A systematic review on measurement instruments of digital competence of university teachers in English Teaching majors

Revisión sistemática de instrumentos de medición de competencias digitales de docentes universitarios en carreras de Enseñanza de Inglés

Mario Esteban Alpizar Rodríguez[1] https://orcid.org/0000-0003-0254-5680

[1]*Universidad Americana de Costa Rica*, San José, Costa Rica
mario.alpizarrodriguez@ucr.ac.cr

Abstract

The research presents a systematic review of measurement instruments for assessing digital competencies among university teachers in English teaching majors in Costa Rica. The study aimed to analyze the digital competencies of educators across various models and regions, identifying the most common competences and categorizing them into distinct dimensions. Data were gathered using a systematic bibliographic review methodology, and relevant literature was analyzed qualitatively. The findings reveal key elements contributing to an ideal measurement instrument, highlighting essential competencies university teachers should possess to effectively integrate digital tools into their teaching practices. This review sheds light on the current state of digital competence among educators and serves as a foundation for developing robust assessment tools tailored to the specific needs of English teaching professionals in Costa Rica. By delineating the critical dimensions of digital competencies, this research provides valuable insights for educational institutions aiming to enhance the digital proficiency of their teaching staff.

Keywords: Digital competencies, teachers' competencies, use of didactic resources, technological competencies, Information and Communication Technologies.

Resumen

Esta investigación presenta una revisión sistemática de los instrumentos de medición para evaluar las competencias digitales de los docentes universitarios de las carreras de enseñanza de inglés en Costa Rica. El estudio tiene como objetivo analizar las competencias digitales de los educadores en diversos modelos y regiones del planeta, identificando las competencias más comunes y categorizándolas en dimensiones distintas. Se utilizó una metodología de revisión bibliográfica sistemática, se recopiló y analizó la literatura relevante a través de un enfoque cualitativo. Los hallazgos revelan elementos clave que contribuyen a un instrumento de medición ideal, destacando las competencias esenciales que los docentes universitarios deben poseer para integrar eficazmente herramientas digitales en sus prácticas de enseñanza. Esta revisión no solo resalta el estado actual de la competencia digital de los educadores, también sirve como base para desarrollar herramientas de evaluación robustas adaptadas a las necesidades específicas de los profesionales de la enseñanza de inglés en Costa Rica. Al delinear las dimensiones críticas de las competencias digitales, esta investigación proporciona valiosos conocimientos para las instituciones educativas que buscan mejorar la competencia digital de su personal docente.

Palabras clave: Competencias digitales, competencias docentes, uso de recursos didácticos, competencias tecnológicas, Tecnologías de la Información y las Comunicaciones.

Introduction

Currently, education as a pillar of the development of society, as in other areas, has been permeated by the integration of Information and Communication Technologies (hereinafter ICT) in the formation processes of all educational levels. Specifically in English teaching, these tools have become an essential resource for transformation, strategic management, and favorable empowerment, intensifying their use in this 21st century (García et al, 2018).

Teachers are an essential part of the teaching process and greatly influence learning, so they must have the appropriate abilities, knowledge, and competencies to promote and establish suitable spaces for knowledge creation and skills development through ICT, according to the demands of the 21st century (Carballo et al., 2015, p. 3).

Within the multiplicity of existing competencies involved in teaching, digital teaching competencies turn out to be essential given the current technological demands and the role that universities play as centers for the professional training of teachers, specifically in English language teaching, which is the focus of this research.

In previous studies conducted at the Universidad de Costa Rica, Charpentier and Escalante (2015) found that the use of ICT as a teaching resource among university educators was limited and not linked to the development of language skills. As a result, examining how this situation has evolved in the current national context becomes relevant, especially considering that the role of a university educator in the English teaching program should be of a designer and mediator of spaces for knowledge construction and include the adoption and integration of the tools, devices, and digital applications provided by the use of ICT (Cruz, 2018).

From this premise, and since there is no definition of a measuring instrument of digital teaching competencies in the country, the following questions arose: What digital competencies can be measured to define an English teacher at a university level as efficient

and competent? How have these competencies been measured in other parts of the world? What competencies could be adapted and measured in the context of higher education in Costa Rica?

The main purpose of this bibliographical systematic review is to collect information and data on instruments for measuring the digital competencies of university teachers from different regions of the world, to understand their adaptation to each different context and thus define the appropriate elements for an ideal instrument for measuring these competences in university teachers of English in Costa Rica.

Literature review

Various documents were analyzed, including models of digital competencies related to the use of ICT and their implementation in different areas of the world, indexed articles, and previous research, which provide a broader perspective on the topic. The research was selected based on the specific topic, methodology, and theoretical frameworks. The documents were organized in a contextual order from the international level to the regional level and finally to the local level. They are presented in two main areas: teacher digital competencies and the didactic use of ICT in English teaching at the university level.

Teacher digital competencies result from the knowledge and use of ICT, as well as the abilities and skills for information search and evaluation and timely problem-solving that arise from the constant use of these technological tools to promote the education of informed individuals capable of social development (UNESCO, 2008).

For this research and as a reference for teacher digital competencies, the INTEF model (2017) was considered, which focuses on the technical knowledge of ICT and its use to promote communication, creation, collaboration, and problem-solving in the teaching practice.

This model is divided into five areas, namely:

- Informational literacy: This focuses on navigation, search, and filtering of information, as well as the evaluation, storage, and retrieval of digital data. Ramírez and Casillas (2014) included a similar area in their knowledge framework called programs and information systems specific to the subject discipline, which covers programs related to a particular field through the use of electronic journals, websites, blogs, specialized databases, virtual libraries, and content repositories. According to Carrera and Coiduras (2012), one of the components of the digital competence of university teachers should be the treatment and efficient management of information on the web, which corresponds to the aforementioned area.
- Communication and collaboration: This focuses on interaction with the community, exchange of information, online citizen participation, collaboration through official channels, netiquette, and management of digital identity, which defines the user profile of ICT. Ramírez and Casillas (2014) also included two areas related to these competencies. The first is the communication area, which covers the use of WhatsApp, chat, email, social networks, learning platforms, blogs, video calls, and text messages. The second area is socialization and collaboration, which includes the use of social web services to follow, read, publish (in blogs), participate in forums, consult wikis, and use social networks. Additionally, this aligns with the RUTE model analyzed by Bosco (2008), specifically in its fifth area, referring to communication competencies through ICT, such as acquiring communication skills

and collaborative work strategies among teachers through virtual spaces and networks. Lastly, Carrera and Coiduras (2012) also mention that one of the components of the digital competence of university teachers is the use of the Internet for collaborative work, communication, and interpersonal interaction.

- Digital content creation: This includes the development, integration, and reworking of digital content while respecting authorship rights, licenses, and programming. As shown earlier, Ramírez and Casillas (2014) align with this model, but in this case, they divide digital content creation into three areas. The first is the creation and manipulation of text and enriched text content, which includes editing functions (text formatting, images, hyperlinks, comments, automatic indexes, citations, numbering, spelling check) in word processors and presentation functions in presentation management programs. The second area is the creation and manipulation of data, which encompasses competencies such as using and managing information sets, databases, and spreadsheets. Lastly, the third area is the creation and manipulation of multimedia content, which includes the creation, capture, recording, transfer, viewing, editing, and conversion of audio, video, and images. All of this aligns with Bosco (2008) in terms of instrumental computer competencies that include the knowledge and skills of individuals and computer resources, both hardware and software, which is more related to software due to the use of programs to create the variety of files mentioned by Ramírez and Casillas (2014). For this research, it is considered important to include editing, as programs allow for changing and even converting files into different formats for various uses.

- Safety and cybersecurity: Device usage involves the protection of personal data, management of digital identity, and health in the use of ICT and the digital environment. Once again, Ramírez and Casillas (2014) coincide and expand on the aspect of digital citizenship, which includes a variety of knowledge within this area, such as conventional use of writing in different communication contexts, use of emoticons, abbreviations, omission of spelling rules, different font types (color, size, style), exclusive use of capital letters, and use of formal/informal language. Additionally, relevant aspects for security are considered, such as publishing information on the web (passwords, geolocation), information integrity (antivirus, backups, website access), and responsible use of information and computer services (author licenses and open-source software). In this regard, other components considered by Carrera and Coiduras (2012) as part of the digital competence of university teachers can be included, such as the implementation and ethical, legal, and responsible use of ICT, which are also part of the digital identity that should be fostered in both teachers and students. Up to this point, technical aspects related mainly to the use and care of software and programs have been addressed, but it is important to consider hardware aspects as well, such as the management, maintenance, and troubleshooting of computer equipment and peripherals. This is in line with what Bosco (2008) analyzed, incorporating instrumental computer competencies related to the knowledge and skills of individuals in managing computer resources, including hardware.

- Problem-solving: This refers to the ability to identify needs and problems in the educational context and to propose and implement technological solutions. This includes the ability to analyze, evaluate, and select appropriate digital tools and resources for teaching and learning. Ramírez and Casillas (2014) also address this aspect, including areas related to the use of ICT as a tool for problem-solving, such as the use of software for problem-solving, the use of educational applications, and the use of virtual reality and augmented reality. Carrera and Coiduras (2012) also

coincide with this area, including the ability to integrate, adapt, and create educational resources using ICT.

It is important to note that these areas of teacher digital competencies are not isolated. They are interconnected and complement each other, forming a comprehensive framework for the use of ICT in education. Teachers with strong digital competencies are able to effectively and creatively integrate technology into their teaching practice, fostering student engagement and enhancing learning outcomes.

In 2016, UNESCO proposed six levels to understand digital competencies in the educational context. These levels encompass different aspects related to teachers' use of information and communication technologies (ICT). Below is a brief description of each level:

- Policy level: This refers to the policies that teachers must consider regarding the use of ICT in their individual contexts and teaching objectives
- Curriculum level: At this level, teachers should be able to integrate ICT into the curriculum and comply with technological regulations. It also involves acquiring specific competencies for virtual teaching, such as planning, developing, monitoring, and evaluating teaching and learning processes in virtual environments.
- Pedagogical level: Teachers should know when and how to use technology in class activities. It involves designing educational scenarios supported by ICT to facilitate meaningful learning and student formation. This level relates to creating a motivating learning environment and establishing empathy with students.
- Didactic level: At this level, teachers should understand the functioning of devices and software and apply activities based on their experiences. They should also evaluate the effectiveness of ICT-supported educational scenarios.
- Organizational level: Teachers use technology during whole-class activities and ensure equitable access to its use. It also includes providing guidance in the learning process, attending to students' individual needs and interests, and conducting research on their own teaching practice in online environments.
- Teacher's digital competence level: This level encompasses helping students use appropriate ICT and develop competence. It involves supporting students in using ICT appropriately and becoming competent in its handling.

These are proposals to understand and develop teachers' digital competencies in the educational context, considering both political and curricular aspects and pedagogical and didactic dimensions.

Research Question

Based on the previous information, the research question for the main problem in this research is the following:

What are the appropriate elements for an ideal instrument for measuring the digital competencies of university English teachers in Costa Rica?

General objective

To define the elements of an ideal instrument for measuring the digital competencies of university teachers of English in Costa Rica.

Methodology

The present research project is based on descriptive research, which aims to review what different authors propose or prove about the research question. This systematized literature review allows the researcher to find similarities and differences in the research topic through thematic analysis, enabling them to draw logical conclusions by confirming what was proposed and spotting opportunities for further research by determining where little or no research has been conducted. Through the thematic analysis, it was possible to identify and categorize the relevant digital competencies according to specific dimensions.

This research project combines a literature review and a systematic literature review. According to the University of Edinburgh (2022), a literature review allows the researcher to demonstrate "knowledge and understanding of the academic literature on a specific topic placed in context. A review of the literature also includes a critical evaluation of the material" (p. 1). In other words, a literature review allows the researcher to collect information considering that the literature must be related to the research question and the topic to be analyzed; therefore, it becomes the beacon for the type of literature sought.

On the other hand, a systematic review of the literature is carried out, according to Petticrew and Roberts (2006), as a method of making sense of a large amount of information and a means of contributing to answers to questions about what works and what does not, and many other types of questions as well. They are a method of mapping areas of uncertainty and identifying where little or no relevant research has been done but where further study is needed. Systematic reviews also point to areas where false certainty abounds. These are areas where we think we know more than we do but where there is little compelling evidence to support our beliefs. (p. 2).

Therefore, the method in this research project allows us to do what Khan et al. (2003) proposed as the steps of a systematic review of the literature, which are to frame the question, identify relevant publications, assess the quality of the study, summarize the evidence, and interpret the findings (p. 5-18). This enables the researcher to find convergences and divergences based on what the different authors present, giving them a broader view of the phenomenon and leading them to draw logical conclusions based on what the literature says.

Qualitative Research

The research approach is qualitative, which, according to Barrantes (2006): "…postulates a phenomenological, inductive, process-oriented conception. It seeks to discover or generate theories. It emphasizes depth, and its analyses are not necessarily translated into mathematical terms". (p.71).

In turn, Hernández et al. (2014) mention that this approach "uses data collection without numerical measurement to discover or refine research questions in the interpretation process" (p. 7). Considering these definitions, this approach allows intense field work, repeated encounters with the study subjects, and an exhaustive record of events to conduct a detailed analysis. Since the research question is often framed to explore phenomena, understand experiences, or examine conceptual frameworks, it is designed to elicit in-depth insights rather than numerical data.

The criteria for including studies focused on specific digital competencies research and how they have been organized, arranged, and measured in other regions; also, the search strategies were based on indexed databases and documents from international institutions related to the topic. The studies were selected based on how well they addressed the research

question and met the inclusion criteria. This included assessing the relevance and rigor of the qualitative research, such as methodological soundness and depth of analysis. The focus was on extracting themes, patterns, and findings from previous studies related to the topic, which involved summarizing key insights, concepts, and interpretations presented by the authors. The synthesis involved thematically or conceptually organizing the findings from different studies.

Considering the objectives of this study, fieldwork characterized the qualities of the events and experiential scenarios under study to find the definition of an appropriate instrument for measuring the digital competencies of university teachers of English in Costa Rica.

Procedure
Framing question for review

Considering the subject in hand, the first specific objective of the research about identifying the elements of the instruments for measuring teacher digital competencies used in different contexts, and the research question of this process "what are the appropriate elements to consider for an ideal instrument for measuring the digital competencies of university teachers of English in Costa Rica?", there has been some research that may turn not only useful but also give a greater insight on the topic. Within the great diversity of models on digital teacher competencies, as well as the instruments used to address and measure these competencies, the following information is presented, Table 1:

Table 1

Frameworks, models, and proposals for digital teaching competencias

Teacher Digital Competencies

Authors	Model/Framework	Dimensions and Competences, it covers
Educational Testing Service (ETS, 2007)	iSkills	• Access: know and know how to collect and/or retrieve information. • Manage: apply from an existing classification or organization scheme. • Integrate: interpret and represent the information. It is about summarizing, comparing, and contrasting. • Evaluate: make judgments about the quality, relevance, usefulness, or efficiency of the information. • Create: adapt, apply, design, invent, or author the information.
ISTE (2008)	NETS-T	This model includes the following areas: • Creativity • Design and develop learning experiences and assessments • Work and learning in the digital age • Promote responsibility and digital citizenship • •Participate in professional development and leadership.
Koehler and Mishra, (2008)	TPACK Model	This model includes the following dimensions: • Technological competencies described as knowledge about technological capacities and applications. • Pedagogical competencies, as its name implies, general pedagogical competencies. • Disciplinary competencies that cover the competencies on the matter and discipline to be dealt with. These, in turn, intertwine, creating more specific ramifications such as: • Pedagogical technological skills • Technological content competencies • Pedagogical competencies of the content • Technological and pedagogical competencies of the content according to the context in which the proposal is developed.
Generalitat de Cataluña (2009)	ACTIC	• Culture and digital participation • Use of the computer and the operating system • Navigation and communication • Treatment of written communication

Authors	Model/Framework	Dimensions and Competences, it covers
		• Treatment of graphic, sound, and image information • Treatment of numerical information • Data processing • Presentation of contents
Pozos (2010)	Integration of the Digital Competence of University Professors in their Professional Teaching Development	In this model, seven Digital Competence Units are structured: • Planning and design of learning experiences in face-to-face and virtual environments. • Development and management of face-to-face and online collaborative learning experiences. • Guidance and evaluation of knowledge construction processes in face-to-face and virtual environments. • Management of growth and professional development with the support of ICT. • Research, development, and pedagogical innovation with/for the use of ICT in education. • Diversity, ethics and responsible use of ICT in professional teaching performance. • Environment, occupational health and safety with the use of ICT in the teaching profession.
Prendes (2010)	ICT skills for teaching at the Spanish Public University	This model includes the following areas: • General computer knowledge and ICT possibilities. • Knowledge and use of methodological strategies for networking. • Possibilities and limitations of ICT in the teaching-learning process • Choice of ICT resources for the classroom • Knowledge and use of tools • Publication of material on the net • Use of ICT for different teaching tasks • Teacher training and innovation with ICT
UNESCO (2011)	UNESCO ICT Competency Framework for Teachers	This model includes the following areas: • Understanding ICT in Education • Curriculum and Assessment • Pedagogy • ICT • Organization and Administration • Teacher's professional learning
Carrera and Coiduras (2012)	Exploratory study	• Knowledge of devices, computer tools, and network applications, and the ability to assess their educational potential. • The design of learning and evaluation activities and situations that incorporate ICT according to their didactic potential, with the students, and with their context. • The implementation and ethical, legal, and responsible use of ICT. • The transformation and improvement of professional teaching practice, both individually and collectively. • The treatment and efficient management of existing information on the network. • The use of the network (Internet) for collaborative work, communication, and interpersonal interaction. • The help provided to students so that they appropriate ICT and show themselves competent in its use.
Ferrari (2013)	DIGCOMP	In this model, the following areas are categorized: • Information • Communication • Content creation • Security • Problem resolution
Fraser et al., 2013	DigiLit Leicester	This model includes the following areas: • Search, evaluation, and organization • Create and share • Evaluation and feedback • Communication • Collaboration and participation • eSecurity and online identity • Technology that supports professional development

Authors	Model/Framework	Dimensions and Competences, it covers
Larraz (2013)	Digital Competence at the University	• Informational: This includes competencies such as: Recognizing information needs, locating information, Evaluating the results found, organizing information, building knowledge, and Communicating knowledge. • Technological: This dimension includes skills such as digital citizenship, organization and management of hardware and software, data processing in different formats, and network communication. • Multimedia: This dimension includes competencies such as Analyzing and creating multimedia messages from a critical dimension, accessing multimedia messages, understanding multimedia messages, and Creating multimedia messages. • Communicative: This last dimension includes competencies such as Knowledge Communication (Information Literacy), Communication (Technological Literacy), Digital Citizenship (Technological Literacy), and Creation of Multimedia Messages (Multimedia Literacy).
Ramírez and Casillas, (2014)	Digital knowledge	The digital knowledge used to measure the degree of technological appropriation (which implies knowledge, use and application, frequency and intention) is made up of eight pieces of computer knowledge and two pieces of informational knowledge that are grouped as follows: • File Handling: Local (USB flash drives, CD) and global (cloud computing) file handling • Device Management: Use and care of digital devices (tablets, smartphones, laptops, printers, guns) • Programs and information systems specific to the discipline of the subject: Programs related to a particular discipline or field of study, use of electronic journals, web pages, blogs, specialized databases, virtual libraries, and content repositories. • Creation and manipulation of text and rich text content: Use of editing functions (text formatting, images, hyperlinks, comments, automatic indexes, citations, numbering, spell checking) in word processors and presentation functions in administrator programs. of presentations • Creation and manipulation of data: Use and administration of information sets, databases, spreadsheets • Creation and manipulation of multimedia content: Create, capture, record, transfer, display, edit, audio, video, and image conversion. • Communication: Use of WhatsApp, chat, email, social networks, distributed learning platforms, blogs, video calls and text messages. • Socialize and collaborate: Use of social web services to follow, read, publish (in blog), participate in forums, consult wikis, and use social networks. • Digital Citizenship: Conventional use of spelling in various communication contexts; use of emoticons, abbreviated words, omission of spelling rules, non-standard font type (color, size, font type), exclusive use of capital letters, use of formal/informal language; as well as security considerations for the publication of information on the web (passwords, geolocation), information integrity (antivirus, backups, access to websites) and responsible use of information and computer services (author licenses and free software) • Digital literacy. Strategies for content creation and search and validation of specialized information in search engines and digital repositories
Rangel, (2015)	Teacher digital competences profile	In this case, thirteen competencies grouped into three dimensions are proposed: • Technological dimension, which includes basic concepts and functions of the computer, basic connectivity tasks, installation and security of the computer equipment, basic functions of the productivity programs, and the positive attitude for the permanent updating in topics related to ICT. • Informational dimension that includes information location and retrieval skills, efficient analysis and selection of information,

Authors	Model/Framework	Dimensions and Competences, it covers
		organization of information retrieved from the Internet, and effective, ethical, and legal use of information. • Pedagogical dimension that includes critical and favorable attitude towards the possibility of integrating ICT in teaching practice, design and implementation of ICT-mediated teaching and learning strategies, design and evaluation of educational materials or resources for integration in teaching practice, ICT to support administrative-teaching tasks and ICT to exchange ideas, information, experiences or knowledge with the community.
Pinto, Cortés and Alfaro, (2017)	TICTACTEP spiral competence model	This spiral model speaks of 3 components: • ICT (Information and Communication Technologies) • TAC (Learning and Knowledge Technologies) • TEP (Technologies of Empowerment and Participation) Each of these components contemplates degrees of appropriation in the following aspects: • Technological • Pedagogical • Communicative • Management • Investigative

Source: Own elaboration and based on the study by Durán, Gutiérrez, and Prendes, (2016)

Assessing the quality of the studies

As explained before, the investigation focused on academic and research papers and documents published by international institutions, universities, and expert scholars. This means the information obtained has been considered reliable based on these types of investigations. In addition, it can be determined by the number of studies that the abilities this type of approach seeks have been developed.

Summarizing evidence

Considering the second specific objective of the research about understanding the components of the measurement instruments according to the needs of each context and the analysis of the data reviewed, it can be noticed that

- The iSkills (2007) model, developed by the Educational Testing Service (hereinafter ETS), besides measuring the ability to think critically in a digital environment through a series of real-world tasks, also focuses on integrating technology skills and cognitive skills. According to their recommendations, governments should begin including large-scale global assessments of ICT literacy. Also, education experts and researchers should conduct new public policy research using the data derived from these assessments. Following the example of ETS, there is community work to develop specific diagnostic assessments focusing on the measurement of ICT literacy.
- The National Educational Technology Standards for Teachers (NETST, 2008) model developed by the International Society for Technology in Education (from now on ISTE) specifies the conditions for adequate integration of technology in education and the standards teachers must develop at different levels contemplating higher education. The model is divided into five dimensions, and each dimension is made up of four indicators.

  a) Facilitate and inspire learning and creativity.
  b) Design and develop digital-age learning experiences and assessments.
  c) Model of work and learning in the digital age.
  d) Promote and model responsibility and digital citizenship.

e) Participate in professional development and leadership.

These five dimensions and their indicators are considered based on four performance levels:

a) Initial or beginner: what a student teacher or trainee teacher is expected to know
b) Medium: teachers with more experience in the use of ICT.
c) Expert: apart from extensive experience with ICT, demonstrates efficient and effective use and focuses on student learning.
d) Transformative: the teacher explores, adapts, and applies ICT in a way that substantially changes teaching-learning processes to meet the needs of an increasingly globalized and digitized society.

- Koehler and Mishra's (2008) TPACK model (an acronym for Technological Pedagogical Content Knowledge, updated in 2016 with a second edition) focuses on the knowledge and skills teachers need to integrate technology into content-area instruction meaningfully. The previous table explains the different dimensions in detail.
- The ACTIC project's model (Accreditation of Competencies in Information and Communication Technologies), prepared jointly by various departments of the Government of Catalonia, highlights eight competencies broken down into competency actions as they can be reviewed in the chart. This model is based on general political frameworks such as the Information Society Strategy of the European Council defined in Lisbon in 2000 and renewed in 2010.
- The Pozos model (2010) focuses on the integration of the Digital Competence of University Professors in their Professional Teacher Development. As can be seen in the chart, seven dimensions construct this model, but each one is measured according to three different categories such as: Basic, Deep, and Complex competencies in the knowledge and use of ICT.
- The "ICT Competences for Teaching at the Spanish Public University" model by Prendes (2010) allows the analysis of competencies exclusively within the university context. This model is structured around three basic university teaching areas: teaching, research, and management. There are three levels of ICT competence domain for each of these areas.
- The "UNESCO ICT Competency Framework for Teachers" is an update of the original version published in 2008 by UNESCO in collaboration with CISCO, INTEL, ISTE, and Microsoft. This framework encompasses both technological aspects and aspects related to pedagogical work within the term competence.
- Carrera and Coiduras' model (2012) resulted from an exploratory study focused on investigating the components of digital competence common to university teachers and students.
- Larraz (2013) developed the "Digital Competence at the University" model, which defines the concept of digital competence and proposes a rubric to work on it around four literacies: informational, technological, multimedia, and communicative.
- The DIGCOMP model (Ferrari, 2013), prepared by Instituto de Prospectiva Tecnológica (IPTS) of the European Commission, is a project to improve the understanding and development of digital competence in a European context. In this project, a total of 21 competencies organized into five dimensions are specified, as can be seen from the table.

- The DigiLit Leicester framework (Fraser et al., 2013), created in collaboration with the Leicester Department of Education (UK), Montfort University and 25 Leicester schools, distinguishes six competency areas named in the table.
- Ramírez and Casillas, in 2014, through their book called "Háblame de Tic. Digital Technology in Higher Education", talk about new skills and digital knowledge for university teachers.
- In 2015, Rangel presented a proposal for a profile of digital teaching competencies and described thirteen competencies grouped into three dimensions: technological, informational, and pedagogical.
- The Common Framework for Teacher Digital Competence developed by Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado de España (hereinafter INTEF) makes a proposal that specifies digital competence through 21 sub-competences organized into three domain levels and five areas.
- The TICTACTEP Spiral Competence Development Model by Pinto, Cortés, and Alfaro (2017) focuses on teaching practices, flexible and genuine use of digital technology beyond its instrumental use and pedagogical articulation, oriented towards educational innovation.

The similarities between the models of digital competencies were classified into the following categories:

a) The first category is related to aspects of information such as access, collection, and retrieval of data both at the level of personal equipment and the network (ETS, 2007 and Ferrari, 2013), as well as navigation, location, evaluation, organization, analysis, and selection of data effectively (Fraser et al., 2013; Larraz, 2013, Ramírez and Casillas, 2014; Rangel, 2015). Within this category are the software, tools, or useful applications to achieve these purposes, such as office software for treating information in its different formats (Ramírez and Casillas, 2014).

b) A second category refers to communication skills. In this case, Carrera y Coiduras (2012), Ferrari (2013), and Fraser et al. (2013) agree on the following competencies: participation, collaborative work, and interpersonal interaction. The models by Larraz (2013) and Ramírez and Casillas (2014) are more specific about the tools and applications, including multimedia messages, instant messaging, email, social networks, platforms, blogs, and wikis.

c) A category shared by the ETS (2007) and Ferrari (2013) models is the creation and publication of content, coinciding with Fraser et al. (2013), Prendes (2010), and Ramirez and Casilla (2014) not only in creating data or information but in encouraging creativity, innovation and the publication of results for the educational community.

d) Another category of great importance is digital citizenship. Its definition may vary according to the model used, be it ISTE (2008), Pozos (2010), Carrera and Coiduras (2012), and Larraz (2013); however, they share elements similar to identify it, such as digital identity, participation, digital culture, responsibility, diversity, ethics, and security, all these characteristics allow defining a user profile when using ICT and encourage awareness of actions in the digital field and virtual.

e) Among the ISTE (2008), Pozos (2010), Prendes (2010), UNESCO (2011), Carrera and Coiduras (2012), and Fraser et al. (2013) models, teacher professional training is identified. It focuses on practice, constant talks, training, and workshops on ICT, which allows for the identification of areas for improvement and complementing them through the necessary action routes.

f) The competencies with the greatest coincidence in the models of Koehler and Mishra (2008), Prendes (2010), UNESCO (2011), Carrera and Coiduras (2012), Larraz (2013), Ramírez and Casillas (2014), Rangel (2015) and Pinto, Cortés, and Alfaro (2017) is digital literacy. It is understood as the technical knowledge of devices, software, data, and other ICT elements, allowing users to perform their tasks effectively and efficiently. Additionally, from the models of ISTE (2008), Pozos (2010), Prendes (2010), UNESCO (2011), Rangel (2015), and Pinto, Cortés, and Alfaro (2017), the combination of digital literacy with pedagogy as parallel elements include aspects such as methodology, curriculum and didactics that allow structuring, organizing, integrating and evaluating ICT by teachers as didactic support within a structured study plan. As an example, we can point out the model with its initials in English (TPACK) by Koehler and Mishra (2008), which intersects technological with pedagogical competencies, resulting in more specific competencies.

The differences or elements present in some models but not others are identified below.

a) Assessment as a competence is defined and approached from various perspectives, as in the ETS model (2007), which alludes to evaluating the quality, relevance, usefulness, and efficiency of the information to be used. In the case of the ISTE (2008), Pozos (2010), UNESCO (2011), and Fraser et al. (2013) models, they refer to the evaluation of learning experiences and are separated from the previous one since they focus on a purely curricular point. Finally, the Carrera and Coiduras (2012) model aims to evaluate the didactic potential of ICT. Therefore, it can be seen that, although similarities have been found previously, at certain points, the differences can be focused on different components of the process that the use of ICT entails. Some models can center on aspects of efficiency and effectiveness of the use of the information obtained from the network, while others are based on the potentiality and didactic use of these technologies, as well as on the learning experiences that they can generate, being all perspectives and completely valid approaches.

b) ICT administration, organization, and management competencies are only present in three models: ETS (2007), Prendes (2010), and UNESCO (2011). This category includes skills such as the identification, assessment, choice, structure, and approach of different technologies to be used by teachers in their courses and programs.

c) Lastly, other competencies are included in only a few models, such as the following: research, reflection, and innovation in the use of ICTs from the Koehler and Mishra (2008) model, cybernetic security aspects of institutions and users appear in the models of Pozos (2010), Prendes (2010), and Pinto, Cortés and Alfaro (2017) and finally the resolution of problems specific to each discipline is seen in the models of Ferrari (2013) and Fraser et al (2013).

As can be noticed in the analysis carried out, a variety of teacher digital competencies or groups of them are identified and structured in different dimensions, depending on the educational contexts of each model. Among the similarities that these models present are information use skills, communication skills in the training process, as well as content creation and publication, digital citizenship, professional teacher training, and digital literacy. Regarding the differences between the models analyzed, it was identified that only some of them incorporate competencies related to the evaluation, administration, organization, and management of ICT, research, reflection, and innovation in the use of ICT, cyber security, and

problem-solving. The information collected allows us to understand the dynamics of grouping teacher digital competencies into dimensions and categories, useful for the purposes of this research.

Interpreting and Discussing Findings

Based on the previous review and for this research, a grouping of digital competencies of university teachers was carried out first, and in order to achieve the third specific objective of this research about analyzing the potential of the components of the instruments for their adaptation to the context of English teaching at a university level in Costa Rica. The first dimension of competencies encompassed Digital literacy, which is divided into four sub-dimensions. The first sub-dimension is called Information literacy, which includes competencies related to aspects of navigation, search, and filtering of information, as well as access to websites and knowledge and skills for navigating the internet. The second sub-dimension is called Communication and collaboration, which encompasses competencies related to knowledge, skills, strategies, and tools for communication and interaction with the community through ICT. The next sub-dimension is called Creation and manipulation of digital content and includes competencies related to file management and software skills to work with them. The last sub-dimension in this section is called technological devices, linked to competencies for using, managing, maintaining, and updating technological devices.

The next dimension is called Security, which is further divided into two sub-dimensions. The first one deals with the Security of ICT users, including competencies related to the security of each user's data, as well as aspects of digital citizenship and occupational health when using the necessary ICT accessories. The second sub-dimension is related to the Security of institutional data, including competencies such as access to updated software licenses, antivirus and other protection programs, ethical and legal use of ICT, and having the appropriate infrastructure.

The third dimension, called the Integration of ICT in teaching, encompasses competencies related to the teaching task of integrating and implementing the use of ICT in classes. This dimension is also divided into four sub-dimensions. The first one is linked to the Curricular scope, including competencies in planning, development, monitoring, and evaluation of the use of ICT in teaching processes. The second sub-dimension is related to the Pedagogical scope, including competencies in designing suitable educational scenarios supported by the use of ICT. The third sub-dimension is associated with the Didactic scope, focusing on competencies in the design of activities, learning situations, and assessment that integrate the use of ICT. Finally, the fourth sub-dimension is defined in the Organizational scope, encompassing competencies related to ensuring equitable access to ICT for those involved and providing guidance to students in the learning process based on their individual needs and interests.

The last dimension is called Appropriation and teacher commitment and includes competencies related to ongoing teacher training in the use of ICT, self-reflection on the use of ICT, teacher commitment, innovation, and creativity in digital media, as well as knowledge of policies related to the use of these technologies.

The following chart refers to the dimensions, sub-dimensions, and digital competencies established based on the previous information, Table 2:

Table 2

Dimensions and Teacher Digital Competences

Dimension	Sub-Dimension	Digital Competences
Digital Literacy	Information Literacy	Navigation, search, and filtering of information, data, and digital content (using different software and browsers to access websites)
		Management, evaluation, storage, and retrieval of data
		Use of electronic journals
		Creation, editing, use, and administration of websites
		Creation, use, and administration of blogs
		Use of specialized databases, libraries, and repositories
	Communication and Collaboration	Promotion of communication and interaction skills and strategies with the community through ICT
		Exchange of data and information with other users
		Promotion of online citizen participation
		Promotion of collaboration through official channels
		Promotion of netiquette, language used in networks, behavior, and respect towards other users
		Management of digital identity and profile
		Use of instant messaging and video calling through applications (Messenger, built-in messaging service in social networks, messaging on platforms such as Moodle or Blackboard, among others)
		Use of email
		Use and administration of spaces, groups, and posts on social networks
		Use of learning management platforms (Moodle, Blackboard, Schoology, Google Classroom, among others)
		Use of text messages
		Use, administration, and moderation of users and content in online forums
		Creation, editing, use, and administration of wikis
	Creation and Manipulation of Digital Content	Promotion of respect for authorship rights, licenses, and programming
		Use of editing, creation, and manipulation functions of files through word processors (doc, docx, txt, pdf, cbr, among others)
		Creation, conversion, and editing of images (png, jpeg, bmp, gif, psd, tiff, among others)
		Use of presentation functions (ppt, Canva, Prezi, among others)
		Use and management of information sets and databases
		Use of editing, creation, and manipulation functions of spreadsheets

Dimension	Sub-Dimension	Digital Competences
		Creation, recording, conversion, and editing of audio files (mp3, wav, among others)
		Creation, recording, conversion, and editing of video files (mp4, avi, flash, open source)
	Technological Devices	Use, administration, installation, and updating of laptops and PCs
		Use, administration, installation, and updating of tablets
		Use, administration, installation, and updating of smartphones
		Use and manipulation of local storage devices (USB, CD, DVD, external memory, among others)
		Use and manipulation of global storage media (iCloud, Drive, Dropbox)
		Basic technical knowledge management by the teacher regarding networks, connections, software, and hardware, among others that do not require immediate intervention from a technical support department.
Security	User Security	Ensuring cybersecurity for users in spaces used for activity development, which should not compromise personal information or family data of teachers and students.
		Health and well-being when using ICT (having suitable space, accessories, chair, desk, and other supplies for their tasks when using ICT).
		Digital citizenship and responsibility.
		Web information publication (passwords and geolocation).
	Institutional Data Security	Access to and integrity of suitable equipment and information (valid author licenses and open-source software)
		Ethical and legal use of ICT
		Access to and verification of the intra-institutional network and the internet
		Ensuring the protection and security of institutional data
Integration of ICT in Teaching	Curricular Scope	Integration of ICT use in the curriculum
		Planning, development, monitoring, and evaluation of ICT use in teaching processes
		Use of didactic materials and ICT resources
		Recognition, understanding, and expression of emotions through the use of ICT
	Pedagogical Scope	Design of educational scenarios supported by ICT
		Assessment of student training in the use of ICT
		Creating a climate of motivation, empathy, and learning through the use of ICT
	Didactic Scope	Application of activities based on previous experiences related to the use of ICT

Dimension	Sub-Dimension	Digital Competences
		Evaluation and feedback on the effectiveness of ICT-mediated educational scenarios
		Provision and definition of ICT environment, resources, and activities
		Designing activities, learning situations, and assessments that integrate the use of ICT
	Organizational Scope	Identification and definition of the most appropriate use of ICT
		Ensuring equitable access to the use of ICT
		Providing guidance to students in the learning process based on individual needs and interests
Appropriation and Teacher Commitment		Identification of technological needs (equipment, ICT knowledge, connectivity, among others)
		Implementation of aspects of innovation and creativity
		Self-reflection on the use of ICT
		Teacher commitment to continuous practice and training in the didactic use of ICT
		Knowledge of policies on the use of ICT at institutional, local, national, regional, and international levels by different competent entities

Fuente: Own Elaboration

In the proposed framework, the different dimensions of digital competencies can interrelate and support each other in matters of constant improvement for university teachers of English. Within the competencies from the dimension named Integration of ICT in Teaching, the decision-making process becomes crucial for managing teaching activities and integrating the ICT in the curricula through the appropriate Digital Literacy, considering the following fundamental components:

- Organization of Spaces: The environmental conditions in which didactic interaction occurs become important. This includes identifying the people involved, the methodological alternatives, the level of student engagement, and the distribution of students within the classroom. These elements help create authentic learning environments and develop a more autonomous, diversified, and situational learning style.
- Spaces as Structures of Opportunity: Higher education institutions must have a purpose as structures of opportunity, defined by the teacher's actions in organizing these spaces. These spaces are viewed as learning agents, active for working in various ways and providing greater variety and prominence to the space.
- Phases of the Learning Process: The teacher structures phases within the learning process, which include stages such as presenting information, a remedial plan, reinforcement, consolidation, and the elaboration and re-elaboration of content information.
- Incorporating New Technologies and Resources: Within the Digital Literacy and Security dimensions, the English teacher verifies the available ICT and considers the following resources:

a) Updated equipment
b) Integration (opportunities)
c) Enrichment and updating of teaching and learning processes
d) Transfer and exchange of information among users
e) Autonomous learning
f) Technical discourse and formative discourse

Additionally, the influence of the internet must be considered, along with the new tools, scenarios, and educational purposes that should address cognitive, socio-cognitive, and theory and activity approaches. These new tools should have characteristics related to adaptability, accessibility, usability, and mobility as we transition from e-learning to m-learning.

- Characteristics of the Subjects: This point appropriately considers the characteristics of students as members of the Information Society. According to Coll and Monereo (2008), this entails a certain complexity, interdependence, and unpredictability in the activities these students engage in, as well as their relationships and individual attributes. Significant aspects include information, over-information, speed of processes and consequences, and the scarcity of time and space for abstraction and reflection. In the context of ICT, factors such as the predominance of culture and spectacle, transformation of geolocation, spatial and temporal aspects of communication, cultural homogenization, and the emergence of new social classes are relevant. According to Salamanca and Ramírez (2020), it is essential to address questions such as who the teacher is, who the students are, and the teacher-student relationship.
- The Context: At this point, it is appropriate to include what Turull (2020) states about competence knowledge, which is holistic (implying the integration of diverse knowledge) and has a context of application in which it makes sense. Comprehensive training prepares students for professional practice based on learning activities conducted in real work contexts; it facilitates their ability to apply the theoretical and practical knowledge acquired at university and complement it with experience, fostering the development of technical, methodological, personal, and participatory competencies. In the case of using ICT, it has allowed certain academic contexts to reach social groups that previously had limited access to content, tools, and resources.

The elements mentioned above generally shaped the formative process being developed; however, they also require alignment of educational intentions, assessment, and methodology as a system. According to Paricio, Fernández, and Fernández (2019), the alignment of all curriculum elements must ensure coherence in the student's entire learning experience, which constitutes the fundamental objective of didactics.

A detailed and clear plan allows for a predictable process and enables the student to engage with it autonomously and confidently, knowing what is expected of them and the framework in which they should carry out their work (Paricio, Fernández, and Fernández, 2019).

Conclusions and recommendations

Teaching in the digital age requires a coherent and comprehensive set of digital competencies beyond technical skills. The framework presented in Chart N°2 covers a wide range of competencies across literacy, security, integration, and commitment, identifying the

necessary elements for instruments to measure teacher digital competencies used in different contexts. There is a clear emphasis on using ICT and effectively integrating it into curriculum, pedagogy, and classroom management in meaningful ways. The findings and discussion of them allowed us to contrast the theory, in the case of Garzón (2017), how didactics mediated by ICT in the context of foreign language teaching is defined as the science and technology that promote practice in organized environments with communicative intent, where the processes of teaching a foreign language can be visualized, organized, and evaluated for substantial purposes solely for the student's benefit.

The extensive systematic bibliographical research has made understandable the required components for potential measurement instruments according to the needs of the Costa Rican context based on the Common European Framework of Reference for Languages (CEFR), providing a common basis for developing language practice programs, curricular guidelines, exams, textbooks, among others.

Throughout the analysis based on the potential components for these instruments, it is possible to affirm that developing teacher digital competencies is critical to ensure effective ICT integration and support student learning with digital tools corresponding to the needs of 21st-century higher education. According to Quintana (2019), the integration of technologies in the educational field should be developed within the framework of pedagogy, meaning that technologies should be incorporated as part of a planned process that considers characteristics such as:

- Efficiency and Effectiveness: ICT can be utilized to achieve educational objectives (effectiveness) while using the fewest resources possible (efficiency).
- Network Connection and Self-Programming Capacity: ICT provides the essential support and infrastructure for user connectivity (network connection).
- Overlap of Educational Spaces: ICT blurs the distinction between formal, non-formal, and informal education, increasing opportunities to enhance teaching and learning processes by introducing contributions from the various available spaces for individual development.
- Heutagogy: ICT offers a range of new ways for lifelong learning.

Finally, to define the elements of an ideal instrument for measuring the digital competencies of university teachers of English in Costa Rica, the framework shown in Chart N°2 indicates a shift towards a more holistic, competence-based approach to teacher digital skills, moving beyond basic ICT skills. The integration of ICT in English teaching specifically should aim to develop students' communicative competence through work on productive skills (Speaking and Writing) and comprehension skills (Listening and Reading), supported by the technological mediation of class activities, which considers ICT as resources for teaching, learning, and production (Quintana, 2019).

Some recommendations that resulted from the research and should be considered are:

- Conduct comprehensive assessments of current teacher digital competencies to identify strengths, gaps, and areas for professional development.
- Develop structured training programs and support systems to help teachers systematically build their competencies outlined in the framework.
- Integrate the digital competence framework into pre-service teacher education curricula to ensure new teachers are well-prepared.

- Establish institutional policies and guidelines to promote the integration of ICT in teaching and learning while addressing security and ethical concerns.
- Foster a culture of continuous learning and innovation around educational technology among teachers through communities of practice, mentoring, and shared learning opportunities.
- Regularly review and update the digital competence framework to ensure it keeps pace with evolving technologies and pedagogical practices.

Provide adequate technological infrastructure, resources, and technical support to enable teachers to apply their digital competencies effectively.

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