What is the applicability of the DigCompEdu Framework for online higher education? A study with Portuguese teachers

Cassio Santos*[1]; Neuza Pedro[2]

[1]Universidade de Lisboa, Instituto de Educação. Lisboa, Portugal https://orcid.org/0000-0002-1402-2978 cassiosantos@ie.ulisboa.pt

[2]Universidade de Lisboa, Instituto de Educação. Lisboa, Portugal https://orcid.org/0000-0001-9571-8602 nspedro@ie.ulisboa.pt

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Abstract

Introduction: To ensure that Higher Education Institutions (HEIs) can face the challenges brought about, primarily, by technological changes, it is necessary that their teaching staff prove to have adequate levels of digital competence. But what digital competence do professors need to have? Does the European Framework for the Digital Competence of Educators (DigCompEdu) reveal to be valid for the context of higher education, in particular, in the online modality? The present study seeks to establish an answer to these questions. **Method:** The qualitative methodological approach was adopted and semi-structured interviews with Portuguese higher education professors was used as data collection strategy. The data were analysed through content analysis processes and presented using descriptive statistics. 22 professors who teach in online higher education participated in this study. **Objective:** To analyse the applicability of DigCompEdu with regard to teaching practices in the context of Online Higher Education. **Results:** The results indicate that DigCompEdu was considered "applicable" to online higher education, both globally and in the analysis carried out by area, ranging from "very applicable" to "applicable". The analysis for each of the 22 competences recorded less favorable results in competences 6.4 "Responsible Use" and 6.5 "Problem Solving", both contained in area 6. **Discussion:** The results point to the applicability of DigCompEdu in Online Higher Education, globally and for different areas. Less favorable results emerged in the area related to "Promoting Digital Competence of Learners", which is understood to be associated with the fact that the interviewees considered that students, young adults, should already have the required knowledge regarding the use of digital technologies, and that it is not the responsibility of the professors to stimulate this competence.

Keywords: Higher Education; e-learning; Teaching Digital Competence; DigCompEdu; Higher Education Teachers

Qual a aplicabilidade do Referencial DigCompEdu para o ensino superior online? Um estudo com professores portugueses

Resumo

Introdução: Para garantir que as Instituições de Ensino Superior (IES) possam enfrentar os desafios trazidos, prioritariamente, pelas mudanças tecnológicas, é necessário que os seus docentes relevem níveis de competência digital adequados. Mas que competências digitais necessitam estes deter? E revela-se o quadro de referência europeu de competências digitais

***Correspondence:**
Cassio Santos
cassiosantos@ie.ulisboa.pt

para educadores (DigCompEdu) válido para o contexto do ensino superior, em particular, na modalidade online? O presente estudo procura estabelecer resposta para estas questões. **Metodologia:** A abordagem metodológica qualitativa foi adotada com a estratégia de recolha de dados por meio de entrevistas semiestruturadas com professores do ensino superior português. Os dados foram analisados com base em processos de análise de conteúdo e apresentados por meio da estatística descritiva. Participaram neste estudo 22 docentes que lecionam no ensino superior online. **Objetivo**: Analisar a aplicabilidade do DigCompEdu no que se refere à prática docente no contexto do ensino superior online. **Resultados:** Os resultados apontam que o DigCompEdu foi considerado como "aplicável" ao ensino superior online, tanto no global como na análise feita por área, variando de "muito aplicável" a "aplicável". A análise por cada uma das 22 competências registrou resultados menos favoráveis nas competências 6.4 "Uso Responsável" e 6.5 "Resolução de Problemas Digitais", ambas contidas na área 6. **Discussão:** Os resultados gerais apontam para a aplicabilidade do DigCompEdu no ensino superior online, no global e para as diferentes áreas. Resultados menos favoráveis surgiram na área relativa à "Promoção da Competência Digital dos Aprendentes", o que se entende associado ao fato dos entrevistados considerarem que os estudantes, jovens adultos, deveriam já deter conhecimentos relativos ao uso de tecnologias, não sendo responsabilidade do docente estimular essa competência.

Palavras chave: Ensino Superior; Educação a Distância; Competência Digital Docente; DigCompEdu; Docentes do Ensino Superior

Introduction

Information and Communication Technologies (ICTs) has transformed education and changed the way the teaching-learning process is conceived and planned, and the United Nations Educational Organization (UNESCO), through Agenda 2030, has recognized the potential of ICT to drive progress, reduce digital inequality, and promote inclusive knowledge societies (Montoro et al., 2016; Santos et al., 2022; UNESCO, 2018).

The increasingly frequent use of digital technologies in personal, professional, and social life has increased the complexity of educational environments, requiring educators to rethink teaching practices and update their digital competences to improve the teaching-learning process, which implies responsibility for the critical, ethical, and creative use of digital technologies (Santos, 2023).

In 2018, the Council of the European Union (re) listed eight key competences for Lifelong Learning (LLL), including digital competences (Council of the European Union, 2018), and specific frameworks have been developed for some of these competences by the European Commission through the *Joint Research Centre* (JRC) and the European Council, as shown in Figure 1.

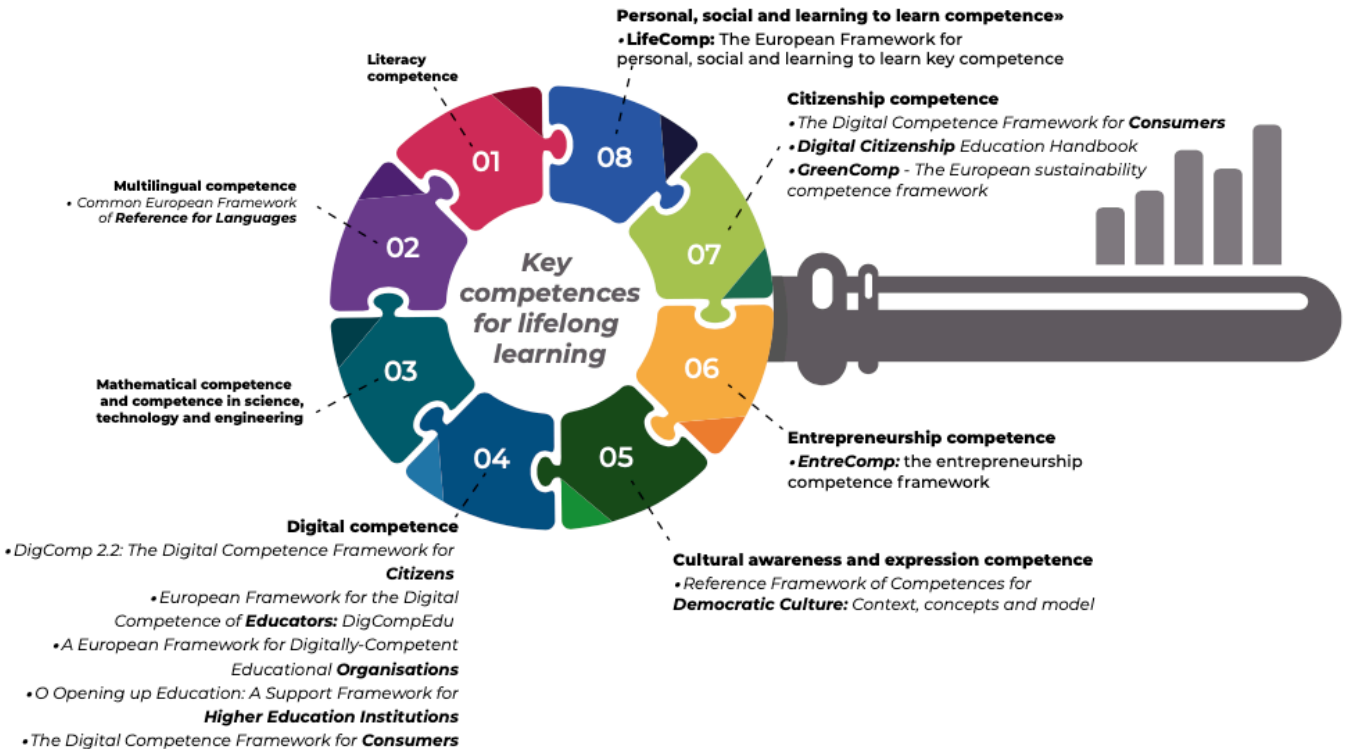
Teaching Digital Competence

Digital competence is a term that originated from the need to define the essential skills for a knowledge society that is constantly evolving and is directly related to current technological development and expectations of the knowledge needed to exercise citizenship in a society where practices are increasingly digitally mediated. Digital competence is considered central and relates specifically to the types of skills that digitally fluent people should possess, as well as being fundamental to social inclusion, civic participation, and sustainable growth in today's society (European Commission, 2010; Ilomäki et al., 2016; Spante et al., 2018).

Digital competence can be defined as the "confident, critical and creative use of digital technologies to achieve objectives related to work, employability, learning, leisure, inclusion and/or participation in society" (Ferrari, 2012, p. 3).

The most recent European Union publication dealing with citizens' digital competences is called *DigComp 2.2: The Digital Competence Framework for Citizens* (Vuorikari et al., 2022a) and has already been translated into several languages, including Portuguese (Lucas et al., 2022) and Spanish (Vuorikari et al., 2022b).

Figure 1
Digital Competences and Frameworks



Source: C. Santos (2023)

Given the importance of digital competence, various studies (Costa et al., 2008; Durán et al., 2016, 2019), technical reports (Centeno, 2022; Verdú-Pina et al., 2022), recommendations (European Commission, 2020), and government initiatives (Government of Portugal, 2021) have been developed around the assessment and certification of these skills, such as the *European Digital Skills Certificate* (EDSC) (European Commission, 2023), as provided for in Action 9 of the Digital Education Action Plan 2021-2027 (European Commission, 2020).

Teacher Digital Competence (CDD) can be defined as the set of knowledge, skills and attitudes relating to the technological, informational and communicational aspects used in the educational-training context, adding good pedagogical and didactic criteria for the effective integration of these elements into the teaching-learning process in a way that is aware of their implications for students' digital training (Santos, 2023).

The CDD has been gaining momentum through official organizations that support its value and demand its development in today's society (Díaz et al., 2019), such as UNESCO (2018) and the European Commission (Lucas & Moreira, 2018), as well as prestigious global institutions such as the International Society for Technology in Education (ISTE) (2023) and the Education and Training Foundation (ETF) (2018).

Several forces are resulting in new challenges and awakening the urgent need to transform higher education for the future, which has a significant impact on the changing role of teachers. These forces include the fourth industrial revolution, pedagogical innovations, the increase in the amount of information available online, the emphasis on Virtual Learning Environments (VLE), advances in artificial intelligence and the shift towards Open Education logics, including, among others, Open Educational Resources (OER) and *Open Access*,

such forces have made the teaching process more oriented towards the efficient and pedagogically productive use of digital resources (Ally, 2019; Lebrún et al., 2021; Oliva et al., 2014).

In order to ensure that HEIs are able to deal with the challenges brought about by socio-economic progress and technological change, it is necessary for their professionals to be properly trained, with one of the main critical areas of training in this sector being technological skills, digital and informational knowledge, considering that such technologies, when used correctly in the classroom, can promote the development of Digital Competence in higher education students, as well as institutional progress (Area-Moreira et al., 2016; Heitink et al., 2016; Mirete, 2016; Narasuman, 2016), both of which are highly desirable.

The challenge for HEIs in the coming years is to develop digital competences in their students in the face of the inevitable extinction of jobs and professions that do not fit into this new panorama: of a Digital Economy and Society (Ortigoza et al., 2021).

The incorporation of ICT in higher education has had a significant impact on students, resulting in a substantial change in the teaching process, encouraging them to leave behind teaching based on conventional methodologies and adopt technologically enriched learning environments, promoting activities that generate autonomy and collaboration among students (Guillén-Gámez & Mayorga-Fernández, 2019; Mirete et al., 2020; Santos et al., 2021b).

> *Today, educators at tertiary level need to adapt to these changes and become more deliberately competent in technology, in order to respond to new challenges and demands - something that has been a recurrent theme since the turn of the century. (*Esteve-Mon et al., 2020, p. 403*)*

DigCompEdu Framework

The central framework in this research, DigCompEdu: European Digital Competence Framework for Educators, is aimed at all educational levels (Lucas & Moreira, 2018 Redecker, 2017), thus lacking key elements for online teaching, not blended learning (Mattar et al., 2020; Viñoles-Cosentino et al., 2022). Therefore, it was deemed necessary to carry out a study to identify whether the competences contained in this framework are applicable to teaching practice in online higher education, even if they do not represent the totality of the necessary digital competencies, which will enable the development of new frameworks in the form of extensions, using DigCompEdu as the central reference.

DigCompEdu is made up of 22 competences organized into 6 areas, as shown in Figure 2, with 6 levels of proficiency and adopting a model of cumulative progression of digital competence, since each higher-level descriptor includes all the lower-level descriptors, i.e. increasing degrees of complexity, from A1 to C2.

The DigCompEdu framework has been consolidated in use in the international scientific community (Caena & Redecker, 2019; Dias-Trindade et al., 2020; Dias-Trindade & Moreira, 2018; Gilioli et al., 2019; Lucas et al., 2021; Santos et al., 2021a, 2021b). Several studies have sought to validate it (Cabero-Almenara et al., 2020; Cabero-Almenara et al., 2021; Cabero-Almenara et al., 2021; Cabero-Almenara et al, 2022; Martín-Párraga et al., 2022b), as well as its native tool, DigCompEdu CheckIn 2019 (Cabero-Almenara et al., 2022; Gallardo-Echenique et al., 2023; Ghomi & Redecker, 2019; Llorente-Cejudo et al., 2022; Martín-Párraga et al., 2022a).

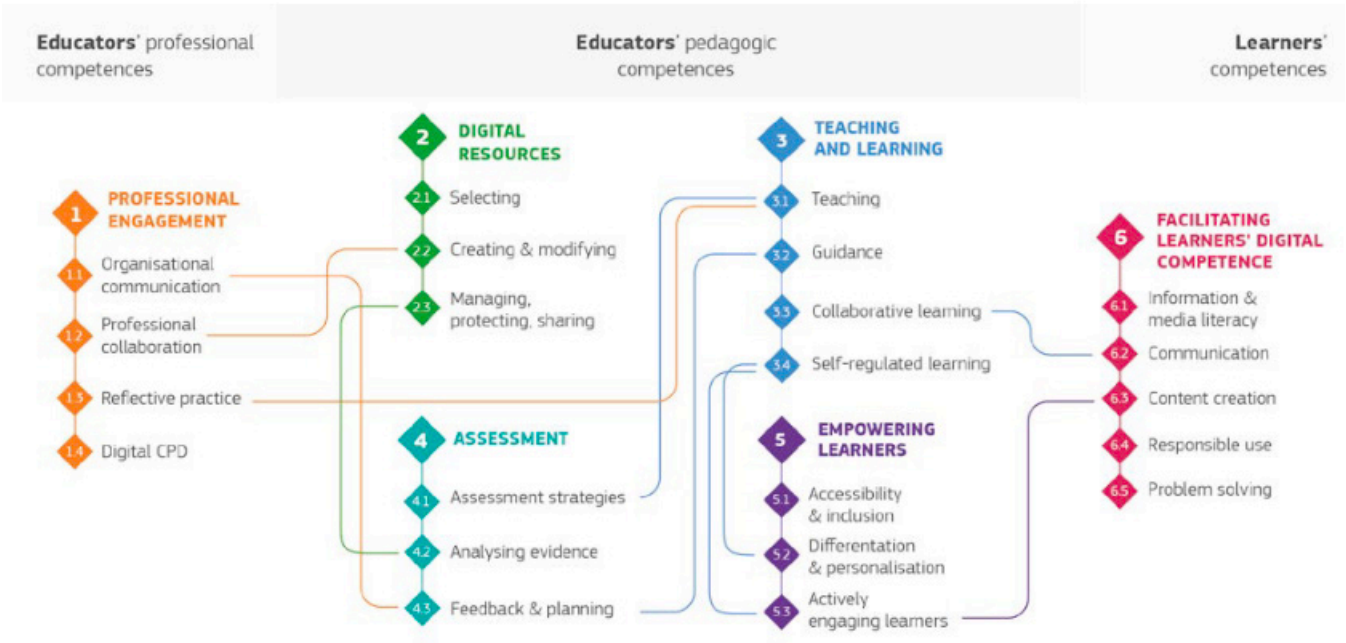
Although the European Union has several benchmarks for digital competences linked to education (Kampylis et al., 2015; Santos, 2017, 2019), there is no European framework specifically for higher education or for online education.

The aim of this article is to empirically validate the DigCompEdu: European Competence Framework from the point of view of teaching practice in terms of its applicability at the level of online higher education, through interviews with professors who teach in this context.

Methodology

This article adopts and applied approach and seeks to validate DigCompEdu's structuring competences in the specific context of teaching practice in online higher education.

Figure 2
DigCompEdu Framework



Source: Redecker (2017).

The methodological approach implemented covers planning and procedures, from general assumptions to detailed methods for collecting, analyzing, and interpreting data, classifying them into distinct categories of approaches: qualitative, quantitative, and mixed (Mattar & Ramos, 2021).

A qualitative methodological approach was adopted to collect data through field research based on semi-structured interviews, in order to achieve greater depth and detail. These were carried out between June and July 2022 with professors in Portuguese higher education.

According to Mattar and Ramos (2021), the interview is a rich data collection technique that is widely used in research in the field of education, making it possible to gather the perspective of different agents (students, professors, managers, coordinators, supervisors, psychologists, and employees in general), whose individual and collective experiences effectively constitute education. According to Babbie and Roberts (2018), the semi-structured interview is organized around general questions and predefined topics, although the order of the questions and the topics covered may vary depending on the interviewer and the dynamic established between the interviewer and the interviewee.

The validity and reliability of data collection by interview is cross-cutting, especially in aspects related to the structure, process, and practice of the interview, including the objective of minimizing the impact that the interviewer and the interview situation can have on the interviewees' responses.

The data collection and analysis process were carried out in full compliance with ethical precepts, in accordance with the ethical charter for research in education and training of the Institute of Education of the University of Lisbon (ULisboa), as well as the General Data Protection Regulation (GDPR), receiving favorable opinion no. 2.906 from the Ethics Committee (CdE).

Participants

This research is part of a larger study that has two phases, and this article is in the second phase.

The first phase aimed to evaluate the level of proficiency in digital competence of in Portuguese higher education professors with the participation of 846 participants from various scientific areas and from public and private institutions belonging to the two subsystems of Portuguese higher education: university and polytechnic institutes (Santos, 2023; Santos et al., 2021b). Among the questions related to the characterization of these participants, one relates to the proportion of time decidated to taught in the different modalities: i. 100% face-to-face, ii. 30% online and 70% face-to-face, iii. 70% online and 30% face-to-face, and iv. 100% online. The second phase, to which this article refers, was based on the sample from the first phase (n=846) with a cut considering only those professors who indicated that they took at least 30% of their teaching activities taking place online, resulting in 331 participants. Of these, only 221 could be contacted considering that providing personal details was optional. Of the 221 professors contacted to take part in the interview process, 25 showed interest (11.3%), indicating a date and time for these effect, but three of them were unable to take part of the interviewing proces for various reasons. As a result, this study involved a total of 22 professors.

Interview Script

The interview script was organized into two dimensions: i. preamble, in which the interviewees were given basic information about the research, as well as the Informed Consent Form (ICF); and ii. frame of reference, with the aim of verifying the applicability of the 22 DigCompEdu competences (22 questions were presented, one per competence).

The questions followed the pattern "To what extent, in your online teaching activity, is the [competence description] important?"

The script was validated through a pilot interview with a professor who met the criteria for being part of the research. As a result, modifications were made to the terms used to make the questions more understandable for interviewees with varying levels of digital competence. In addition, adjustments were made to the number of questions to ensure that the interviews did not exceed a maximum duration of 90 minutes.

Data Collection Procedure

The professors interviewed were asked about the importance of the 22 competences contained in DigCompEdu, with the aim of checking their applicability in online higher education. The interviews totaled 33:18:19 (thirty-three hours, eighteen minutes, and nineteen seconds), with an average duration of 01:30:50 (one hour, thirty minutes, and fifty seconds). They were carried out online, through videoconferencing system (Zoom Colibri software, version 5.2 for MAC, a service provided by FCCN, the Scientific Computing Unit of the Portuguese Foundation for Science and Technology-FCT).

For the process of transcribing the interviews individually, the text editor *Word for MAC* (*Microsoft*, version 16.61) was used, and the professors' names were replaces with letters of the alphabet [Professor A, B, C...], thus guaranteeing their anonymity. After transcribing the interviews, the content was grouped by competence (question) and imported into NVivo (Lumivero, version 2021) for coding and analysis.

Data Analysis

The analysis of the interviews was based on the content analysis procedures proposed by Bardin (2020), who proposes three chronological poles: i. pre-analysis; ii. exploration of the material; and iii. treatment of the results, i.e. inference and interpretation. According to Mattar and Ramos (2021), "as with other methods of analyzing and interpreting data, especially in the case of qualitative approaches, content analysis is based on the processes of coding and categorization" (p. 279).

The content analysis culminated in the creation of indices: (a) yes, (b) no, (c) neutral and (d) no response, when asked about the importance of a particular competence for online higher education.

To create the "applicability indicator", the percentage of the "yes" index was considered

exclusively in relation to the total number of interviewees in this second phase (n=22), with the following applicability ranges being considered: (a) not applicable (0 to 25%); (b) not very applicable (26 to 50%); (c) applicable (51 to 75%); and (d) very applicable (76 to 100%).

Results

Sample Characterization

The sample consisted of 22 Portuguese higher education professors. In terms of level of education, 77.35% (n=17) had a doctorate degree, 9.1% (n=2) a master's degree and 13.6% (n=3) a bachelor's degree. 59.09% (n=9) were male and 40.91% (n=13) female. Regarding age, 13.6% (n=3) were aged between 35 and 44 years old, and 40.9% (n=9) were aged between 45 and 54 years old, and 45.5% (n=10) between 55 and 64 years old. Regarding teaching, 27.3% (n=6) taught at undergraduate level, 36.4% (n=8) at master's level and 36.4% (n=8) at doctoral level, with 63.6% (n=14) dedicating 30% of their workload online, 22.7% (n=5) dedicating 70% of their workload online and 13.6% (n=3) teaching 100% online. Regarding the institutions to which they were affiliated, 72.7% (n=16) were linked to universities and 27.3% (n=6) to polytechnics institutes, of which 95.5% (n=21) were public institutions and 4.5% (n=1) were private institutions.

Overall Result

Considering the applicability indicators described above, the results show that, overall, DigCompEdu was considered "applicable" to the context of online higher education. However, when it came to areas, the results were different: (a) Professional engagement, (b) Assessment and (c) Empowering learners were considered "very applicable", while (a) Digital resources, (b) Teaching and learning and (c) Promoting learners' digital competence were considered "applicable", according to Figure 3.

Results by Competences

Competences in Area 1: Professional Engagement (PE).

Competences: (a) Organisational communication, (b) Reflective practice and (c) Digital Continuous Professional Development (CPD) were considered "very applicable"; while (d) Professional collaboration was considered "applicable", as shown in Figure 4.

Regarding Organisational communication (1.1), the interviewees reported on the importance of organisational communication, making statements such as: "Yes, it's quite different, and those who

Figure 3

Overall Applicability Results by Area

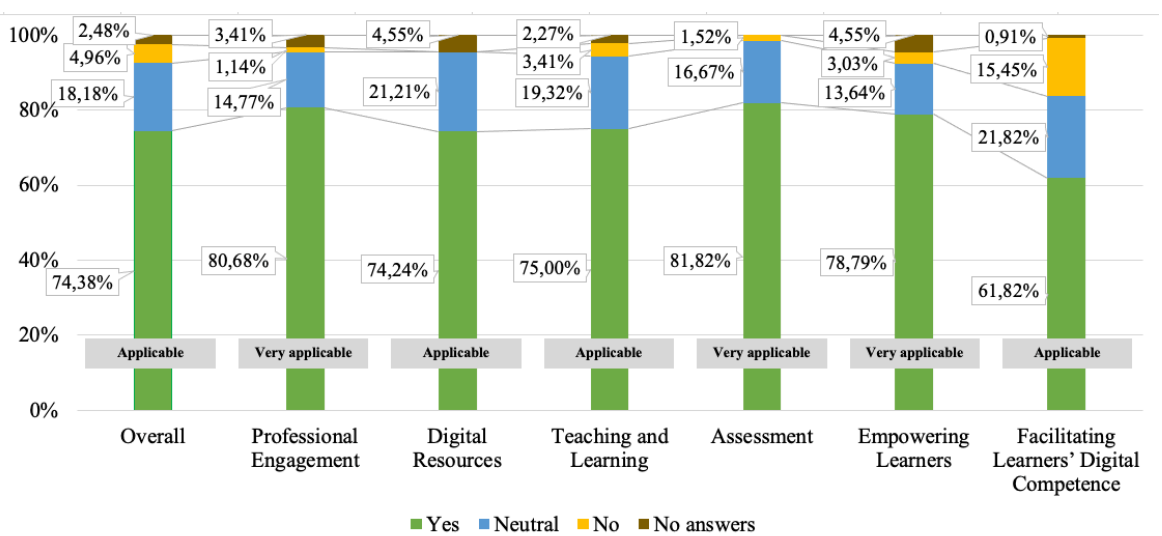
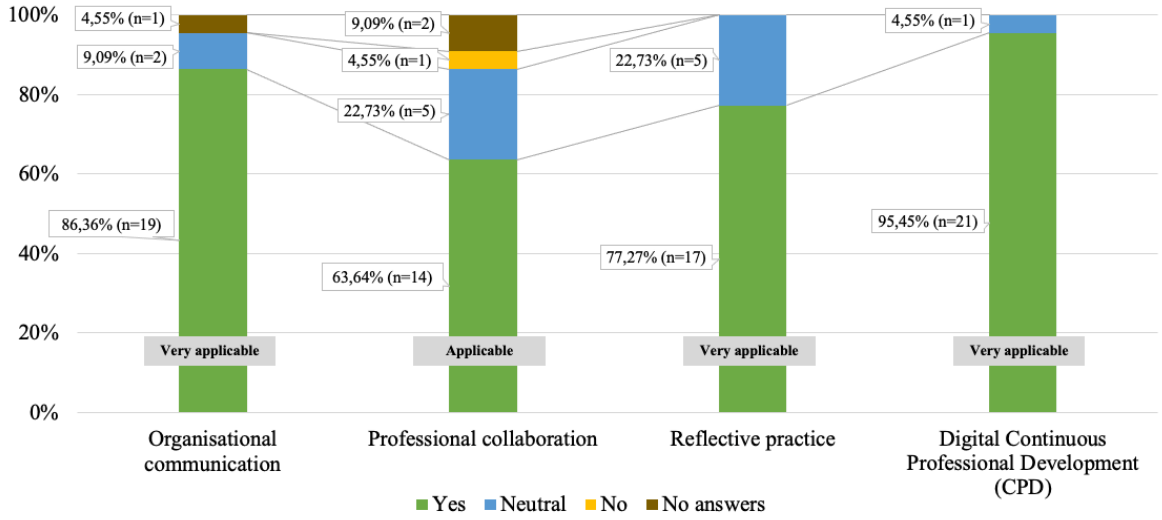


Figure 4

Area Applicability: Professional Engagement in Online Higher Education



don't do it are left out... I mean, I feel that today communication through digital tools is absolutely central" [Professor Q]. Although they report concerns about a possible reduction in communication between students in online teaching, "What I think is that a little is always lost, in other words, there is some contact lost between, especially between the students, not so much between the professor and the students" [Professor L].

In the Professional collaboration competence (1.2), various activities were indicated as being able to benefit from the use of digital technologies for online higher education, such as those relating to: (a) methodology, "Yes, I think it helps, especially the sharing of experiences and methodologies" [Professor T]; (b) scientific production "[...] online is very useful, we're writing a scientific article, we can't answer to reviewers alone, we have to consult the rest of the team, the submission itself is online, the notification is online" [Professor F]; and (c) logistics "There are many more facilities, we have broken down the barriers that exist. When we collaborated with colleagues, we were always dependent on being able to travel to another city" [Professor D].

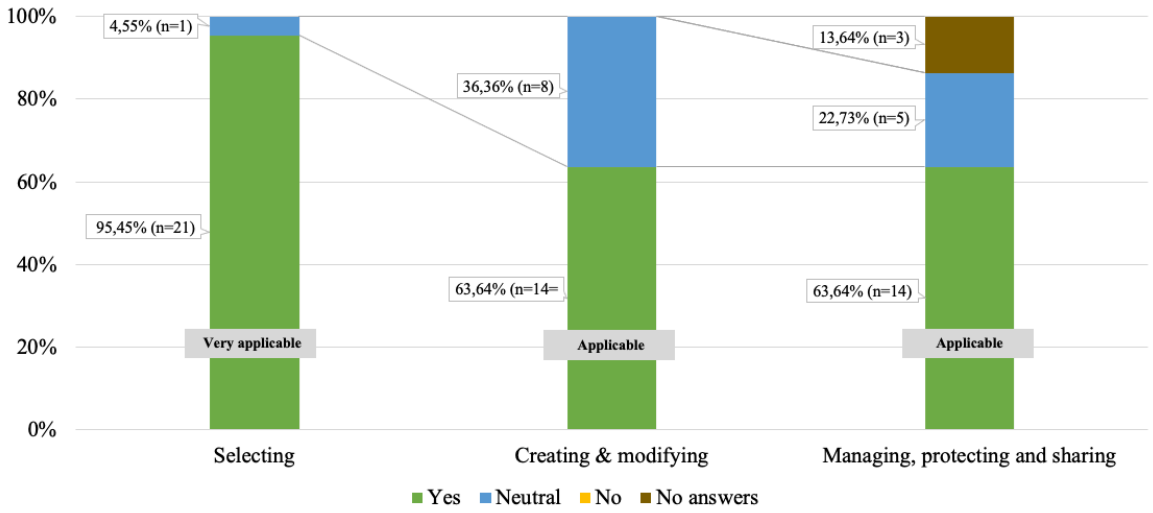
In the Reflective practice competence (1.3), the interviewees reflected on their own use of digital technologies, whether in relation to: (a) their continuity, "Yes, I think it's important, because I think digital is a tool that's here to stay, with which we have to work more and more" [Professor S]; and (b) the meaning of their use, "[...] for me, technologies always come with a practical application, in other words, integrated into teaching strategies" [Professor B].

In the Digital Continuing Professional Development (CPD) competence (1.4), the interviewees reported the difference between online and face-to-face training, stressing that online training is particularly important. There are also reports of improvement in this context through practice in the use of digital tools, not necessarily through training, but through self-training practices: "Without a doubt, all my progress so far is also due to my mastery of certain types of tools" [Professor J]. [Professor J].

Competences in Area 2: Digital Resources (DR)

Competence (a) Selecting was considered "very applicable", while (b) Creating & modifying and (c) Managing, protecting and sharing were considered "applicable", as shown in Figure 5.

Figure 5
Applicability of the Area: Digital Resources in Online Higher Education



Regarding the Selecting competence (2.1), the interviewees identified this competence as elementary and of particular relevance to professors: "It's fundamental. I think this is one of the great roles of the professor: to select the good resources and separate the wheat from the chaff" [Professor H]; "It's decisive. It's something I do all the time because that's precisely what interests me, the potential of resources for certain purposes" [Professor B]; and "This is a professor's regular job. When a professor starts a course, he or she has to select content" [Professor A].

In the Creating & modifying competence (2.2), the interviewees praised the creation and modification of digital resources: "[...] the great potential is this: that anyone has the skills to build certain resources, modify these resources [...]" [Professor B], although they expressed factors linked to the need to value this competence: "[...] for some time now I have wanted to make new materials, new resources, but this is not valued enough for the purposes of progression in the teaching career" [Professor A], as well as the (b) high workload involved in this process: "[...] this work is in-depth, it's laborious, it's expensive and it does require that you do it... Anyway, there are people who are native and who do everything well" [Professor E].

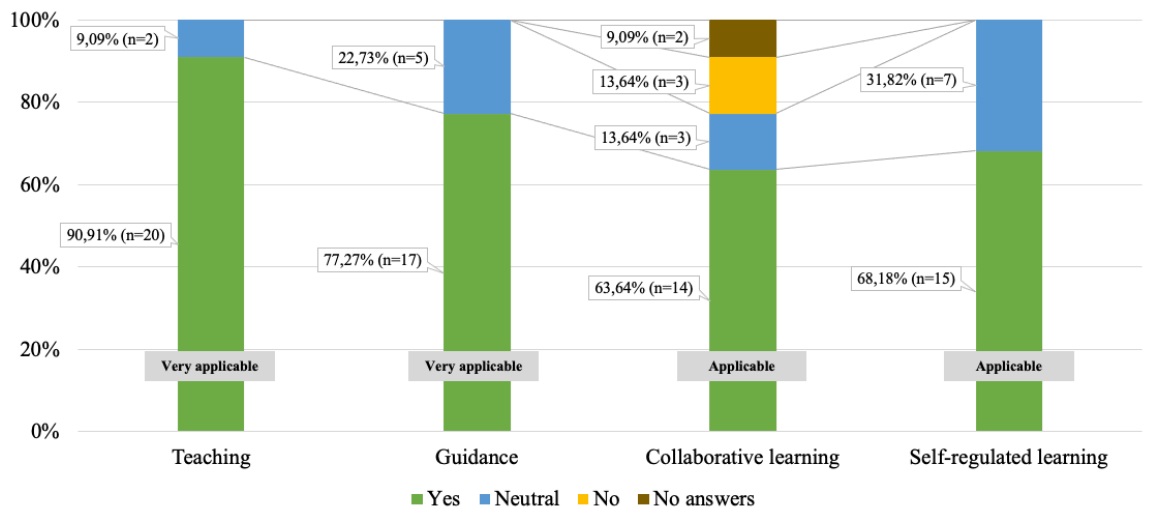
In a similar vein, the interviewees generally reported the relevance of the the Managing, protecting and sharing competence (2.3): "This is an issue that has recently been regulated in Europe. It's also already in various corners of the world, it's a growing concern" [Professor Q], although with rather conflicting opinions regarding professional and institutional practices in relation to the sharing of materials.

Competences in Area 3: Teaching and Learning (TL)

The competences (a) Teaching and (b) Guidance were considered "very applicable", while (c) Collaborative learning and (d) Self-Regulated learning were considered "applicable", as shown in Figure 6.

Regarding the Teaching competence (3.1), the interviewees reported with some clarity their recognition of the importance of mobilizing digital competences for the online teaching process itself: "[...] I use it in all curricular areas, from didactics where it is indispensable to other

Figure 6
Area of Expertise: Teaching and Learning in Online Higher Education



subjects" [Professor B].

In the Guidance competence (2.3), the interviewees reported an increase in the frequency of communication related to online guidance; however, they also indicated negative aspects arising from this increase in the frequency of requests for guidance due to a reduction in students' autonomy: "Online, they don't even stop to think about it. Now this doubt has arisen, I'm going to read this, I don't know what this is, I'll write to the professor" [Professor J].

Regarding the Collaborative learning competence (3.3), although this competence was considered "applicable", a number of interviewees indicated that it was not applicable, further attesting to the low efficiency of collaborative learning for online teaching: "If we're talking about collaborative learning, that is, them getting together, talking, doing group work... Then, I think it makes it difficult, I have the feeling that the 'online' makes it difficult" [Professor F]; and "I don't think so, it's gotten a bit worse, when they do group work, they're together it's better than when they're separated by ZOOM" [Professor M].

In the Self-regulated learning competence (3.4), the interviewees attest to the importance of this competence for students: "This is absolutely necessary; online, it's fundamental" [Professor Q]; however, they say that they generally feel that students lack this skill: "[...] regardless of the system, they don't self-regulate their learning. Because they accumulate everything, all the material until the exam date" [Professor N] and "Student self-regulation is something that I think most students lack" [Professor D].

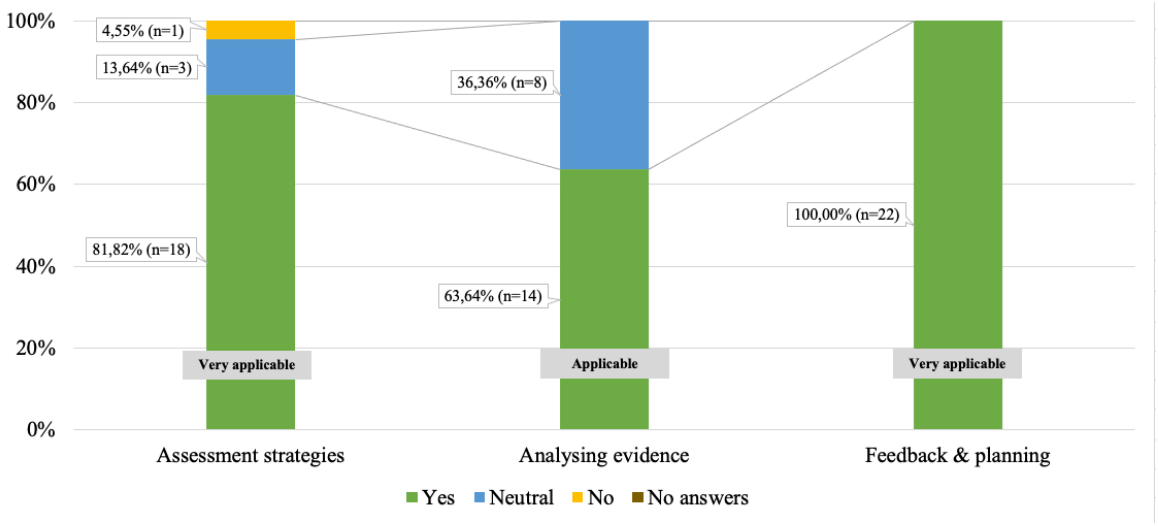
Competences in Area 4: Assessment (AS)

The competences (a) Assessment strategies and (b) Feedback & planning were considered "very applicable", while (c) Analysing evidence was considered "applicable", as shown in Figure 7.

In the Assessment strategies competence (4.1), the interviewees indicate its applicability, listing continuous assessment as the preferred means: "[...] our pedagogical model (first cycle) foresees that they follow a continuous assessment aspect, for example, that throughout the semester they can carry out two small assignments and be assessed by it" [Professor A].

In the Analysing evidence competence (4.2), the interviewees pointed out that they considered criteria to be rigorous when selecting the evidence recorded by the Virtual

Figure 7
Applicability of the Area: Assessment in Online Higher Education



Learning Environments (VLE): "[...] for example, participation in a discussion group, but it can't be the number of participations, it has to be what was said in that discussion group" [Professor E], including the use of advanced external data analysis tools: "[...] two or three years ago we had a project that used *Google Analytics*. And it was great" [Professor C].

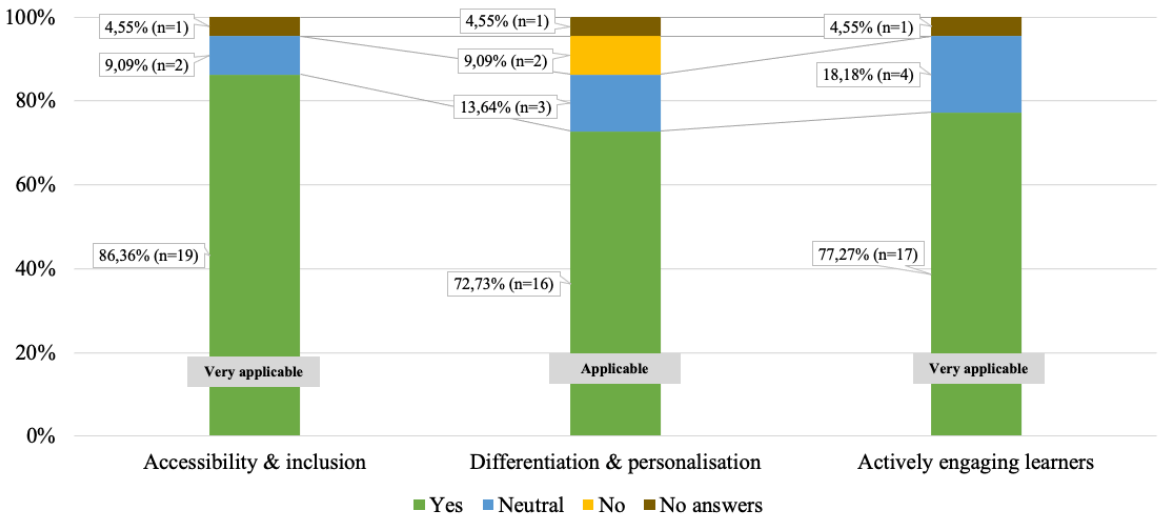
In the Feedback & planning competence (4.3), the interviewees highlighted the importance of feedback and planning for online teaching: "[...] in distance learning, feedback is crucial, so feedback has to be provided to students" [Professor A]; and they also highlighted it as having greater relevance compared to face-to-face teaching: "In online teaching there is a greater concern with feedback, not least because there is this insecurity of not being present. This therefore leads us to create moments for systematic feedback" [Professor Q].

Competences in Area 5: Empowering of Learners (TL)

The Competences (a) Accessibility & inclusion and (b) Actively engaging learners were considered "very applicable", while (c) Differentiation & personalization were considered "applicable", as shown in Figure 8.

In relation to the Accessibility & inclusion competence (5.1), the interviewees highlighted its applicability: "It's extremely important. If you can't ensure this, you're creating situations of discrimination between students and therefore conditionin" [Professor D]; as well as highlighting the need to respond to the diversity of disabilities: "[...] accessibility for the blind is one thing, for the hearing impaired it's another, for students with cognitive learning problems it's yet another thing" [Professor E]. In the Differentiation & personalization (5.2), the interviewees expressed its importance for online teaching: "Yes, I think ... it's one of the advantages of online teaching" [Professor E]; and they also attested to the natural characteristics of online teaching, as opposed to the methodologies used in the past: "It's absolutely necessary in the online process. it's one of the advantages of online teaching" [Professor E]; and they also attested to online teaching's natural characteristics, in contrast to the methodologies used in the past: "It's absolutely necessary, in the online process I don't see why not, in fact, it's appropriate, it's suitable exactly for these situations, a student has greater availability" [Professor T].

Figure 8
Applicability of the Area: Assessment in Online Higher Education



In the Actively engaging learners competence (5.3), the interviewees reported that the online environment favors the active engagement of students, either because they feel more uninhibited: "There are several students, as we know, who are more introverted. They participate more in the online system than in the classroom" [Professor Q]; or even generationally "[...] perhaps there is more involvement because they are very inclined to do everything online" [Professor F]. The interviewees also attest to the importance of this competence: "If we can't get students involved in learning activities with enthusiasm, we're not doing our job properly, are we?" [Professor E].

Competences in Area 6: Promoting Learners' Digital Competence (PC)

The Competences (a) Communication and (b) Content creation were considered "very applicable"; while the competence (c) Information & media literacy was considered "applicable"; and, finally, the Competences (d) Responsible use and (e) Problem solving were considered "not very applicable", as shown in Figure 9.

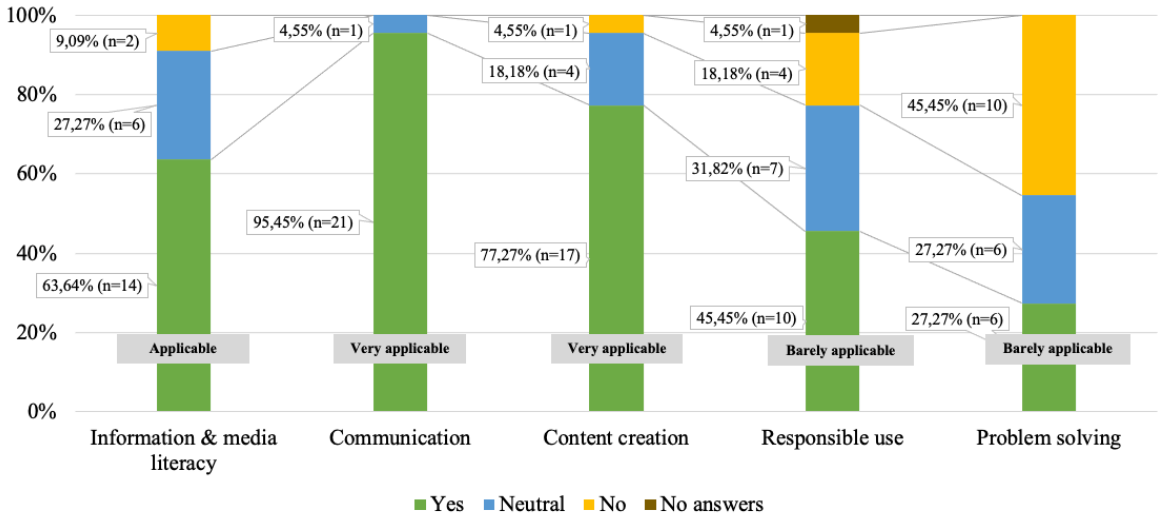
In the Information & media literacy competence (6.1), the interviewees reported the great importance of digital Competences for students when they enter online higher education: "[...] if a student comes to online education without digital literacy, they have no chance of succeeding" [Professor E].

They also raise comments about the increased need for professor training due to the rise in student proficiency: "What's going to happen in the very near future, as early as next semester, is that students are going to demand more. We're going to have to run ahead of the students" [Professor C].

In the communication (6.2), the interviewees generally reported the importance of promoting digital communication and collaboration Competences as a teaching strategy: "[...] students have to go through a process of co-creation; co-creation is working with organizations, companies and external stakeholders [...]" [Professor Q] however, they report difficulties in selecting technologies and tools, as students tend to adopt their own: "[...] we have never been able to provide communication and collaboration tools that are used by students, i.e. they look for others that are not controlled by us" [Professor E]. They also highlight the advantage of students

Figure 9

Applicability of the Area: Promoting Learners' Digital Competence in Online Higher Education



who master the technologies online: "In this case, what I noticed was that the student or students who mastered the tools tend to took more responsibility for the work, and the others who don't were more passive online" [Professor I].

In the Content creation competence (6.3), the interviewees attest to its applicability, also assuming the need to encourage students to play a leading role: "[...] develop the power and ability to take ownership of these tools and use them too, to be builders, producers of knowledge, not just consumers" [Professor B].

In the Responsible use competence (6.4), although considered "not very applicable", some of the interviewees reported the importance of this competence in online teaching: "This issue of security has also become very important to be incorporated into our content" [Professor G]; also indicating the level of teaching as a decisive factor in promoting this competence: "So, it's one thing for me to teach online with high school students, it's another thing to talk about adults, [....] we must have good practices in this sense, in other words, the correct use of resources" [Professor E].

Finally, regarding Problem solving competence (6.5), although considered "not very applicable", the interviewees recognize its importance, but do not integrate it into their curricular units: "I think it's like this, those problems, they always have to solve them, because everyone has problems like that, but integrating that into our practice ?, no !." [Professor E].

Discussion

Several studies have been carried out on the higher education population using the native questionnaire, DigCompEdu (DigCompEdu CheckIn 2019), generally obtaining an intermediate level of digital competence proficiency (B1-Integrator) (Dias-Trindade et al., 2020; Fernández-Morante et al., 2023; Santos et al., 2021a, 2021b). Despite these multiple applications of the European framework for digital competence for educators, no studies have been found that ensure the applicability of each of the competences contained in this framework to the reality of higher education, particularly the one that takes place online. This study sought to compensate for this limitation.

Through interviews with online higher education professors, this research aimed to empirically analyze the applicability of this framework to the context of online higher education from the point of view of teaching practice. The general results pointed to its applicability, with the majority of respondents considering the various competences considered to be "applicable".

As for the areas analyzed (six) independently, the results ranged from "very applicable" in the areas of Professional engagement, Assessment, and Empowering of learners, and to "applicable" in the areas of Digital resources, Teaching and learning, and Promoting learners' digital competence, thus attesting to the fact that even with this cut-off point, the frameworks is understood by the professors surveyed as being applicable to their practice.

The five competences contained in the "Promoting learners' digital competence" area of DigCompEdu are linked to the five areas of DigComp 2.2: European Digital Competence Framework for Citizens (Lucas et al., 2022), i.e. the European Commission clearly delegates the responsibility for promoting the digital competences of citizens/students to professors (Pedro et al., 2023).

Of the six areas, area 6 "Promoting learners' digital competence" had the lowest percentage of professors (61.82%) indicating "yes" to its applicability in online higher education, which may be related to the fact that the competences contained in this area, discussed in more detail below, relate to technical knowledge (associated with specific training areas, e.g. computer science) and/or to the understanding that these competences should not necessarily be promoted by professors in the students of different higher education courses. This may be related to the fact that the competences contained in this area, discussed in more detail below, relate to technical knowledge (associated with specific training areas, e.g. computer science) and/or to the understanding that these competences should not necessarily be promoted by professors in the students of the different higher education courses, thus contradicting the expectations of the European Commission in aligning the frameworks (DigCompEdu and DigComp).

By broadening the cut-off by competence, of the 22 contained in the framework, 63.64% (n=14) were considered "very applicable", 27.27% (n=6) "applicable" and only 9.09% (n=2) were considered "not very applicable". The latter refer specifically to competence 6.4 "Responsible use" and 6.5 "Problem solving"; both contained in area 6, relating to "Promoting learners' digital competence".

The Responsible use competence (6.4) calls for activities that aim to convey to students a favorable attitude towards digital technologies, encouraging their creative and critical use, empowering them in relation to a the protected use of their devices, digital content, and personal data so that they can understand security measures, protection, risks, threats, and privacy in digital environments. In this competence, 18.18% (n=4) of the interviewees pointed out that it was not applicable and 45.45% (n=10) that it was applicable, the other professors chose not to answer (n=1) or to assume a neutral position (n=7).

The Problem solving competence (6.5) advocates the inclusion of learning activities, tasks, and assessments that encourage students to personalize digital environments, solve technical problems when using devices and recognize the constant need to update their digital competences, while also highlighting the importance of students identifying and choosing the appropriate digital technologies to solve problems and using them creatively to generate knowledge. In this competence, 45.45% (n=10) of the interviewees pointed out that it was not applicable and 27.27% (n=6) that it was applicable, while the response from the other professors was neutral (n=6).

The framework under analysis considers that digital competences are broad, comprehensive, and instrumental in today's society and that, as a result, professors have a responsibility to promote their development in their students as digital technologies are increasingly incorporated into the teaching and learning process, since the ability to foster students' digital competences becomes an essential component of professors' digital competences. However, professors in

higher education do not see it the same way.

It is important to note that area 6, "Promoting learners' digital competence", is on the "Learners' competences" axis, i.e. it is the ability to promote a given competence and not an intrinsic competence of the professor needed to carry out a given teaching activity.

The professors interviewed believe that, since these are young adult students, these Competences should already be ensured, for example, with regard to "Responsible use", one professor indicated that "[...] they're already adults [...] but it's not something we talk to them about" [Professor R]; regarding the "Problem solving" competence, they said that "[...] they always have to solve these (technical) problems, because everyone has problems like that. But integrating this into our practice doesn't make sense" [Professor E], namely because HEIs have specific services for this purpose "there's a student support service, a hotline they can call when there's a problem of this kind" [Professor L].

Despite fulfilling its objective, the limitations of this study are the size of the sample and the fact that the professors only work in the context of one member state of the European Union. As future studies, we suggest validating the applicability of this framework with a larger sample, in terms of size and breadth, involving other countries in the European Union, as well as specialists in distance education and adopting complementary another data collection strategies.

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