

RESEARCH/INVESTIGACIÓN

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**EDUCATING THE *HOMO DIGITALIS*: THE ROLE OF EDUCATION
AND DIGCOMEDU TO PALLIATE THE EFFECTS OF
ALGORITHMS, FAKE NEWS, POLARIZATION, AND LACK OF
CRITICAL THINKING**

Educando al homo digitalis: el papel de la educación y del digcomedu para paliar los efectos de los algoritmos, las fake news, la polarización y falta de pensamiento crítico

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ABSTRACT

The classrooms of our educational organizations (primary schools, secondary schools, and universities) are inhabited by members of the so-called “Millennials”, “generation Z” and “generation Alpha”, generations made up of children, adolescents, and young people born in an augmented society where technology and social media are ubiquitous and where algorithms increasingly make decisions or skew their perceptions. The impact that hyper-connection and the embodiment of technologies have on their lives reaches varying degrees, depending on the generation to which they belong, but it can cause serious psychological and relational dysfunctions and ethical dilemmas. Furthermore, the generalization of technologies in the educational world is leading us, on the one hand, to new forms of power and control of society, but also new exclusion gaps. What role should education play in this scenario? Is the initial and ongoing training of teachers addressing these issues? The article reviews these issues and proposes a training scenario based on DigComEdu, the European Framework for Educators' Digital Competence.

KEYWORDS: Digital competence - Digital literacy - Teacher training - Educational technology - Digital ethics gap - FoMO - Digital identity - Confirmation bias - Algorithm.

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RESUMEN

Las aulas de nuestras organizaciones educativas (escuelas, centros de secundaria y universidades) están habitadas por integrantes de las llamadas “generación de los millenials”, “generación Z” y “generación Alfa”, niños, adolescentes y jóvenes nacidos en una sociedad aumentada donde la tecnología y las redes sociales están omnipresentes y donde los algoritmos toman cada vez más decisiones o sesgan sus percepciones. El impacto que la hiperconexión y la corporeización de las tecnologías tiene en sus vidas alcanza diversos grados, dependiendo de la generación a la que pertenezcan, pero puede causar serias disfunciones psicológicas, relacionales y dilemas éticos. Además, la generalización de las tecnologías en el mundo educativo nos está llevando, por un lado, a nuevas formas de poder y control de la sociedad, pero también a nuevas brechas de exclusión. ¿Qué papel ha de cumplir la educación en este escenario? ¿La formación inicial y permanente de los docentes está atendiendo estas cuestiones? El artículo revisa estas cuestiones y propone un escenario formativo que parte del DigComEdu, el Marco Europeo para la Competencia Digital de los Educadores.

PALABRAS CLAVE: Competencia digital - Alfabetización digital - Formación del profesorado - Tecnología educativa - Brecha ética digital - FoMO - Identidad digital - Sesgo de confirmación - Algoritmo.

EDUCANDO HOMO DIGITALIS: O PAPEL DA EDUCAÇÃO E DO DIGCOMEDU PARA PALIAR OS EFEITOS DE ALGORITMOS, FALSAS NOTÍCIAS, POLARIZAÇÃO E FALTA DE PENSAMENTO CRÍTICO.

RESUMO

As salas de aula das nossas organizações educacionais (escolas, escolas secundárias e universidades) são habitadas por membros da chamada “geração dos millennials”, “geração Z” e “geração Alfa”, crianças, adolescentes e jovens nascidos em uma sociedade aumentada onde a tecnologia e as mídias sociais são onipresentes e os algoritmos cada vez mais tomam decisões ou distorcem suas percepções. O impacto que a hiperconexão e a incorporação de tecnologias têm nas suas vidas atinge graus variáveis, dependendo da geração a que pertencem, mas pode causar graves disfunções psicológicas e relacionais e dilemas éticos. Além disso, a generalização das tecnologias no mundo educacional está nos levando, por um lado, a novas formas de poder e controle da sociedade, mas também a novas lacunas de exclusão. Qual deve ser o papel da educação nesse cenário? O treinamento inicial e contínuo de professores aborda essas questões? O artigo analisa essas questões e propõe um cenário de treinamento com base no DigComEdu, o European Framework for Educators 'Digital Competence.

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PALAVRAS CHAVE: Competência digital - Literacia digital - Formação de professores - Tecnologia educacional - Lacuna de ética digital - FoMO - Identidade digital - Viés de confirmação - Algoritmo.

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1. INTRODUCTION AND LITERATURE REVIEW

Currently, we are witnessing profound social, geopolitical, economic, and cultural transformations, which were announced at the end of the 20th century and which have accelerated in the first two decades of the 21st century. We cannot ignore the undeniable advance of Humanity since the last third of the last century, which has produced a false sense of omnipotence about the destinies of the Planet, as the historian Yuval Harari reminds us in his works *Sapiens* (2014) and *Homo Deus* (2016). A fiction that has been destroyed into pieces due to the COVID-19 pandemic in which we are still immersed at the time of writing this article.

But even before the zoonosis that has put the coronavirus in our lives, Warren Bennis and Burt Nanus (1985) had already spoken at the end of the 20th century about the need for organizations and people to prepare to adapt in an agile and flexible way to VUCA environments (Volatility, uncertainty, complexity, and ambiguity), uncertainty and volatility that have a negative side, baptized by Zygmunt Bauman as “liquid modernity” (2007): a world in which the identity of individuals is constructed as consumers on the lookout for immediate and thoughtless happiness and immediate reward. Bombarded by the continuous and biased infodemic, people have lost contact with all the ideological, social, and moral and ethical behavioral references that had driven their actions in previous times.

In these last three years, world education has generated new frameworks, with a holistic and more humanistic approach, that respond to the complex needs of an increasingly global and interconnected Planet. The common objective that all pursue is to minimize the negative aspects of technological innovation and change that have a history of uneven contribution to human flourishing, as we have been able to verify in the very unequal effect that the pandemic has had in the most and least developed countries in the world during 2020. The OECD's *Compass for 2030 Learning* (2018, 2020), UNESCO's *Futures of Education 2050* initiative (2019a, 2019b) or the *Global Education Pact* promoted by Pope Francis from the Vatican (2020) are just three of the most significant examples of these frameworks, which seek that transformative role of education for the Common Good and the achievement of human wellbeing. We are immersed in a fourth industrial revolution that has changed the ways of working, producing goods, relating to each other, and even the competencies and skills that are going to be valued the most in the coming years at the labor level, among which critical thinking, which we will talk about in this article, is of primary importance (World Economic Forum, 2020). Therefore, we insist that the educational world must continue

to reflect to understand whether it is adequately addressing its didactic approaches and curricular frameworks, including the use of technology, to ensure that it is preparing today's learners for the world of the present and of the future.

Since the arrival of the Internet, the use of information and communication technologies has been transforming, without us even realizing it, our daily and educational reality. Above all, the great leap has occurred since mobile devices appeared, whether tablets or smartphones, which make us a kind of "postmodern cyborgs" (Sánchez and Andrada, 2013), being one more appendix of our body to which we delegate issues such as our orientation ability -apps such as Google Maps- and even transform our linguistic expression -of our smartphone we say "I ran out of battery" instead of "it ran out of battery"-. Nobody disputes the advantages that the incorporation of technology in the educational world can have, especially during a health emergency such as the current pandemic generated by COVID-19. Without this daily incorporation of technology into our lives, what has been labeled as "emergency remote teaching" would have been unfeasible, which, despite its shortcomings, has allowed the teaching-learning processes not to be suddenly interrupted during the periods of home confinement to which we have been forced in the different countries of the world. However, "emergency remote teaching" is not synonymous with adequate integration of educational technologies or good instructional design, let alone other dimensions such as digital health and media literacy, on which this article focuses. One of the key factors for proper integration of educational technology is the quality of the training that teachers receive, and regarding critical digital literacy and the fight against misinformation on the Internet, we still have a long way to go. The impact that hyperconnection, embodiment, and excessive dependence on technologies have on the students who live in our educational institutions reaches different levels, depending on their age and degree of maturity, but there is abundant and recent research (Echeburúa and de Corral, 2010; Franchina et al, 2018; Overton, 2019; Terán Prieto, 2019; Torres Serrano, 2020) which shows that it can cause serious psychological and relational dysfunctions and ethical dilemmas. Education is basic to help students avoid intellectual and emotional manipulation, maintain strong self-esteem despite external influences, and build a more solid self-concept that helps them avoid feelings of exclusion, inferiority, and anxiety disorders and depression.

2. METHODOLOGY

This article performs a recent literature review, which informs the subsequent argued discussion. Some of the constructs that we use for this discussion (Overexposure and overidentification) come from the categories of problematic behaviors of the publication *Factors of youth digital socialization of the Fundación de Ayuda para la Drogadicción* (Gordo et al., 2019).

The bibliographic review method is specified in a search in digital databases used in education (ERIC and Dialnet), as well as in specialized journals on teacher training in Spain and Latin America.

Although some works that are not directly related to the world of education and that the author had previously handled have been included in the discussion on the effects of technology, the inclusion criteria that we have mostly taken into account to choose the sources of the current revision are:

- **Chronology:** articles, books, and studies published between 2010 and 2021
- **Language:** Spanish and English
- **Field of work:** education
- **Keywords:** works that contain the combined keywords "Digital competence", "Digital literacy", "Teacher professional development", "Digital ethical gap", "Educational technology", "Digital identity", and their equivalents in English.
- **Geographic environment:** Spain and Latin America

3. OBJECTIVES

The research objectives guiding the study are as follows:

1. Problematize the impact and consequences of the use and abuse of technologies, the internet, and social networks on people, and more specifically on children and young people who are in school.
2. Critically address whether teacher training is developing an adequate vision of the digital identity and the digital competence of teachers, which can address the challenges described in the previous point.
3. Propose, as a synthesis of what has been discussed, some keys to improving teacher training in this matter, associated with areas 5 and 6 of the DigComEdu or European Framework for Educators' Digital Competence (Redecker, 2020).

4. RISK FACTORS AND CONSEQUENCES IN THE USE AND ABUSE OF THE INTERNET, TECHNOLOGY, AND SOCIAL MEDIA

Cristóbal Cobo (2019) asks us to take a healthy distance from what he calls "prevailing techno-enthusiasms" to practice technological disobedience and critical reflection, at a time when he considers that we have reached the end of the digital honeymoon. The Internet is no longer a tool for universal access and inclusion, but rather an instrument of surveillance, influence, manipulation, data and privacy "extractivism", loss of self-control, and cognitive overload. Several decades back in time, other technocritical voices such as that of Michael Apple (1991) argued that the excessive use of educational technology posed risks for education, among which a distortion of teaching to favor the most technically expert teachers to the detriment of teachers with other pedagogical skills, or curricula that foster a technical mindset focused on the "how" at the expense of a humanistic orientation that asks questions about the whys stand out. Nissenbaum and Walker (1998) also explored the general concern of many education experts about the dehumanization of the school and the possible threats to social and ethical values resulting from school computerization. The concern was specified in four aspects: that the students separate themselves from people and society; that the teacher-student relationship could be broken; that the

teaching of important values is compromised; and that education became excessively standardized. The work concluded that there were genuine risks serious enough to warrant precaution and that steps should be taken to minimize them.

We will now explore the extent to which these concerns are reflected in current challenges in our educational institutions, and how they relate to digital identity and digital competence for teachers.

4.1. Overexposure: the construction of identity through technology

Educational institutions are not disconnected from their context, whether that ecosystem is conceived at a local or global level. The COVID pandemic has further diluted the boundaries between formal, non-formal, and informal education, something that was already presented as desirable in the concept of *Long Life Learning* proposed in the European educational competence framework that governs our national and regional legal framework. The pandemic has made it clear that the school was present where a group of students had a device to connect with their teachers and learn, each from a different physical location. In fact, this blurring of borders is, according to Eurídice Cabañes (2013), a feature of postmodernity, a hybridization of the human and the technological that is introduced into every day, in our ways of relating, which forces us to constantly ask ourselves where we are going and how individual and collective identity is built. Cabañes flees from a technophobic vision and invites us to choose whether we want to be a "consuming mass or a creative group". Dolors Reig (2016) expresses herself along the same lines, with her now-classic concept of technologies such as TEP: technologies of empowerment and participation.

But the omnipresence of technology also overexposes us. Pope Francis has spoken of the "constant spectacle of our hypervigilated lives" in his last encyclical of October 3rd, *Fratelli Tutti*:

Everything becomes a kind of spectacle that can be spied on, watched, and life is exposed to constant control. In digital communication (...) respect for the other is shattered and, in this way, at the same time that I displace him, I ignore him, and keep him away, without any shame I can invade his life to the extreme.

José Carlos Ruiz expresses himself in a similar way, in his 2021 book *Filosofía ante el desánimo*:

It is not enough to know ourselves, we also have to show it, show our world, narrate our achievements, tell our wishes, publish our feelings, show our opinions, expose our creations, upload our photographs, "share" our reflections... Everything is oriented to flee from the impersonal, which is perceived as subtraction, as negativity. The problem appears when our personality, that sum of temperament (genetic) and character (educational), feels the pressure to assume a successful identity, which is generally very far from reality (p. 16).

Bibliographic reviews and studies such as that of Alonso-Ferreiro, Regueira, and Zapico-Barbeitio (2019) have also shown that this overexposure has more harmful effects when it comes to teen girls and that the intense use of social networks is associated, on numerous occasions, with practices that violate basic pillars of digital security, such as sexting or cyberbullying, one of the most serious consequences of the overexposure that we are discussing.

The connection through technology is a new form of compromise between loneliness and the fear of failure or invasion of privacy, something that MIT Professor of Technology and Society, Sherry Turkle, calls "schizoid." It is mere illusion, and when the illusion of the Other fades, we feel more alienated than ever. The deep loneliness that emanates from the paradox of "together, but alone", is developed in her 2012 book *Alone Together- Why We Expect More from Technology and Less from Each Other* and defines the new relational dimension of homo digitalis in these times in which social networks and virtual presence have largely supplanted physical encounters and "real" human contact because screens allow a security separation with which we avoid the most complicated aspects of "real" relationships and showing ourselves as we are. It is an issue on which she has delved even more in her book *In Defense of the Conversation* (2020).

Another of the philosophers of the post-truth era and of the techno-critics of the 21st century who have warned that virtual connectivity is not an authentic connection is the Korean Byung-Chul Han. In his essay *The expulsion of the different* (2017), he alerts that digital hyper-connection does not facilitate the encounter with others, but leads us to find people who think like us and make sure that our horizon of experiences becomes increasingly narrow, making us pass by the unknown or those we consider different. The final consequence is that hyper-connection ends up locking us in an endless loop of the self and, ultimately, leads us to a self-propaganda that indoctrinates us with our own notions, while reinforcing our confirmation bias and we become more intolerant to ideas that challenge and remove us.

The students who inhabit our classrooms see quite clearly the artificiality of this virtual connection, and use the term "posture" abundantly, which is defined in the RAE as an "artificial and imposed attitude that is adopted for convenience or presumption". The neologism entered the Academy's dictionary just five years ago, in its 23rd edition and, at least in Spain, we all associate this word with vain and false behavior on social networks.

4.2. Overidentification and FoMO: The fear of being left out

Although young people recognize the inauthenticity that we discussed in the previous section, being aware that many users of social networks abundantly "posture" and only seek to increase their number of followers or likes, the truth is that they are terrified of "being left out" of their virtual tribe, they compare each other all the time, and allow their privacy to be constantly trampled on. This psychological

anxiety derived from hyper-connection in social networks was coined in 2013 with the acronym FoMO: Fear of Missing Out (Przybylski et al, 2013). It is related to the theory of self-determination, by Ryan and Deci (2000), which affirms that the feeling of kinship or connection with others is a legitimate psychological need that influences the psychological health of human beings. In this sense, FoMO is understood as a self-regulatory state that arises from the situational perception of each person. The study found that there is a significant correlation with having low self-esteem, and those who obtained a lower satisfaction of basic needs, low levels of mood and satisfaction with life, had higher levels of FoMO and presented more compulsive attitudes when it came to constantly checking social networks. The results of the 2013 research have been corroborated by other studies such as that of Torres-Serrano (2020), which verifies in its sample with young Spanish Instagram users aged 18 to 30, that a high score in FoMO is correlated with greater use of the social network, as well as a high score in FoMO correlates with a higher score in narcissism and, on the other hand, with low self-esteem. The study by Franchina, Vanden Abeele, Van Rooij, Lo Coco, and De Marez (2018) has also shown, this time with a sample of Flemish adolescents, that a high score on the FoMO scale is a predictor for later problematic behaviors in social networks, or relational conflicts, in what has already been coined as "phubbing": belittling someone physically present, paying more attention to the Smartphone than to the person in front of us.

But even before the term FoMO was coined, Echeburúa and de Corral (2010) warn in their work about the consequences of the use and abuse of the Internet and social networks, and how this abuse is related to psychosocial variables, such as psychological vulnerability and stress, advising preventive strategies within the family and in educational institutions. For these prevention strategies to be effective, it is evident that teachers must be previously trained in the risks involved in misuse, something that is still scarce in training plans for Digital Teaching Competence, more focused on the instrumental and on the instructional design than in "digital health"; Although, as the study by Alonso-Ferreiro, Regueira, and Zapico-Barbeito (2019) collects, the number of initiatives, programs, and plans that focus on the education of citizens in safe and healthy use of digital technologies is increasing. Some examples are *Pantallas Amigas*; *IS4K-Internet Segura for Kids*; the *Plan Navega con Rumbo*, and INTECO's legal guides regarding social networks, minors, and privacy on the internet.

4.3. Misinformation: algorithms, confirmation biases, polarization, and lack of critical thinking

In 2018, the study by MIT professors Vosoughi, Roy, and Aral, published in the journal *Science*, raised many alarms about how impulsive the adult world is when it comes to sharing hoaxes online, with the consequent dangers that this can have for the stability of democracies. The work studied the origin and impact of the hoaxes spread through Twitter. The most striking thing about their conclusions is that it is not bots that spread fake news, but human beings. 70% of fake news, especially if it is political, goes viral much faster on Twitter than real news, which increases the danger of an

increasingly polarized and manipulable society in great need of critical digital literacy. Behind the behavior of the adult who retweets without thinking, there are very human issues: we pay more and more attention to the small influencers, and our viscerality, our prejudices, and emotions are constantly manipulated. Thus, our confirmation bias is managed at the whim of the algorithms, which decide what we should read and how we (un)inform ourselves to polarize ourselves more and more, and at the same time that the infodemic bombards us, the networks generate an addiction that prevents the inhibitory control of the impulse, reflection, and a reaction time between the stimulus and the response that they do not grant us. In fact, the inventor of the "infinite scroll", Aza Raskin, has compared addiction to social networks with dependence on cocaine (González, 2018).

The Netflix documentary "The Social Dilemma" (Orlowski, 2020), starring Aza Raskin himself and other technologists who created gadgets and artificial intelligence whose main task is to capture our attention, also denounces the risks of overexposure to social networks, the infodemic, misinformation, and internet abuse, besides warning that democracy is being put at very real risk and that it can lead us to a dangerous social confrontation and the destruction of our societies, while we let the devices and the Internet apparently solve our lives and "think for us."

Marina Garcés (2017) warns of the dangers of believing too much in technological "solutionism". We are led to believe in the utopia that technology will lead us to a world without problems, but we can end up turned into stupid humans who have delegated and "outsourced" their intelligence and allow themselves to be managed by machines and algorithms. Garcés considers that this delegation is an unprecedented gesture of anthropological pessimism and that we are falling into the error of thinking that algorithms will make more informed decisions, in theory, more neutral and freer from human error, until we realize that the algorithm is not neutral. Harari (2018) also raises this same dilemma about the power of algorithms in his book *21 Lessons for the 21st Century*: there are post-humanists convinced that they no longer even need to think critically and understand the reality that surrounds them, because everything is data and they trust everything to a good information system (Harari gives the example of smartwatches that collect biorhythms and health status, for example) or algorithms that seem to know our tastes and needs better from the outside than we do, and that tell children and adolescents which YouTube video to consume next... From this article, we defend that this extreme "dataism", which makes critical thinking superfluous, is an aspect on which current education must reflect at length because it can become a new gap in the structures of social manipulation and power: a thinking elite vs. a large majority of people who allow others to program the algorithms and think for them, or what Cristóbal Cobo calls "the vassals of data, who suffer from info-vulnerability" (Cobo, 2019, p.36). The author problematizes what he calls "digital hyper-positivism":

Does the age of big data bring us closer to the truth or is it just a technophilic mirage? (...) It is essential to develop future-proof skills, not limited to certain tools, instruments, or methodologies (...) In short, to favor the development of

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new capacities that are not limited to the technical aspect of certain technological tools but rather that favor learning to think differently and allow us to face new problems from a perspective that goes beyond the instrumental. (p. 29-30)

4.4. Moral and ethical blindness

Carrie James, a member of Harvard's Project Zero, published her book *Disconnected: Youth, new media, and the ethics gap* in 2014. In its pages, James warned that despite living in the most informed era of humanity -something that should, in theory, favor a greater open-mindedness, more global competition, and a greater spirit of tolerance to other ways of understanding the world and reality- today's young people are inclined to think very narrowly, to focus on themselves and on very close people they know in real life. The book is supported by extensive interviews with children and young people ranging in age from 10 to 25, and through these interviews, James describes her thoughts on issues such as privacy, intellectual property, and virtual participation. Three ways in which young people approach their online activity are described: practicing self-centered thinking, in which they are mainly concerned about the consequences for themselves; moral thinking, when they worry about the consequences that their virtual praxis will have for the people they know; or ethical thinking, if they care about strangers and larger communities. James concludes that adolescents, for the most part, are blind to moral or ethical concerns. For example, hostile speech or insults, if they occur in online content, are usually justified with the comment "it's just a joke". Regarding intellectual property, they seem to feel that "if it is online, it belongs to everyone"; They show a relaxed attitude towards piracy, downloading other people's files, or the use of copy/paste of materials without worrying about referencing the sources.

5. FRAMEWORKS FOR TRAINING IN DIGITAL TEACHING COMPETENCE: ARE CURRENT CHALLENGES BEING RESPONDED TO?

As Castañeda, Esteve, and Adell (2018) recall, training in educational technologies is still a challenge both in initial training and in the permanent professional development of the teacher. Teachers seem to be very aware of both the need to improve this training and the need to minimize some of the risks for students that we have discussed in previous sections. The study by Pérez Escoda, Iglesias Rodríguez, and Sánchez Gómez (2016) is one of those that most clearly shows the importance that Spanish teachers and future teachers give to the adequate acquisition of digital teaching competence and the need they feel to master it for their performance, which implies the need to raise it not only in initial teacher training but also in ongoing training. Similarly, the V study on the use of technology in education carried out by Blink Learning (2019), with a large sample of teachers (1851 teachers in Spain and 1417 in Latin America, among which the teachers of Secondary, High School and Professional Training reached 74% of those surveyed) affirms that one of the greatest challenges in the use of technology in the classroom is the issue of data security and

protection (22%). When asked to identify an academic deficit in their students when using technology, 48% say that their students cannot select and contrast reliable sources of information, and 30% say that they are concerned about the issue of privacy and data protection, and the inability to perceive the risks to which they are exposed on the internet.

The COVID-19 crisis has highlighted challenges and problems that already existed, but which were aggravated by having to virtualize education for months: poor integration of technology and active teaching methodologies; low digital competence in a significant percentage of teachers; the finding that the label “digital natives”, popularized a decade ago, does not correspond to reality, because the student body does not have high digital competence at the content production level either. Furthermore, to all these issues are added the educational gaps for students who come from vulnerable backgrounds, and which have widened with the recent gap in access and digital use that has jeopardized the continuity of the learning process during emergency remote teaching.

5.1. Initial teacher training, digital health, and media literacy: the case of Teacher Training Master’s Degrees

To determine whether the current training frameworks are meeting the challenges of educating *Homo Digitalis*, we have verified whether there are subjects dedicated to exploring and problematizing the integration of ICT within initial training for secondary school teachers, as it is the age group of those students who are more likely to present the problems that we have pointed out in this work. Taking into account that the SUE (Spanish University System for its acronym in Spanish) currently has 83 universities, 50 public and 33 private ones, we have consulted on the Internet the study plans of 20 teacher training master's degrees from several of these universities (most of them are public, although we have included in the consultation private universities such as Mondragón or Camilo José Cela) to have a significant sample. Only in two of the masters consulted is there a compulsory subject related to the integration of ICT and in another five masters, it is optional. The credits of these subjects range between 2 and 4, out of a total of 60. Although the study plans of these degrees are based on order ECI/3858/2007, of December 27th, ten years before the INTEF’s Digital Framework existed and thirteen years before DigComEdu appeared, it seems to us that the attention devoted to digital literacy and health in the initial training of secondary school teachers is clearly insufficient.

	University where the Secondary Teacher Training Master’s Degree is taught	website	Subject dedicated to the integration of ICT in Education

1.	Universidad de Alicante	https://web.ua.es/es/masteres/profesorado-de-educacion-secundaria-obligatoria-y-bachillerato-formacion-profesional-y-ensenanza-de-idiomas/	NO
2.	Universitat Autònoma de Barcelona	https://www.uab.cat/web/estudiar/la-oferta-de-masteres-oficiales/plan-de-estudios/plan-de-estudios-y-horarios/formacion-del-profesorado-de-educacion-secundaria-obligatoria-y-bachillerato-formacion-profesional-y-enseñanzas-de-idiomas-1096480309783.html?param1=1236065658068	NO
3.	Universidad Camilo José Cela	https://www.ucjc.edu/estudio/master-universitario-en-educacion-secundaria/	YES. MANDATORY. Technologies applied to specific didactics- 2 credits
4.	Universidad de Cantabria	https://web.unican.es/centros/educacion/estudios/asignaturas?p=75&c=2021	YES. MANDATORY. Technologies applied to specific didactics- 2 credits YES: a section (Educating in contemporary society: a new social and educational scenario. The importance of new technologies in school) within the subject "Family and School in the Information Society" (4 credits)
5.	Universidad de Castilla La Mancha	https://www.uclm.es/estudios/masteres/master-secundaria-fp-idiomas	NO
6.	Universidad Complutense de Madrid	https://www.ucm.es/masterformacionprofesorado/plan-de-estudios	NO (Only in a specific didactic): ICT tools for teaching Computer Science and Technology
7.	Universidade da Coruña	https://estudios.udc.es/es/study/detail/437v06	NO

8.	Universidad de Extremadura	https://www.unex.es/organizacion/servicios-universitarios/servicios/servicio_becas/archivos/ficheros/MASTRES%20OFICIALES/planes-de-estudio-anexo-v/PlanMUFPEsaclaracionpracticum.pdf	NO
9.	Universitat de les Illes Balears	https://estudis.uib.es/es/estudis-de-master/master/MFPR/assignatures.html	NO
10.	Universidad de León	https://www.unileon.es/estudiantes/oferta-academica/masteres/mu-formacion-profesorado-eso-bachillerato-fp-idiomas/plan-estudios	NO
11.	Universidad de Mondragón	https://www.mondragon.edu/es/master-universitario-habilitacion-docente-ejercicio-profesiones-profesor-educacion-secundaria-obligatoria-bachillerato-formacion-profesional-ensenanza-idiomas/plan-estudios	Yes, IT IS OPTIONAL Information and Communication Technologies in Education (4 credits)
12.	Universidad de Murcia	https://www.um.es/web/estudios/masteres/profesorado/historico-guias/2021-22	Yes, OPTIONAL. a part of the subject "Pedagogical Update I. Methodology, Technological Scenarios, and Didactic Evaluation" - 4 credits
13.	UNED- Universidad Nacional de Educación a Distancia	http://portal.uned.es/portal/page?_pageid=93,22164976&_dad=portal&_schema=PORTAL&idContenido=8	NO
14.	Universidad de Navarra	https://www.unirioja.es/estudios/master/M0nA/	NO
15.	Universidad de Oviedo	https://www.uniovi.es/-/master-universitario-en-formacion-del-profesorado-de-educacion-secundaria-obligatoria-bachiller	YES, MANDATORY. Information and Communication Technologies: 1 credit
16.	Universidad de la Rioja	https://www.unirioja.es/estudios/master/M0nA/	NO

17.	Universidad de Sevilla	https://www.us.es/estudiar/que-estudiar/oferta-de-masteres/master-universitario-en-profesorado-de-ensenanza	YES, OPTIONAL. Teaching and Learning with ICT-4 credits
18.	Universidad de Valencia	https://www.uv.es/uvweb/master-profesorado-secundaria/es/programa-del-master/plan-estudios/plan-estudios-1285886102408.html	NO
19.	Universidad de Valladolid	https://www.uva.es/export/sites/uva/2.docencia/2.02.mastersoficiales/2.02.01.ofertaeducativa/detalle/Master-en-Profesor-de-Educacion-Secundaria-Obligatoria-y-Bachillerato-Formacion-Profesional-y-Ensenanzas-de-Idiomas/	NO
20.	Universidad de Zaragoza	https://estudios.unizar.es/estudio/ver?id=659	YES, OPTIONAL Information and communication technologies for learning. 3.5 credits

Figure 1: List of teacher-training master's degrees consulted and subjects dedicated to ICT integration

5.2. Permanent training: the INTEF's digital health and safety offer

Given that the safety of schoolchildren in the use of technology is one of the issues that most concern educators and families, from the Ministry of Education and Professional Training, through the National Institute of Educational Technologies and Teacher Training (INTEF), initiatives have been launched for the training of practicing teachers that seek to respond to several of the challenges that we have pointed out in this work. As of the date we write this article, INTEF offers the first edition of a NOOC (Nano Open Online Course) on Technoethics, which will begin in November 2021, and during 2019 it has offered NOOCs on digital identity care (Sexting and other risky practices), Cyberbullying, Digital respect, and protection of personal data, basic measures of digital protection or privacy on the internet.

5.3. European Framework for Educators' Digital Competence: DigComEdu

Beyond the circumstantial problems described in previous sections, when discussing what happened during the COVID 19 crisis and "emergency remote teaching" (some of them, in fact, can already be considered conjunctural problems in vulnerable environments), digital teaching competence transcends the individual and instrumental training of teachers in educational technology, as highlighted by Colás, Conde, and Reyes (2019). In their work, they analyze the INTEF's Digital Teaching Framework of 2017, which they consider reductionist in their approach to digital

teaching competence, since it focuses fundamentally on technical and formal skills of the teacher, and they compare it with the European DigCompEdu Framework (Redecker, 2020). The authors opt for the latter framework since it progresses from the individual empowerment of the teacher in a technological world towards proposals for the transfer of the development of competence to students. The latest NOOCs offered by the INTEF since 2019, and which we have mentioned above, seem to want to correct these training deficiencies highlighted in the study by Colás, Conde, and Reyes (2019). However, it would be necessary to quantify the real scope in the percentage of practicing teachers who have enrolled in these courses to understand if this type of initiative can effectively contribute to minimizing the dangers that we have raised in the article.

We agree with Colás, Conde, and Reyes that DigComEdu implies a conception of digital skills as transformative and empowering skills, especially in areas 5 (Empowerment of students) and 6 (Development of digital competence in students), and it aligns much better with the global frameworks for education that we mentioned in the introduction. DigComEdu emphasizes that teachers have to train students in the application of digital technologies critically and responsibly in terms of information, communication, content generation, wellbeing, and problem-solving, and in that sense invites them to give students tools to fight against the problems that we have discussed throughout section 3 of this study.

5.4. Teaching digital identity

However, before being able to accompany the students' skills development, we, teachers, must reflect on our teaching digital identity, since we are role models for children and young people. It is vital to become aware of our new role in a postmodern digital society, characterized by the hybridization, omnipresence, and embodiment of the technology of which Cabañes (2013) spoke and in which we become active agents that enable meaningful learning experiences, connecting and involving students and improving their development as learners.

The teaching digital identity, (...) is a dynamic and permanent process that implies giving meaning and reinterpreting one's own beliefs, values, and experiences in light of the new contexts and frameworks of relationships in contemporary society; a process of negotiation, representation, and constitution of the experience lived inside and outside the school by teachers and their visions, beliefs, and expectations about what it means to be a teacher and the type of teacher one wants to become in a society characterized by the digitization of the human experience, which compared to other previous historical moments, offers new ways of accessing knowledge and new forms of representation, collaboration, communication, and learning. (Correa et al., 2015. p. 47)

Learning and teaching in modern classrooms require pedagogical approaches to inform the design of digital environments that facilitate conceptual learning and the

development of students' understanding of how to carry out learning and thus help them develop the competence of learning to learn and the rest of "21st-century skills" (Engeness, 2021). As Colás, Conde, and Reyes (2019) emphasize, the digitally competent teacher is no longer the one who best knows how to use technologies or the one who has the greatest knowledge of them, but the one who can take advantage of that background for the development of the digital competence of their own students.

Castañeda, Esteve, and Adell (2018) emphasize that the institutional models of digital teaching competence that had been used before have several important shortcomings: they consider technology as a tool neutral in values (when, as we have discussed, its use can hardly be considered as such) and also reduce the teaching action to work in the classroom, thus avoiding dimensions such as social and political commitment or the possible impact of educational institutions in their communities. We agree with Castañeda, Esteve, and Adell that it is necessary a reconceptualization of the teacher's digital identity that directs both, educator and student, to critical empowerment and the possibility of developing their agency, understood as technical capacity guided by good judgment, in a world increasingly mediated by technology. We believe that we can support ourselves in area 5, and especially in area 6, of DigComEdu, to carry out this critical empowerment, and that the latest actions of the INTEF in terms of training offers are a good sign that we are on the correct path, although there is still a long way to go, as shown by the scarce offer in initial teacher training that we have indicated in section 5.1.

5.5. Self-perception of future teachers about their digital competence and initial training

In the present work, we have not been able to review the self-perception that active Spanish teachers have of their own digital competence, but we have located three studies that we consider significant to name on education students who will be teachers and professors tomorrow. The first, by Esteve-Mon, Gisbert-Cervera, and Lázaro- Cantabrana (2016), carries out a self-perception questionnaire in education students, which shows encouraging results: the vast majority of the participants in the study considered themselves quite or very capable for the performance of digital competence. The study showed that the youngest students (20-24) showed a higher perceived self-efficacy than the older group, and the most significant differences were precisely those related to digital citizenry and responsibility, which seems to indicate that the new generations are increasingly aware of the risks involved in the use and abuse of the internet, which we commented at the beginning of this work. However, the work of Moreno- Guerrero et al (2020), carried out within the framework of INTEF 2107 with students of the Master's Degree in Compulsory Secondary Education, High School, Vocational Training, and Language Teaching at the Ceuta Campus of the *Universidad de Granada*, does not give such optimistic results. The groups of future teachers have an average level in the area of information competence and information literacy, they present higher values in the storage and retrieval of information, data, and digital content; medium levels in the storage and retrieval of information, data,

and digital content; but they have lower results in the evaluation of information, data, and digital content, precisely one of the aspects that concerned us in the analysis of this article.

The third work (Alonso Ferreiro, 2018) describes a PBL experience for the development of digital teaching competence in the initial training of teachers of the Infant Education Degree of the *Universidad de Santiago de Compostela*. During the proposed PBL, university students had to collaboratively develop a didactic project that integrated tasks with digital technologies. The high satisfaction expressed by the students with the proposal, especially regarding the possibility of implementing the PBL in their visits to the practical schools, highlights the importance of active methodologies in the initial training of teachers concerning the development of digital teaching competence and transferability capacity.

6. CONCLUSION: A NEW APPROACH TO THE TRAINING AND DEVELOPMENT OF DIGITAL TEACHING COMPETENCE

In the present work, we have discussed the need not to remain in a mere instrumentalist vision of Digital Teaching Competence if we want to address the enormous challenges of educating in a world increasingly mediated by technology. We have a new opportunity to conceive this broader vision in the curricular developments of the new LOMLOE educational law, which indicates digital education as one of its transversal axes, but which, however, will only offer an elective subject in the first three courses of ESO for the development of digital competence, as stated in its article 24.

We consider it very important to give a more holistic approach to the teacher's digital praxis and help empower students with more critical and informed literacy, which prevents new forms of exclusion or psychosocial problems, with which we suggest that content and evaluation criteria that attend to these aspects be made explicit for all the curricular developments of the new educational law, so that what the LOMLOE states in its Fourth Final Provision is tangible: "The educational administrations must include in the development of the curriculum, the digital competence referred to in the previous section, as well as the elements related to situations of risk derived from the inadequate use of ICT, with special attention to situations of violence on the Internet".

It is essential to educate children and young people about the risks that may exist on the internet and help them carry out a responsible use of the devices and their presence on the Internet to avoid negative physical and/or psychological consequences for them. To achieve this, the initial and permanent training of teachers must be improved, but a deep reflection about our digital identity and how it influences our students is also necessary since we are models of behavior that students learn.

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Within area 6 of DigComEdu (development of students' digital competence), it seems a priority to us to train teachers so that they can fully develop the information and media literacy subsection, with indicators as important as "Critically analyze, compare, and evaluate the credibility and reliability of data sources, information, and digital content", or the sub-section of communication and digital communication, with indicators such as "Being aware of the rules of behavior and skills to function tactfully when using digital technologies and interacting in digital environments", "Adapting communication strategies to specific audiences and taking into account cultural and generational diversity in digital environments", or, lastly, "protecting one's reputation". We have many important challenges ahead of us, including fostering critical thinking in our students in virtual environments and strengthening their self-image and self-esteem.

The FAD report *ICTs and their influence on the socialization of adolescents* (Ballesteros and Picazo, 2019) showed that skills related to the design and creation of content, but above all with Internet safety and proper use of devices, were the least relevant in the teaching of the centers. According to the interviewed adolescents, knowledge about how to protect personal data on the Internet was only taught in 30.5% of schools, while the development of critical thinking about the information found on the Internet fell to 22.5%, and the use of devices such as tablets and smartphones was limited to 18.6%. In the coming years, it seems urgent to us to raise these percentages, if we do not want to face an increase in the problems that we have discussed in this article.

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