





# Digital Literacy in Teacher Education: Transforming Pedagogy for the Modern Era

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**Abstract.** This chapter describes research developed in the Spanish educational framework in 2020, during the period of home confinement, which was carried out with the purpose of reducing the spread of the COVID-19 disease. The aim of this research is to find out about the use of Information and Communication Technologies (ICT) and two groups of digital technologies and the effects of this use. The tools analyzed were: i) six digital tools for communication and ii) nine digital tools for instructional design, in a group of 108 practicing teachers, aged between 23 and 65 years. They participated in this study by answering an online questionnaire called EDU-COVID [1]. Most of the teachers worked in public schools (69.4%), in several autonomous communities in Spain. The largest representation was from Castile and Leon (39.8%). These analyses revealed statistically significant differences in perceptions of the use of digital tools according to variables such as gender and type of school. Based on these findings, the study discusses and evaluates the educational suggestions of the new educational reforms aimed at digitizing teaching. The research provides information on the impact of digital technologies on teaching, assessing ongoing efforts to improve the quality of teachers' ICT instruction.

**Keywords:** Teachers · digital literacy · ICT · digital technology

## 1 Introduction

Current knowledge society and the evolution of Information and Communication Technologies (ICTs) have led to great advances in different spheres of action: social, cultural, and academic areas [2, 3].

On the one hand, previous studies have demonstrated that attitudes are an important predictor of the use of the digital tools [2–4]. On the other hand, other recent studies have signaled that the attitudes and beliefs of teaching faculty on the use of digital tools are a barrier to the integration of the same tools, due to the fear of change, the lack of training and personal use are presented as traditional obstacles to their integration in the teaching-learning process [1, 5–9].

Self-efficacy, which refers to the belief that a person has about their ability to perform a behavior successfully [10], is presented as an important determinant of the behavioral

intention of use, that is, there is reliable evidence that having a positive judgment about one's ability influences the acceptance of digital tools in teaching [11]. In fact, a recent study reveals that pre-service teachers with higher levels of internet self-efficacy and lower levels of anxiety are more likely to have higher levels of digital citizenship [12].

At the same time, the digital competence of teachers seems to be another of the predictors affecting the use of digital tools in the educational process.

In line with this, in the Spanish educational framework, a common reference framework for the diagnosis and optimization of teachers' digital competence was defined in 2017 through a detailed report prepared by the National Institute of Technology and Teacher Training [13] linked to the Ministry of Education, Culture and Sport (MECD) of the Spanish Government.

Furthermore, teachers are considered to have a high level of digital competence when they are not only able to use technologies to enrich their teaching strategies, but also to propose and develop innovative practices based on the possibilities offered by digital tools [14].

In recent years and in view of the exponential increase in the use of technologies in educational processes, there is a greater demand for digitally competent teachers and the need for new approaches when it comes to integrating technologies in education [15]. Thus, being able to integrate and use digital tools in the educational process implies having a set of generic skills and skills specific to the teaching profession itself [16].

In the spring of 2020, teaching faculty were obligated to use their digital skills and technological capabilities to comply with the educational, social and health requirements during the COVID-19 pandemic, suddenly becoming teachers 3.0 [2, 6].

For this reason, it is considered essential to examine the use of two groups of tools by active teachers in compulsory education in Spain: i) those that facilitate communication and ii) those that promote instructional design. Within the first group, we examine videoconferencing tools such as FaceTime, Skype, Microsoft Teams, Google Meet..., video viewing tools such as YouTube or Vimeo, synchronous communication applications (WhatsApp, Telegram...), social networks (Facebook, LinkedIn...), image sharing tools (Instagram, Flickr, Picassa...) and microblogging tools such as Twitter, Tumblr... And, within the second category, tools for editing content collaboratively (Google Tools, Microsoft 360...), survey tools (Google Forms...), recording tools (Camstudio...), tools for creating interactive content such as Canva, Genially..., tools for gamification (Google Tools, Microsoft 360...), tools for creating interactive content such as Canva, Genially... Those aimed at gamification such as Educaplay, Socrative..., those that facilitate video editing (Imovie, FinalCut...), those for blogging, wiki and those focused on programming such as Jommla, Scratch...

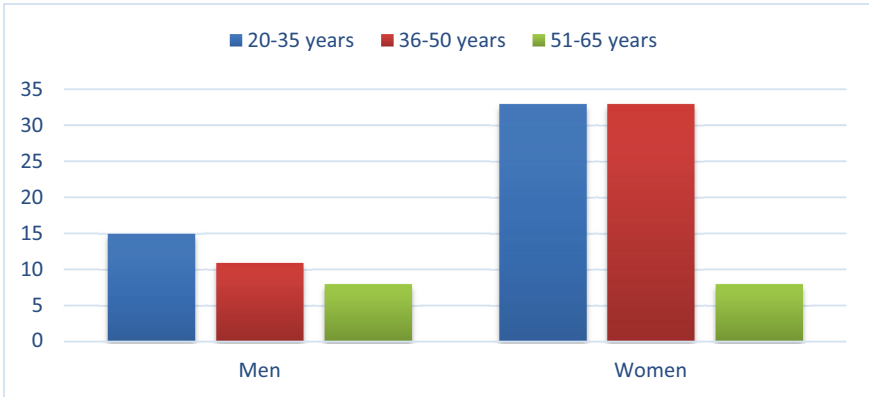
## 2 Method

### 2.1 Research Objective

The aim of this study is to examine the use of digital tools by active teachers of compulsory education in Spain, during the ninety-nine days of home confinement, as well as to know their assessments regarding said tools and their own use.

## 2.2 Participants

The participants of this study are 108 active teachers of compulsory education in Spain, between 23 and 65 years old (see Fig. 1). Of which, the majority carry out their teaching work in public educational centers (69.4%), not being career civil servants in most cases (66.7%).



**Fig. 1.** Description of participants

In the spring of 2020, data is collected from teachers in a total of several autonomous communities from Spain. Most of the teachers surveyed carry out their academic work in Castilla y León (39.8%). According to García-Martín and García-Sánchez, 2013 [5], the largest autonomous community in Spain and the third largest territory in the European Union. Also, this is the most typically Spanish, applicable, and representative region in Spain, and historically has a greater linguistic heritage (Castilian Spanish) and cultural tradition.

## 2.3 Design and Instrument

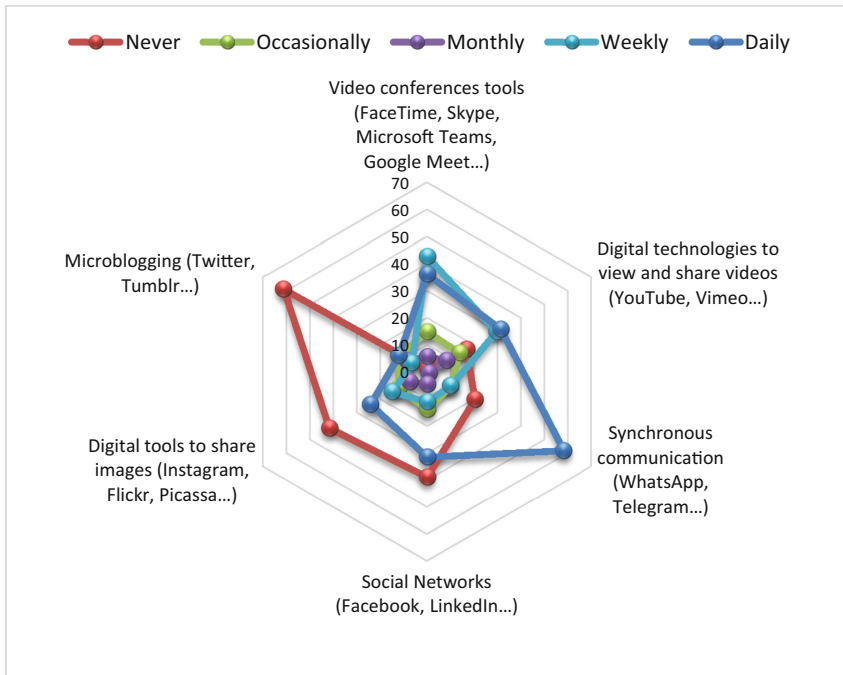
This study is based on a quantitative research design, supported by an exploratory descriptive and correlation approach in which the survey method is used through the design and application of an online questionnaire, the EDU-COVID [1] through the Google Forms web tool. The reliability of the instrument is acceptable ( $\alpha = .61$ ). This score may be due to the number of items, the number of response alternatives and the proportion of variance in the test.

### 3 Results

#### 3.1 Teachers' Perceptions About the Use of Digital Tools

##### For Communication

According to the use of six digital tools *for communication*, as can be seen in Fig. 2, the teachers use social networks daily (58,3%) and the video conferences tools such as FaceTime, Skype, Microsoft Teams, Google Meet (36,1%). However, only 12% of the participants use microblogging (Twitter, Tumblr...).



**Fig. 2.** Using of digital tools for communication

##### For Instructional Design

In relation to the use of nine digital tools for instructional design, as can be seen in Fig. 3, collaborative content editing tools such as documents, spreadsheets, Google, or Prezi presentations are the most used by teachers that have participated. However, less than 1% of participants use programming technologies like Jommla, Scratch...

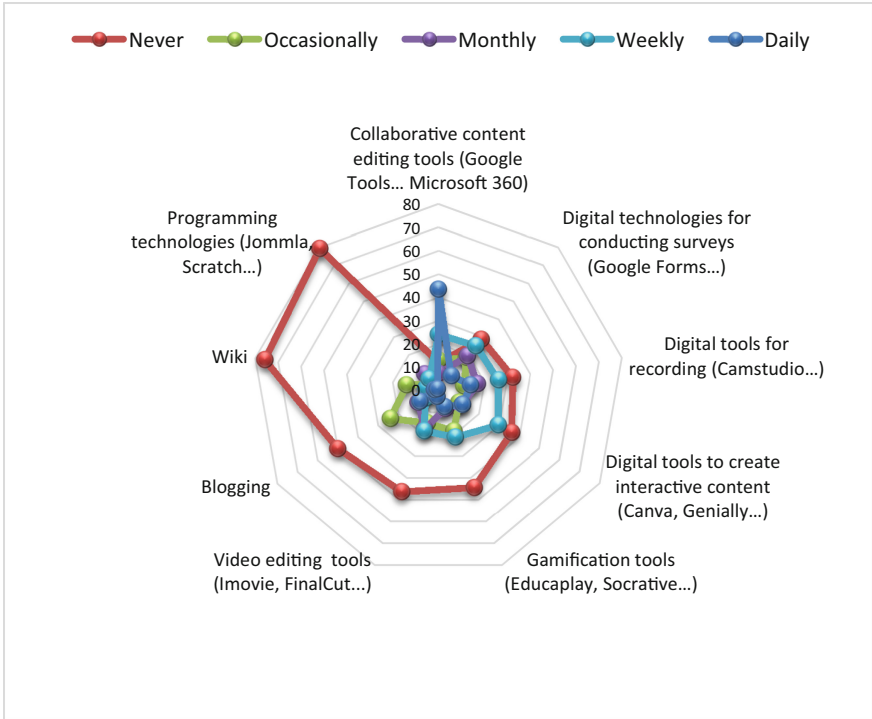


Fig. 3. Using of digital tools for instructional design

### 3.2 Patterns of Digital Tools Use Among Spanish Teachers

#### Sex

A pattern of differential use is obtained between male and female teachers in relation to virtual teaching platforms: Moodle, E-dixgal and Escholarium. Being significantly higher, in the case of male teachers [eg.  $M_{MoodleFemale} = 2.76$  vs.  $M_{MoodleFemale} = 2.15$ ;  $p = .009$ ]. At the same time, men use digital tools to a greater extent for collaborative content creation, while women use more gamification tools [eg.  $M_{GamificationFemale} = 2.36$  vs.  $M_{GamificationMale} = 2.12$ ;  $p = .026$ ].

In reference to the assessment of the tools and their own use during confinement, it is the women teachers who feel more satisfied. However, it is the men who claim to have made a deeper use. As well as the male teachers consider that the teaching developed during the exceptional state has guaranteed the achievement of objectives and the obtaining of learning results, to a greater extent, than the women.

#### Type of Center

In relation to the type of center (public or concerted), statistically significant differences are observed, with medium and large effect sizes, in the variables related to the use of Google Classroom [ $p = .019$ ,  $\eta^2 = .073$ ], of Escholarium [ $p = .028$ ,  $\eta^2 = .066$ ]; of digital tools or applications for the design of online surveys such as Google Forms,

Mentimeter and SurveyMonkey [ $p = .010, \eta^2 = .085$ ] and of digital tools or applications for programming such as Joomla and Scratch [ $p = .009, \eta^2 = .086$ ].

There is evidence of a pattern of differential use between teachers of public and concerted schools, to the benefit of teachers of concerted education, in various variables such as the use of Escholarium as a virtual teaching platform [ $M_{Public} = 1$  vs.  $M_{Concerted} = 1.08; p = .030$ ]; the use of digital tools or applications for conducting online surveys such as Google Forms, Mentimeter and SurveyMonkey [ $M_{Public} = 2.48$  vs.  $M_{Concerted} = 3.38; p = .016$ ] and the use of digital tools or programming applications such as Joomla and Scratch [ $M_{Public} = 1.27$  vs.  $M_{Concerted} = 1.92; p = .015$ ].

### 3.3 Teachers’ Perceptions About the Teaching Given During the Confinement

According to the evaluation of the teaching given by teachers during confinement, as can be seen in Fig. 4, the teachers consider that the most of them affirm that didn’t guaranteed the achievement of the objectives, the obtaining learning outcomes, the acquisition of skills and the assimilation of content.

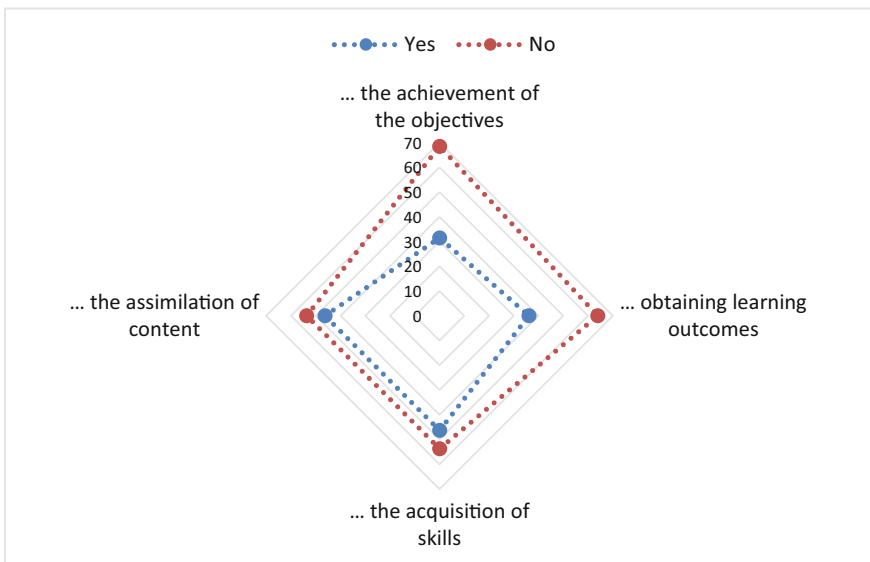


Fig. 4. Do you consider that the teaching given during confinement has guaranteed...?

## 4 Conclusions

Based on the stated objective and the results obtained, it is observed that the most used tools during the pandemic were the educational platforms, Moodle and Google Classroom, which may be due to the fact that part of the teachers surveyed exercised their professional work at higher education levels in which Moodle is the most used learning management system [17, 18]. Followed by the use of collaborative content editing tools between teachers, online surveys and audio and video recording.

All this can be understood by the need to evaluate or take exams online, as well as to develop masterful teaching sessions synchronously or asynchronously through audio and video recording [19]. In relation to the assessment of the use of digital tools, eight out of ten teachers are satisfied with their use, and more than 90% considered that it was relevant, necessary, and functional.

Finally, it is necessary to conclude that, in recent years, in educational contexts, improvements in teaching have been related to the use of technology in the classroom, so that teachers, to a greater or lesser extent, have had to develop a certain digital competence to respond to the demand for the integration of these tools in the teaching and learning processes. However, the COVID-19 pandemic and the consequent confinement have produced a substantial change in the teaching and learning process, giving rise to a reality that has surpassed any prediction; The much-mentioned educational digitization is, today, a reality that is here to stay.

So, training and research on integrating digital tools into classrooms must be addressed from multivariate approaches, understanding that educational digitization is the result of several personal, formative, and contextual factors whose relationships can be very complex [20]. In this sense, España Digital 2026 is the agenda for the digital transformation of schools in Spain, whose objectives include developing digital competences for education, from the digitization of schools to universities, including vocational training, providing technological resources for the development of digital skills in education and increasing the number of graduates in digital areas, both in university education and vocational training. To this end, various programs are currently being implemented in collaboration with the Autonomous Communities with a twofold objective. On the one hand, to develop digital skills for compulsory education and, on the other hand, to support the digital transformation of the education system by equipping schools and students with devices.

Finally, it should be noted that one of the key elements to ensure the success of educational digitization is teachers that are in active of compulsory education in Spain, as they are responsible for adapting and applying digital tools in the teaching and learning process [1, 6–9, 11, 12, 20]. In this respect, the European Framework of Digital Competence Framework for Citizens (DigComp) has become a widely accepted tool for measuring and certifying digital competence and has been used as a basis for teacher training and professional development in Europe and beyond. As citizens, educators need to be qualified with these competences to participate in society, both personally and professionally. At the same time, we must emphasize that not only an optimal level of digital competence must be achieved, but we must also consider if teachers see and believe in the advantages and possibilities provided by technology, and receive the necessary training and support, digital tools can be effectively integrated into the educational process [6–8].

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