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Research Article

Beyond functionality: Building critical digital teaching competence among future primary education teachers

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ABSTRACT

Digital literacy has moved away from its traditional instrumental conception, to be nourished by critical perspectives that have been increasingly adopted in all areas of the analysis of technology and education. The importance of generating educational models that contribute to the emancipation of people in a post-digital and highly complex world is an increasingly evident challenge. However, it is still difficult to find concrete examples of pedagogical strategies specifically devised to foster digital literacy in line with this much needed emerging critical lens. This paper presents a case study of a set of learning experiences integrated into a compulsory module for students in the 1st year of a degree in education sciences, which leads to the qualification required to teach at primary schools in Spain. The results highlight the importance of providing students with learning opportunities conceived to help them become future teachers ready to have a transversal impact on education for the emancipation of people in the post-digital world, rather than simply training them as operators who use technology to enhance skills.

Keywords: digital literacy, digital competence, teachers' education, critical digital literacy, digital education

INTRODUCTION

In a society where the pervasiveness of information and communication technologies (ICTs) has been catalyzed by a global pandemic, the word 'digital' has ceased to be a meaningful qualifier. Most, if not all, realms of everyday life are somehow infused by the production, storage, and circulation of bits, meaning that prefixes such as 'digital', 'cyber' or 'e-' have become increasingly redundant. In less than twenty years, perspectives on the educational uses of technology have transcended the classic visions of the three paradigms (Pavlik, 2015), as defined by dimensions such as interactivity, media uses or direction. In this complex scenario it is more important than ever to ideate and embrace approaches that are socially engaged, holistic and ethical and take education beyond the pedagogy-technology dichotomy (Fawns, 2022).

Looking at technology through a critical lens is no longer a possibility, but a necessity for our educational systems (Marín & Castañeda, 2022). Our concerns regarding education have become more profound and digital literacy has gone from being understood primarily as mere instrumental training to being increasingly recognized as a key to the social emancipation of citizens (Solmaz, 2018). While critical digital competence and pedagogies are increasingly present in both the academic literature and the policy making arena, it is still

difficult to find them deeply embedded into the day-to-day of educators' professional practice and the overall fabric of educational institutions (Sendag et al., 2015).

Bringing critical approaches to educational technology at all levels of education is essential, for instance by fostering among students a socially engaged perspective of post-digital living (Facer & Selwyn, 2021; Pangrazio et al., 2020). Exploring and understanding the impact of these implementations, especially in the context of both pre- and in-service training for educators, should be a priority.

The main objective of this paper is to highlight the relevance of supporting future educators in the development of critical digital teaching competence, with a special focus on the ethical and social responsibilities of being a teacher in a post-digital society. In this regard, it is key to foster pedagogical approaches that prioritize the well-being of students, for instance regarding data protection, and commit to a critical evaluation of technologies before being integrated into teaching and learning processes. For this purpose, we have conducted a case study looking at a set of learning experiences designed to foster critical engagement with educational technology among future primary school teachers. The experiences are embedded into the curriculum of a mandatory module and aim to help students to critically reflect on the use of digital technologies for educational purposes, guiding them through the process of evaluating tools with criteria that go well beyond functional or purely instrumental aspects.

The experiences are presented in a sequential way to explore the teaching perspectives as they unfolded, as well as the students' reactions and outputs. We propose this pedagogical approach as a model of "good practice that encourages students to adopt a similar approach in their professional development and to develop their respect for individual privacy" (Loftus & Madden, 2020, p. 459).

BACKGROUND

Fostering criticalness is increasingly recognized as essential at a time that can be described as post-digital (Selwyn & Jandrić, 2020) in which the socio-technical media landscape is characterized by datafication processes that permeate all aspects of everyday life, to the extent of operating as the defining element of the political economy of a global system often referred to as informational (Cohen, 2019), surveillance (Zuboff, 2019), or platform (Srnicek, 2017) capitalism.

In this environment, education–on its wider understanding beyond the school boundaries–maintains its relevance for socialization and employability, but the need of reinforcing its emancipatory approach–the one that subjectifies the person (Biesta et al., 2015)–does not always attract the level of attention it deserves in an increasingly datafied society. The pedagogy of the *digitally oppressed* is understood as "an interest in using methods of good teaching and learning (pedagogy) to raise critical consciousness about something" (Markham, 2019, p. 755). In this case that 'something' is the social, political, and ethical implications of computerization and datafication; which constitutes an emergent and unavoidable need for the present and future of education.

Digital (media and information) literacy has emerged as a polyhedric–and arguably rather fragmented–field that draws on various scholarly traditions, schools of thought, and disciplines (e.g., information sciences, media studies, and education). A testament to that diversity is the high number of labels and terms that have emerged over the years. Words such as 'digital', 'media', 'information' or 'data' are among the most widely used terms to describe the subject, while the kind of knowledge or expertise to be fostered is referred to by means of an even wider range of terms, including 'literacy', 'literacies', 'fluency', 'competence', 'competencies', 'capabilities' or 'skills', just to mention a few of the most popular labels. Each possible combination of words comes with both implicit and explicit assumptions about what needs to be learnt and the very nature of the expertise to be developed, and also mirrors the important differences regarding how digital literacy and other related concepts are approached across diverse cultural and language contexts (Pangrazio et al., 2020).

We approach digital literacy as "a notion of situated multiple integrated skills and practices (conceptual, attitudinal, procedural, and ethical) that empower people (individuals and teams) to participate and communicate efficiently in society" (Marín & Castañeda, 2022, p. 4). As such, it encompasses the kind of awareness and development needed for emancipation in this post-digital environment where the digital transformation is having a direct impact on the individual and cultural wellbeing (Markham, 2020).

Adding the adjective 'critical' to the mix highlights the need to interrogate both what we encounter when interacting with the media landscape and what we throw ourselves into that ecology. It ultimately implies that in order to be able to act as emancipated subjects and fully engaged citizens in post-digital societies (beyond the national boundaries of this concept), we need to ask questions about the social, political, and ethical implications of the design and use of ICTs.

The ability to critically assess content and sources to determine their credibility and identify potential biases has been a long-term concern of media and information literacy scholarship and practice, predating the rise of the internet. Instead of losing relevance throughout the transition from a media landscape dominated by mass media to the networked ecosystem that started to unfold during the last decade of the 20th Century, criticalness has gained even more prominence due to the currently endemic levels of disinformation, misinformation, and malinformation (Wardle & Derakhshan, 2017). Pangrazio (2016) contrasts such a long-established notion of 'critical digital literacy' built around critical consumption with a more recent turn towards 'digital design literacy' that focuses on the production of digital forms.

However, in addition to critical engagement with content–whether it is as producers or consumers–, critical (post-)digital media and information literacies require, more than ever, to pay attention to ICT infrastructures and the extent to which we have control over them (Villar-Onrubia & Marín, 2022). As pointed out by Wood and Monahan (2019), infrastructures operate as both enablers to certain practices and deterrent to others, meaning that far from being neutral political actors they favor some worldviews, interests, and social groups over others. They can take the form of material elements like roads, bridges, pipes, servers, cables, and other types of hardware, but also intangible creations such as algorithms and tracking technologies that actively shape, the same or even in more profound ways, life in post-digital societies. Being a critical subject in any sustained way requires a profound understanding of the contexts within which digitalization or datafication is occurring (Markham, 2020).

Digital literacy has evolved in the last two decades from a traditional instrumental approach to more complex conceptions (Marín & Castañeda, 2022), and criticalness has also permeated policy-making agendas internationally. For instance, according to the key competences for lifelong learning recommendation adopted by the Council of the European Union, digital competence requires individuals to "take a critical approach to the validity, reliability and impact of information and data" (European Union, 2019). It also calls for awareness of legal and ethical principles, as well as for adopting a reflective and critical attitude to the evolution of digital technologies and content. The meaning of criticalness in that context is further elaborated in the European Commission's digital competence framework for citizens, mainly in relation to evaluating data, information, and digital content, but also regarding attitudes towards artificial intelligence that involve identifying opportunities while weighing risks for privacy and safety (Vuorikari et al., 2022).

Nevertheless, transforming that vision into tangible ways of reshaping education is not a simple endeavor. Calls to "criticize misuse, inappropriate use, over-inflated claims, and exclusions and oppressions involved in the introduction of ICTs into education" (Kahn & Kellner, 2005, p. 246), to debunk myths (Friesen, 2008) or even to distrust educational technology (Selwyn, 2013) are clearly not new. However, for a long time these have been just minority voices within a field largely captivated by the idea that digital tools enhance teaching and learning (Bayne, 2015) almost by magic or, even further, that technology can easily "fix" all educational problems as a kind of silver bullet.

Key stakeholders in the educational arena, including policymakers and institutional leaders, are under mounting pressure to treat technology as "the" way of overcoming large-scale problems. After all, promises involving relatively simple solutions to highly complex and multidimensional problems are enticing to many people, as customers and the electorate, and the fast-growing multimillion-dollar edtech industry is pushing to sell their products (marketed indeed as solutions) in a context of increasing commercialization and privatization that has been accelerated by the COVID-19 pandemic (Williamson & Hogan, 2020).

The social role of educators as catalysts of change and agents of critical development has been conscientiously eroded over the last forty years, as they have been repositioned as mere operators in the service of predefined market standards (Rudd & Goodson, 2016). Teaching is too often approached as a technical skill, based solely on psychological and pedagogical procedures, but ideally devoid of aesthetic or moral dimensions and ostensibly detached from social engagement (Martínez Bonafé, 2001), as well as from

familiar or community links (Cochran-Smith et al., 2014; Zeichner et al., 2016); indifferent to what Castañeda (2021) was called "the social commitment" by Castañeda et al. (2021).

This bare-bones technical conception of the teachers' role is clearly reflected in how the 'new' teacher's competences for the digital world have traditionally been understood. A systematic literature review looking at articles on educators' digital competence, published between 2008 and 2018 regarding, identified three distinct ways of understanding digital competence in that context:

1. Technological knowledge and skills that are not specific to the teaching profession,
2. The ability to integrate ICTs into teaching and teach students as they use technology in their learning, and
3. Professional digital competence beyond pedagogical aspects, such as communication or administrative tasks (Starkey, 2020).

Moreover, several frameworks have been created with the aim of identifying the specific knowledge, skills, and attitudes that all educators should have in order to be able to integrate ICTs effectively and appropriately into their practice, such as the UNESCO ICT competency framework for teacher (2018) or the European framework for the digital competence of educators (Redecker, 2017). However, the critical dimension of teachers' digital competence is only addressed by a minority of those frameworks, while clearly ignored–when not avoided–by many teachers around the world (Castañeda et al., 2021).

As stated by Facer and Selwyn (2021) after reviewing key lessons learnt over the last four decades: "it is no longer acceptable to turn to education technology naïvely and without recognition of the mixed outcomes of the past" (p. 10). In the context of post-digital societies, for educators to be able to introduce ICTs effectively and ethically into their practice (i.e., to plan and deliver networked learning experiences), it is essential that they adopt a critical perspective not only on the pedagogical value of technologies but also on a much wider range of implications and consequences (Fawns, 2022; Sendag et al., 2015). The critical digital perspective must cut across the teaching profession and, while it must incorporate a particular sensitivity to the use of technology for social engagement and the expanding educational relationships beyond purely physical environments, it must also involve a critical view of technologies and their impact on pedagogical methodologies, tasks, environments, and the relationships established inside and outside the classroom (Castañeda et al., 2021).

Therefore, those 'additional aspects' of data literacy–those related to being empowered to adopt critical perspectives–encompass the ethical and responsible use of data, including appropriate considerations of the privacy of students (Gummer & Mandinach, 2015). These should be key concerns to anyone in the teaching profession, as well as managers and administrators, and must be reflected on teacher training. This article presents a case study on a series of learning experiences conceived to foster a critical perspective on technology use among future primary education teachers at the beginning of their degree.

CASE STUDY

This article looks at a set of educational experiences designed with the aim of fostering critical engagement with educational technology among first year university students, namely a cohort enrolled in a degree that leads to the qualification required to teach at primary education schools in Spain. Firstly, these experiences invite students to critically reflect on the socio-technical environment that surrounds them (e.g., how complex it is, how they adopt certain tools into their practice, and who influences the configuration of that environment). Secondly, they highlight the importance for them to, as future teachers, make informed decisions regarding the use of digital technologies for educational purposes; by taking into consideration not only pedagogical and purely technical aspects but also the social, political, economic, and ethical implications of technology.

Following the example of similar case studies (Eltahir, 2019; Mierzwa & Mierzwa, 2020), the research aims to capture the complexity of teaching and learning experiences (Mills et al., 2009), focusing on their potential to transform the way students approach educational technologies and adopt them (Scholz & Tietje, 2001). Rather than following a classic research report structure, we present the findings in a dynamic way that walks the reader through the step-by-step procedure.

These learning experiences were planned as tasks embedded into the curriculum of a pre-service teacher training module in a Spanish university, titled "educational resources and ICT for primary school". The module is part of the initial training of primary education teachers and is delivered on campus, in English as the language of instruction, for students in the first year of the degree. It is worth six credits (following the criteria of the European credit transfer system) and the estimated student workload is 150 hours.

The course is delivered by a female lecturer with more than 15 years of teaching experience in higher education (HE), without any teaching assistants involved. It runs over 12 weeks (five hours per week) in the Spring term. In the academic year 2021-22, when the analyzed learning experiences took place, the module had 47 students enrolled: 33 women (70.21%) and 14 men (29.79%). The class was split into eight teams, with members of each team working together to complete 11 weekly tasks.

It is a mandatory introductory module specifically designed to help students become digitally competent teachers. Nevertheless, bearing in mind that those competencies cannot be developed in a finalist way, it is vital to be aware that the goal of this course is

> "to offer students information tools, learning strategies and cognitive mechanisms that allow them to start developing their teaching competence for the digital world and continue developing it autonomously or guided–according to their needs–throughout their professional performance."

More specifically, the module covers the following competencies:

1. To know the communicative characteristics of the media and resources in the teaching-learning processes, as well as their implementation processes.
2. A critical attitude towards the use of audiovisual media and new screens in the teaching-learning processes.
3. Habits of continuous training in teachers and attitudes of inquiry in the use of educational resources.
4. To know the processes of interaction and communication in the classroom.
5. To reflect the conditions of integration of ICT in the field of primary education, as well as on the conditions of applicability of new resources and didactic strategies.
6. Reflect and question teaching behavior and encourage habits of continuous training through research and innovation activities and the use of ICTs.

In particular, the research presented in this article examines learning experiences emerging from task number 5: "evaluating technologies for teaching". In this task, students start to explore some of the general aspects that teachers must consider when planning the adoption of technologies for educational purposes. The main aim of the task is to enable future primary school teachers to critically reflect on the complex socio-technical ecosystem they mobilize for the completion of academic tasks and coursework. In this regard, the task highlights the importance of critically evaluating technology use in order to inform professional decisions that enhance their pedagogical and educational environments. Therefore, the task is directly concerned with competencies 1, 2, 5, and 6 of the module.

THE EDUCATIONAL EXPERIENCE

The whole experience is structured in various stages and tasks, some of them designed to be completed in-class–by teams working independently or in plenary–and others outside the classroom, working in teams. Detailed instructions were uploaded to the university's learning management system (LMS) two days before the first on-campus session, and the complete activity was completed in a period of 10 days from that moment, including four face-to-face sessions on campus: three of them of one hour and the remaining one lasting two hours.

1st Stage (Session 1): Exploring the Technological Ecosystem of the Module

After explaining the general objectives of the task students start exploring independently the safety and level of control they have over the socio-technical ecosystem they use in the module. In order to do so, first of all, they had to identify at least one element of their ecosystem. Then, each team had to identify:

Table 1. Tools identified most often as key from those required for the module

Tool	n	Example of description
Instagram	5	"*Post the results of our tasks and the process of it during the class. There we can also see our classmates work so that we can take ideas from them*" (team 3).
Aula Virtual	4	"*The Aula Virtual is a tool that represents a class but in a virtual way*" (team 8).
Padlet	3	*"We upload our projects and sometimes make lists to organize everything"* (team 4).

Note. n: Number of teams using the tool

Table 2. Tools identified most often as key from those already in use by team members

Tool	n	Example of description
Instagram	5	*"We created an account for the team in order to upload content related to the activities we develop every week and post the pictures and the different materials in #RICT2122 apart from using it too in order to show the rest of the class the daily work and the work in class by using the stories section*" (team 5).
Google Drive	4	"*We share every task with every member of the team by using Google Drive because it makes us do the tasks in real-time and it ables us to work on them at the same time and all together. We have worked in here because it also saves our works instantly and we are always ready to work on it*" (team 8 referring to Google Sites).
Google Doc	4	*"everyone can work at any time from home, read what the other members wrote and complete the task*" (team 6 regarding Google Docs).

Note. n: Number of teams using the tool

1. Three main tools that the teacher required them to use, in a compulsory way, for the completion of module tasks.
2. Three main tools they discovered on their own during the module and which they decided by themselves to use when completing the tasks.
3. Three main tools they were already using before starting the module and which they integrated into the team work to complete the tasks.

Students had to reflect on the name of each tool and the practices enabled by it. Moreover, they had to determine how comfortable they felt when using each of the groups of tools and whether they found them useful or not. We used an online questionnaire to collect these reflections.

Among the key tools nominated by teams from those they had been required to use in the module compulsorily, Instagram was the most popular, mentioned by five teams as a platform they used to post content and share ideas. Four teams mentioned Aula Virtual, the LMS of the university, as a place to find the tasks' instructions, and as a virtual representation of the class. Four teams mentioned Blogger for the creation of an online portfolio for the module, while other teams chose Wix or Google site for that purpose. Three teams identified Padlet as the tool of choice for sharing their coursework for the module.

Table 1 includes the most popular tools, indicating the number of teams making use of them and examples of descriptions by some of the teams.

As for those tools discovered and freely chosen by students while completing the tasks for the module, the only tool mentioned by five teams was Miro, which is used to do diagrams, conceptual maps, and presentations. The QR-Code Generator was mentioned by two members of two teams.

Regarding the tools freely chosen by team members from those they were already using before the start of the module, it is worth noting that all teams mentioned Google products as the basis for creating collaborative documents. Namely four teams mentioned Google Docs and four mentioned Google Drive. Canvas was also a tool mentioned in this category by five teams, while two teams mentioned Instagram and two others mentioned WhatsApp (**Table 2**).

As shown by **Figure 1**, Google products feature prominently across the three sets of tools. Along with Instagram, they were the only platforms already in use that were also part of the selection of mandatory tools for the module.

All the teams said to feel comfortable using the whole range of tools. In the case of mandatory tools, they reported that those tools helped them to organize their work ("all the tools were useful and make our work easier", team 1) and that they felt inspired by their peers ("we really feel very inspired with what our classmates upload on their Instagram and we get some ideas from them" team 4), being able to imagine other ways of

Figure 1. Comparison of mandatory, discovered and already in use tools mentioned by students as key (Source: Authors)

presenting information ("These apps, make us organize the work properly in order to classify the contents we work on and they make us learn about technology and several ways to complete the activities", team 5).

As for 'new' tools discovered by teams themselves in the context of the module, most of them mentioned the usefulness of those tools as a key factor for feeling comfortable using them:

> "At the very beginning, it seemed a bit strange to us to use them because we were not into them, and we were reluctant to use them. However, after using them, we gradually start enjoying them, and, furthermore, seeing them as useful yet important tools" (team 6).

Teams stressed the importance of working with tools they were already familiar with, especially for solving big tasks:

> "As all of these tools were already known by the team members it was easier for us to organize ourselves in order to do the tasks correctly, due to the fact that we did not need to waste any time in learning how to use these instruments" (team 7).

2nd Stage (Session 2): Evaluating the Tools

After answering questions in class, they had to evaluate each of the tools following a twofold process:

1. First, they had to use the *rubric for eLearning tool evaluation* (Ansley & Watson, 2018).
2. Second, they had to check the reports on all the tools evaluated by the common sense privacy program[1].

The rubric consists of a set of indicators aimed at helping educators evaluate tools they intend to use for teaching and learning, according to nine categories:

1. Functionality, which includes four elements: Scale, ease of use, tech/support/help availability, and hypermediality.
2. Accessibility: Standards, user-focused participation, required equipment, and cost of use.
3. Technical: Integration/embedding within an LMS, desktop/laptop operating system, browser, and additional downloads.
4. Mobile design: Access, functionality, and off-line access.
5. Privacy, data protection, and rights: Sign-in/ sing-up, data privacy, and data ownership.
6. Archiving, saving, and exporting data.
7. Social presence: Collaboration, user accountability, and diffusion.

[1] https://privacy.commonsense.org/

Figure 2. On-campus session number 3: Team's discussion (Source: Authors)

8. Teaching presence: Facilitation, customization, and learning analytics.
9. Cognitive presence: Enhancement of cognitive task(s), higher order thinking, and metacognitive engagement.

Teams had to evaluate each of the tools by rating them for each of the above dimensions as

(a) works well,

(b) minor concerns,

(c) major concerns, or

(d) not applicable.

This evaluation was conducted by teams in an independent way during the second session (one hour) on campus. Once completed, the teams had to submit the rubric using an online form. Interestingly enough, there were considerable discrepancies across the evaluations conducted by the different teams. While the results of the evaluation are not relevant to the aim of the research, the task itself represents an interesting exploration that is worth reporting as contextual information for the case study.

3rd Stage (Session 3): Discussing the Evaluation Process

At the third session on campus (two hours), students started by discussing with members of their own teams (**Figure 2**) the evaluation process they undertook during the previous stage.

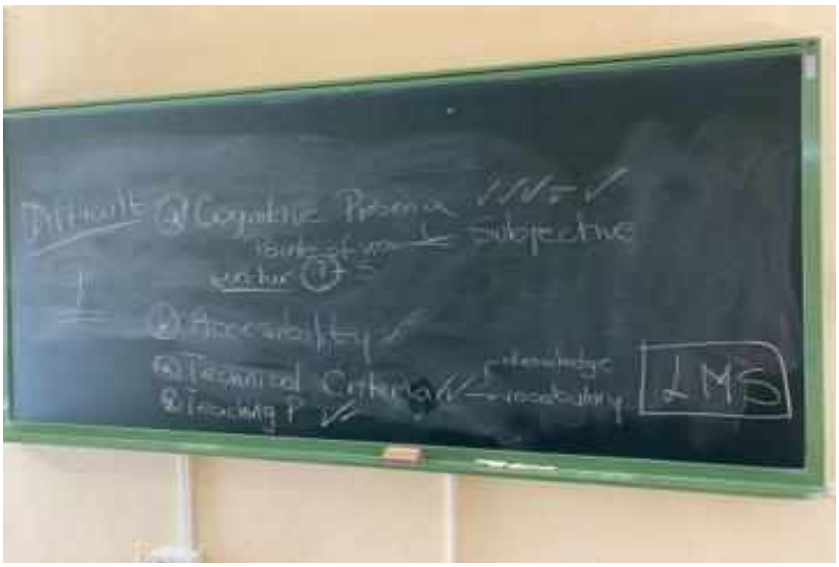

Figure 3. On-campus session number 3: Key points share in the plenary discussion-1 (Source: Authors)

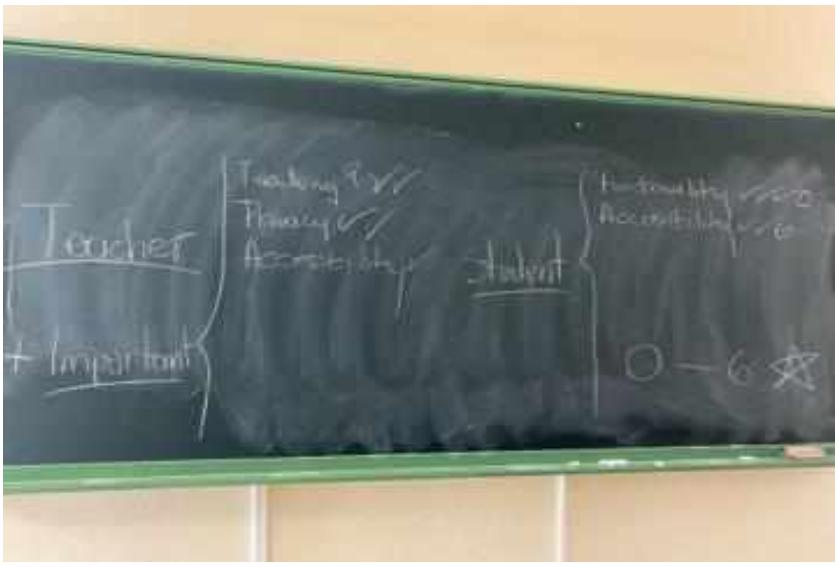

Figure 4. On-campus session number 3: Key points share in the plenary discussion-2 (Source: Authors)

After the intra-team discussion, each of the teams had to present key conclusions in plenary. The professor synthesized the plenary discussion on a blackboard (**Figure 3** and **Figure 4**).

First, each team had to determine which criteria from the rubric had been the most difficult to assess for them, explaining why that was the case. Most teams (seven) agreed on the difficulty of evaluating the 'cognitive presence of tools', as they regarded it as a very subjective category. Some groups (three) highlighted how difficult it was to evaluate the tools regarding 'technical criteria' due to their perceived lack of technical knowledge and vocabulary. Two teams stressed the difficulty of evaluating 'accessibility', and two others identified the 'teaching presence' category as the most difficult to evaluate.

After that initial question, teams had to name their most important criteria, both as future teachers and current students (**Figure 5**).

Figure 5. On-campus session number 3: Slides to introduce the questions for intra-team reflections (Source: Authors)

Figure 6. On-campus session number 4: Students sharing their mechanisms to rate tools on the blackboard (Source: Authors)

From the teachers' point of view, the most important categories were 'teaching presence' and 'privacy' (selected by three teams), while two others remarked 'accessibility' as the most important criteria. Regarding the students' point of view, four teams considered 'functionality' as the essential criterion, while three identified 'accessibility' as the most relevant. One of the teams could not agree on any single aspect and determined that those two criteria were equally important.

They also had to reflect upon the most surprising aspects of the entire evaluation process. Two of the teams indicated that they were shocked when they could not find some of the tools on the common sense privacy program website, as well as after realizing that some of the tools got shallow scores.

Two of the teams highlighted that the tasks had enabled them to discover, for the first time, how to analyze the extent to which digital tools respect privacy, making them realize the importance of this for their future students. Two other teams stated that they had learnt to find differences regarding the use of tools from different devices (i.e., mobile vs. desktop). It is worth noting that six out of the eight teams were surprised at realizing for the first time that some tools could not work offline, but they do not regard that issue as problematic because they reported being always online.

4th Stage (Sessions 3 and 4): Building Scale

During the last part of session 3, after the plenary discussion, teams had to devise a mechanism to transform the results of the rubrics into a six-star scale, determining the suitability of each tool for use in educational contexts. Each team had the freedom to group and prioritize categories according to their preference, but they were required to justify their choices.

At the following session (one hour), all teams presented their mechanism in plenary, using a blackboard to summarize critical points (**Figure 6**).

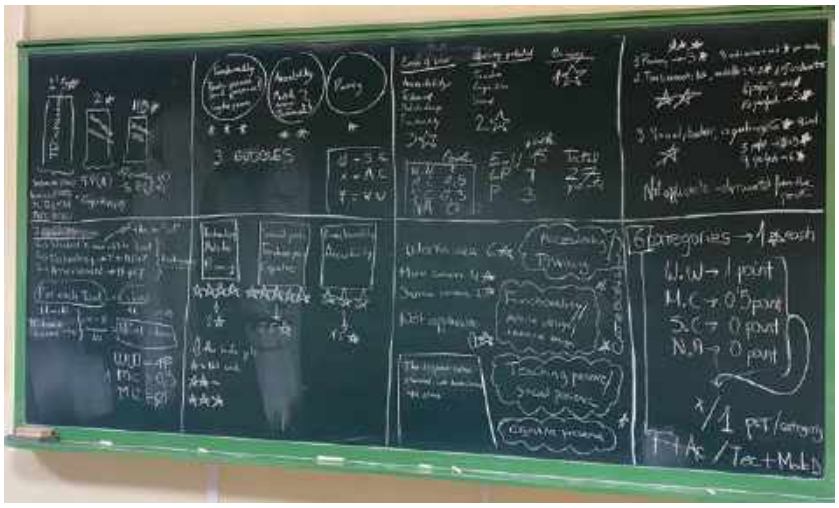

Figure 7. On-campus session number 4: Teams' mechanisms to rate tools (Source: Authors)

After sharing the key aspects of each of the rating mechanisms, the students and the professor reflected upon the challenges of rating tools for teaching efficiently, how those mechanisms could be useful in real schools, and how each mechanism mirrors values and beliefs about teaching, learning and education from each one of the team members (**Figure 7**).

Reflective Accounts

After completing each of the tasks, the teams were required to use an ePortfolio to share their reflections upon the learning experience along with outputs of their work. The ePortfolios had to be created as open (i.e., publicly available) blogs built using an online tool of their choice.

The reflections reveal that before participating in this learning experience students had an overall more naive or uncritical approach to digital technologies, meaning that their choices were primarily driven by their own convenience and ease of use while ignoring other important implications. As put by two of the teams:

> "The best part of the week has been realizing that perhaps something that seems simple at first glance, like choosing a digital tool, may not be so, since many things should be taken into account in order to choose it" (team 1).

> "Perhaps when people choose any tool, whether in the school environment or not, we only look at its functionality, that is, we look at whether it is easy to use, and we do not value thousands of other aspects that may be of crucial importance" (team 5).

Indeed, until completing the tasks they were largely unaware of some of the most problematic issues that might result from using technology, for educational purposes and beyond. A key realization for all the teams was that, as future teachers, they will have an important responsibility and duty of care towards their students. This will require them to critically evaluate technologies before being adopted into teaching and learning processes:

> "We have learned together the importance of technology in the classroom and how it directly or indirectly affects students. Before, we were not aware of all that it entails and some aspects we had not thought about." (team 4).

> "We had not thought about how complex technology is and more if we use it at school with our future students. In our opinion, we do not take the tools we use in serious way. We use them without thinking about the consequences or what is behind them. In consequence, we might damage children, so before they use an app, we should evaluate it in order to make it safer and productive for them" (team 7).

Apart from concerns relating to privacy and data protection, another key issue that emerged as an important consideration that needs to be looked at when choosing digital tools was accessibility:

> "This week's activity has helped us to think twice before using applications, as much as due to the fact of the bad conditions of privacy and cookies that some applications have, as well as the accessibility, which we did not take into account, but it is a crucial aspect when applying it in a class" (team 1).

Beyond gaining awareness of particular aspects of technology that–both as current students and future teachers–will need to carefully address before adopting tools into their practice, another important insight captured in the ePortfolios is that the tasks provided a valuable opportunity to learn how to evaluate technologies. While at the beginning the process felt challenging to some, indeed team 8 recognized being "overwhelmed" because they did not fully grasp some aspects of the rubric, in general, they appreciated the importance of using a systematic approach to inform educational technology decisions.

> "In this task, we have discovered aspects that we never thought could be used when introducing technologies in class or, perhaps we thought about them but never fell into creating a method to decide which technological applications to use and which not until this week" (team 1).

In addition to using ready-made resources, they also had to create their own mechanism to rate technologies and determine their suitability in educational contexts. While this aspect was certainly challenging, it was also deemed rewarding.

> "The best part of the activity was undoubtedly when we had to face the challenge of creating an evaluation method for the tools we added in the task, it was a great challenge for us and we were delighted to face it, perhaps because it motivated us as it was not an easy task" (team 6).

DISCUSSION AND CONCLUSIONS

Criticalness is increasingly gaining ground as a necessity in the field of digital literacies and digital education (Decuypere et al., 2021; Fotopoulou, 2021; Gouseti et al., 2021; Pangrazio, 2016). Beyond the academic literature, this is also starting to be present in policymaking efforts such as the *Digital Education Action Plan 2021-2027*:

> A sound understanding of digital information, including personal data, is vital to navigate a world increasingly infused with algorithms. Education should more actively help learners to develop the ability to critically approach, filter and assess information, notably to identify disinformation and to manage overload of information as well as develop financial literacy. Education and training institutions can help build resilience to information overload and disinformation, which becomes more widespread in times of crisis and major societal upheaval. Countering disinformation and harmful speech through education and training is crucial for effective participation in society and democratic processes, especially by young people (European Union, 2019, p. 12).

Nevertheless, despite the growing attention to critical approaches in relation to the use of ICTs in education and other realms of life in contemporary societies, most of the discussion still remains at the level of principles (Marín & Salinas, 2022). In this regard, there is a need for more accounts by educators exemplifying how those principles can be operationalized in practice (Biesta et al., 2020; Tondeur et al., 2017). This article addresses that gap in the literature by presenting a case study on a set of learning experiences embedded into a mandatory module for 1st year students enrolled in an undergraduate degree in educational sciences leading to the qualifications required to teach at primary schools in Spain.

The main objective of this paper was to capture and present the complexity of these teaching and learning experiences, highlighting their potential to transform the way students approach educational technologies.

The paper presents a complex approach that includes qualitative and quantitative analysis made by the participants (the professor and the students) on how to critically appraise educational technologies to be used

in the classroom. This is relevant to the analysis of educational practices in HE (Kimmons, 2022), while in this precise case it also offers a way for the students that actively engage (Rambe, 2017), to understand the complexity of those implementations in their future educational scenarios where they are going to be the teachers (Gummer & Mandinach, 2015).

The focus on technology use in the context of teaching-learning activities that go beyond institutional spaces (Scott et al., 2016) enhanced the opportunities for participants to understand the role of educational spaces (Yeoman, 2018). The educational space included tools that the institution, or the teacher, embedded into teaching practices, as well as additional tools–suggested in each task or selected by students. It is important to acknowledge that such tools were complemented by the physical conditions they are used into (Gourlay, 2021).

The experience analyzed in this paper highlights the complexity and difficulty of evaluating the implementation of technologies in educational contexts (Castañeda, 2021; Sadler, 2010). This is illustrated by the exploration of the applied rubric (Ansley & Watson, 2018), which includes many categories that must be considered and is reinforced by the difficulty on creating a mechanism to globally evaluate the tools.

The debates built around the different tasks show us many interesting reflections, revealed as valuable learning opportunities for students (Ramsden, 2003). The reflections about cognitive presence and teaching presence were unusual for students (Raes, 2022), but those reflections around accessibility or privacy were considered by them as some of the most interesting and enlightening. This approach makes those reflections go beyond the theoretical approach and become part of a relevant reality regarding students (for themselves, as students, and for their future students).

Overall, the teams considered that having to evaluate technologies systematically and critically by means of the proposed instruments and resources (e.g., a ready-made rubric), as well as creating their own rating mechanisms, enabled them to have a wider perspective on ICTs beyond functional aspects (Fawns, 2022). More specifically, the learning experiences reported in this paper empowered students to recognize a diverse range of implications around the use of technologies for educational purposes, such as the potential impact of digital tools on students' privacy and wellbeing or accessibility limitations (Komljenovic, 2020; Livingstone et al., 2020).

The reflections shared by students stressed the importance of introducing approaches like this one into the education of future teachers (Marín et al., 2021). Dynamics that integrate debates with theoretical approaches are positively regarded by students and emerge as powerful opportunities to facilitate deep reflection, remarking the importance of student engagement beyond the classroom (Laurillard, 2012). These dynamics open spaces for teacher and students' agency that enrich the approaches and contribute to the professional development (Albion & Tondeur, 2018).

In particular, the module under analysis provided students who aspire to become teachers with an opportunity to learn how to critically evaluate digital tools and inform their decisions before being adopted in primary education contexts. The article presents each of the tasks that students were required to complete and summarizes key points from the reflective accounts that all teams had to post on their respective ePortfolios, highlighting the importance of reinforcing students' self-regulation and emancipation (Barak et al., 2016; Dabbagh & Kitsantas, 2013). It represents a way to dynamically prompt students to reflect as (future) teachers and give them tools and strategies to continue doing those reflections–about the same or other topics–once they become teachers. In order words, it helps them to develop their tools and strategies for their personal learning environment as teachers (Korhonen et al., 2019).

Even though the case study focuses on a single cohort of students at just one single university in Spain, both the findings and the proposed approach can be valuable to educators at other HE institutions–in that country and beyond–who aim to foster critical digital teaching competence among future primary school teachers. This should help them overcome naive perspectives on technology and realize the ambition of creating a new professional that transversally contribute to the education for emancipating people in the post-digital world (Biesta, 2013; Castañeda et al., 2021), rather than just "producing" operators that use technologies for enhancing the learning.

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