[44]	x	x	x	x	Mixed Quantitative Qualitative	Questionnaire	Teachers of Natural and Physical Sciences/ 249 teachers	Present the work plan with the use of motivational strategies such as videos, virtual laboratories, animations and experiments that allow a clear understanding of the learning process. Promoting research in students to solve situations related to science and technology.
[45]				x	Quantitative	Questionnaire Interview	130 students	Universities need to focus on teaching and evaluating innovation competence.
[46]	x	x	x	x	Quantitative Descriptive Correlational	Questionnaire Interview	188 student teachers	The Dikolan tool presents digital competences for the natural sciences. It is important to develop digital skills, such as AI that are used in research projects.
[47]				x	Quantitative	Questionnaire	Sample: 64 teachers	Future teachers have management of technology; however, mentor teachers do not dedicate enough time, the establishment of support systems is recommended.
[48]	x	x		x	Quantitative Descriptive	Questionnaire	Students from state universities/ 45 future teachers	There is an ideal relationship between student grade point average and teaching proficiency. This is strengthened when they participate in the design, implementation and evaluation of educational programs.
[49]	x	x		x	Quantitative Descriptive	Questionnaire	Teachers from 40 countries	The teacher must commit to inclusion encouraging students to be creative, reflective, look for new ways to solve problems by planning practical activities, positive procedures, experiments; focused on learning to know, learning to do, learning to be and learning to live together
[50]		x	x		Quantitative	Questionnaire Evaluation rubric	71 teachers/ 47 teachers	Posting weekly activities allows access to thoughtful feedback using the appropriate digital tools on the platform.
[51]	x	x			Quantitative	Questionnaire	Sample: 92 English teachers	The improvement of the competence of the teachers is evidenced in the learning achievement of the students. Teacher demotivation and lack of creativity affect professional development.
[52]				x	Quantitative	Questionnaire	Sample: 208 teachers	It is imperative to search for resources and continuous training to solve the problems caused by confinement and the increase in collaborative work due to the use of ICT.
[53]	x	x	x	x	Quantitative	Questionnaire	831/210 teachers	Teaching skills and professional excellence must be focused on the student, taking into account the context, teaching, classroom management, implementation of materials, didactics in digital technology and critical thinking to develop language skills.
[54]	x	x			Quantitative	Questionnaire	Sample: 69 teachers	Teachers, in order to use intercultural teaching and learning strategies, must know the beliefs, worldview and social structures of the students' communities.
[55]	x	x	x		Quantitative	Questionnaire	Sample: 50 teachers	It is necessary to address the challenges of today's society and the specificities of education in social studies; emphasizing the adaptation of the curriculum and teaching-learning with the use of technology.
[56]				x	Mixed Quantitative Qualitative	Questionnaire Interview	Sample: 12students	Co-designed mini-game tests, prototype evaluation, feedback, educational tools allow students to get creative and constructive ideas which enhance the learning.
[57]	x				Quantitative	Questionnaire	Sample: 23 initial training teachers	Entrepreneurship such as resource management, projects, innovation, creativity, risk taking, decision making, communication, collaboration, and teamwork develop entrepreneurial skills.
[58]	x	x	x		Mixed Quantitative Qualitative	Questionnaire	5109/1003 teachers	The pandemic forced teachers to master adapting and implementing new digital strategies to organize university education online.
[59]				x	Quantitative No experimental	Questionnaire	69 teachers/ 56 teachers	There are possibilities in planning, implementation and execution of the pedagogical practice, but teachers do not adopt new methodologies since their ICT training is insufficient.
[60]	x				Descriptive Mixed Quantitative Qualitative	Questionnaire	Sample: 34 teachers	Didactic training in the methodology related to the motivation and benefits of applying ApS through project planning and management.

D=Discipline; P=Pedagogical; T=Technological; I=Investigative

Taking into account the type of research, quantitative research (26) is preferred over mixed research (12). The trend of research designs is oriented entirely towards non-experimental ones (38). From the foregoing, it can be deduced that the generality of the articles stated the use of the questionnaire; this

demonstrates the predilection for assuming estimated constructs with techniques in which the validity and reliability of the instrument are considered.

On the other hand, the most information was obtained from the Scopus 52.6% (20), Ebsco 44.8% (17), and ProQuest 2.6% (1) database as presented in Table 2. Likewise, the analysis by country shows that Spain (18.4%) and Indonesia (15.9%) are the countries where the largest amount of research related to the construct of teaching competencies is carried out; while those with the least production in relation to the theme are: Brazil, United States, Peru, Netherlands, Poland, Arabia, Philippines, Pakistan, Nigeria and South Africa with only 1 article in each of them between 2019 and 2022 as presented in Table 3. On the other hand, 94.7% (36) of the analyzed information was published in English, while only 5.3% (2) published in Spanish as shown Table 4.

The systematic review allowed data analysis and highlighting qualitative categories that specify the teacher's skills: i) Teaching competencies is the integration of disciplinary, pedagogical, technological and investigative competencies all intertwined and that will result in student learning achievements; ii) The pedagogical competence of the teacher influences student learning, accelerates knowledge, encourages participation and motivation to learn, thus improving the quality of the educational service; iii) It is necessary to address the challenges of today's society and the specificities of education by developing teaching skills that strengthen their professional profile; iv) The disciplinary knowledge is complemented with general notions of pedagogy to adequately address teaching and learning and the approach to technological competence, which guarantees a good teaching service and that students achieve academic performance in the courses; v) Technological competence is related to digital literacy, technical skills, the use of technological tools and different multimedia platforms for teaching in this new world that mixes face-to-face, online and hybrid educational environments; vi) Technology is a tool that changes every day, the ability to select digital platforms, technological tools and follow a holistic perspective is required to improve teaching and integrate technology into education; vii) Education should focus on the development of the competence of research and innovation of knowledge as a vital process in teacher training in the initial stage of the profession and in all permanent teacher training.

Table 2. Distribution of information by database

Database	Frequency	%
Scopus	20	52.6
EBSCO	17	44.8
ProQuest	1	2.6
Total	38	100

Table 3. Distribution of data by country

Country	Frequency	%
Brazil	1	2.6
Colombia	2	5.3
Ecuador	2	5.3
USA	1	2.6
Mexico	3	7.9
Peru	1	2.6
Germany	2	5.3
Spain	7	18.4
Finland	2	5.3
Netherlands	1	2.6
Poland	1	2.6
Arabian	1	2.6
Indonesia	6	15.9
Philippines	1	2.6
Pakistan	1	2.6
Turkey	4	10.6
Nigeria	1	2.6
South Africa	1	2.6
Total	38	100

Table 4. Distribution of data by language

Language	Frequency	%
Spanish	2	5.3
English	36	94.7
Total	38	100

### 3.1. Pedagogical competence

When analyzing the results of the pedagogical competences subcategory in higher education, it was evidenced that it seeks to understand theories, principles and postulates that support pedagogy. In addition, to know the teaching-learning methods, the methodological models, didactic materials, the educational media with quality criteria. Likewise, it seeks various forms of personalized attention to the student that facilitate the evaluation of knowledge in an authentic way. Finally, it allows access to tools to monitor and guide with participation dynamics in order to facilitate learning [7], [28], [30], [31], [36], [37], [50].

On the other hand, teaching competencies allow the promotion of sustainable development through methods such as deliberative dialogue, problem-based learning, planning and project management [49]. That is why the development of studies that allow exploring the roles and pedagogical practices is recommended, which allows the development of teaching skills in teaching [43]. Nevertheless, it should be noted that the pedagogical perspective is related to curricular planning, diagnosis of students' learning needs, adaptation of lesson plans according to the student, planning of didactic strategies, planning of practical activities, planning of study visits, and experiments among others [27], [31], [35], [40], [49].

Likewise, it is necessary to specify that the teacher needs to have pedagogical skills related to reflective feedback, management of an adequate classroom environment, time management, effective communication, tutoring, knowledge transfer, development of student life projects, work promotion, cooperative, meaningful learning and project-based learning related to the use of digital media that seek to consolidate student learning [21], [27], [28], [31], [34], [44], [46], [51], [53], [54]. All this is important to the extent that the management of the teacher's pedagogical competence influences student learning, accelerates knowledge, encourages student participation and motivation. There is a direct relationship between the student's grade point average and competence, skills used by the teacher in the classroom which help enable effective learning [34], [48].

### 3.2. Disciplinary competence

The disciplinary competence is referred to the academic domain, management of course content, teaching experience, which allows the increase of capacities, skills, and teaching self-efficacy [7], [28], [30], [33], [34], [39], [40], [55]. On the other hand, the management of disciplinary competences as entrepreneurial competences of the teacher allows the management of resources, project management, innovation, creativity, risk taking, problem solving, decision making, communication, collaboration and teamwork establish a frame of reference that allows the development of skills for entrepreneurship in students [57]. The management of disciplinary competence allows to increase the confidence, security, improve the profile and professional development of the teacher [61]. In addition, it allows the teaching-learning processes to be strengthened through the use of technological resources [32]. However, the existence of unmotivated teachers in teaching activities are not capable of developing relevant competencies of the educational task [21], [51].

### 3.3. Technology competition

The 21st century underlines the need to understand digital competence, the practical use of technology, digital literacy, technical skills, the use of technological tools and different multimedia platforms for online teaching, thus allowing the development of virtual classes [6], [31], [55]. Along these lines, the use of digital media is related to managing Google, the internet, social networks, YouTube, Facebook, Skype, blogs, email, platforms, and messaging services. As well as the management of software, hardware, office programs, digital equipment such as laptops, projectors, multimedia smart boards, audio, video web conferences, forums, websites, three-dimensional learning environments, virtual laboratories, simulated experiments that place the student in a central and active role which are efficient in distance education [32].

Technological competence allows the development of skills to locate, access, analyze, organize and interpret data. In addition, navigation skills, search, evaluation, filtering, storage and retrieval of information. Likewise, skills to generate information that facilitate decision-making, skills for digital experiences, evaluation of prototypes and management of educational tools which allow students to obtain creative and constructive ideas that promote learning [54]. Similarly, technological competence facilitates the development of research projects and the use of new approaches such as augmented reality, printing, artificial intelligence, creating better learning environments, improving teacher performance and student performance oriented towards learning. promote the active construction of knowledge [36]. On the other hand, digital competitiveness considers five aspects such as connectivity, human capital, use of the internet and integration of digital technology [30].

When a new educational scenario emerged during the COVID-19 pandemic, teachers faced new methodological, didactic and educational communication challenges in which they were forced to face current digital challenges [34]. On the other hand, there are barriers to the integration of technology for teachers such as distractions, poor connection to the network, lack of time, not having adequate technology,

closed curricula, lack of professional support, anxiety to face the use of ICT among others [31]. These difficulties are more evident in women than in men [52]. Similarly, seniority often disadvantages teachers in technology-based practices [36]. This leads to the conclusion that it is imperative that the teacher receives continuous training to adapt to the new technology and use it efficiently in the educational task.

### 3.4. Investigative competence

Scientific research allows the development of skills to analyze, understand and solve situations related to science and technology which strengthen the processes of understanding, the method of registration, organization, interpretation, systems, analysis and generation of data [44]. Likewise, authentic research skills are developed through open experiments, promotion of skills through the investigation of context problems and research projects with methodological standards and the consideration of American Psychological Association standards, understanding the needs of teacher training in this new world that mixes face-to-face, online and hybrid educational environments [61]. The research to be carried out can be of a quantitative, qualitative or multi-method type that can include various tools for its execution.

Studies indicate that future teachers are perceived as having a very high level of competence in handling technology and that the internship is the place where the association of theories and practices is allowed in a real teaching-learning environment to acquire authentic learning experiences. learning [47], [48]. However, some studies showed that some students face problems in learning research skills and understanding scientific concepts; it is observed that teachers do not have an adequate evaluation process, students are limited to the generation of a basic report and the lack of debate techniques and science projects which harms the comprehensive education of students [38], [44]. Finally, the results suggest that universities and training centers need to focus on the teaching and evaluation of innovation competence through the implementation of principles of constructivist learning environments aimed at promoting creativity, leadership, energy and research. In the same way, education should focus on information search dimensions and develop research and innovation of knowledge as a vital process in teacher training in the initial stage of professional training and continuous training to promote critical reflection and improvement of teaching performance [45], [53], [62].

## 4. CONCLUSION

The present investigation identifies that the disciplinary, pedagogical, technological and investigative competence must be worked on in an interrelated manner. From this perspective, the management of the four teaching competencies allows for an ideal professional profile of the higher education teacher to ensure student learning so that they are able to face all the challenges of today's society and improve educational quality. Technological competence refers to the management of digital tools and platforms, virtual laboratories, simulated experiments that place the student in a central and active role. The study shows the need to integrate technology effectively, organizing practical training for teachers in training at their initial stage and for teachers in service.

This study demonstrates through the analysis of scientific literature that teaching skills in virtual education led us to understand the need to change, transform and jointly assume disciplinary, pedagogical, technological and research skills to improve our role and interaction in education, virtual classrooms geared to meet the learning needs of online students. In this way, the quality of the educational service is improved and greater satisfaction is ensured for the learning and academic performance of the students. It is important to promote research in students through experiments, building skills through the investigation of context problems and research projects with methodological standards.

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