R E L A T E C

Latin American Journal of Educational Technology

2024
Vol 23 (1)

ISSN: 1695-288X

Nodo Educativo (Research Group)
Publications Service – University of Extremadura (UEX)
University Network of Educational Technology (RUTE)

RELATEC

Latin American Journal of Educational Technology

2024 - Volume 23 (1)

Biannual Journal

Start date: 2002

http://relatec.unex.es

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https://doi.org/10.17398/1695-288X.23.1.9

RELATEC
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ARTICLE / ARTÍCULO

Digital competence of preservice teachers of pre-school and primary education: a multiple comparisons study

Competencia digital del futuro docente de Educación Infantil y Primaria: un estudio por comparaciones múltiples

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Received: 11 november 2023
Reviewed: 26 november 2023
Accepted: 1 december 2023

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Abstract: Digital competence is an essential element for initial teacher training, as it allows them to integrate technologies into their practice. The objectives set were: (1) to know the self-perceived level of future primary and early childhood education teachers regarding their digital competence; (2) compare if there are significant differences in digital competence between future teachers of both educational stages; (3) to identify if there are significant differences in competence between the different academic courses of the degree, for each educational stage. We proposed a non-experimental study of the ex post facto type and a sample of 897 students of Early Childhood and Primary Education. The results showed that they have a medium-high self-perceived level of digital competence in both educational stages, finding significant differences between future teachers of Early Childhood and Primary Education, the latter being the ones who obtained the highest scores. In Early Childhood Education, significant differences were found between those of the first and fourth year, while in Primary Education, differences were found between all academic courses, except between the third and fourth. These results suggest that initial training should focus on developing the digital competence of future teachers, with special attention to the first academic courses.

Keywords: Digital competence, Preservice teachers, University students, Educational technology, ICT.

Resumen: La competencia digital es un elemento esencial para la formación inicial de docentes, ya que les permite integrar las tecnologías digitales en su práctica. Los objetivos planteados fueron: (1) conocer el nivel auto percibido de futuros maestros de Educación Primaria e Infantil respecto a sus competencias digitales; (2) comparar si existen diferencias significativas en competencias digitales entre los futuros docentes de ambas etapas educativas; (3) identificar si existen diferencias significativas en competencias entre los diferentes cursos académicos del grado educativo, para cada grado educativo. Planteamos un estudio no experimental de tipo ex post facto y muestra de 897 estudiantes de Infantil y Primaria. Los resultados mostraron que tienen un nivel auto percibido medio-alto de competencia digital en ambos grados educativos, encontrando diferencias significativas entre los futuros docentes de Educación Infantil y Primaria, siendo estos últimos los que obtuvieron puntuaciones más altas. En Educación Infantil se encontraron diferencias significativas entre los de primero y cuarto curso, mientras que en Educación Primaria se encontraron diferencias entre todos los cursos académicos, excepto entre tercero y cuarto. Estos resultados sugieren que la formación inicial debe centrarse en desarrollar las competencias digitales de los futuros maestros, con especial atención en los primeros cursos académicos.

Palabras-Clave: Competencia Digital, Formación inicial del profesorado, Estudiantes universitarios, Tecnología Educativa, TIC.

1. Introduction

In recent years, Information and Communication Technologies (ICT) have significantly transformed the way we live, work, communicate and learn, and have profoundly impacted society (Cabero-Almenara et al., 2023). So important have they become that, according to Tomczyk et al., 2023, having ICT skills, access to new media and the internet, the ability to use popular e-services, a willingness to use ICT, and a critical-constructive attitude towards it are all essential for being able to cope in today's information society. Given the increasing integration of technology into our society, it is imperative that both students and teachers develop the necessary skills to use it effectively (Gabarda-Méndez et al., 2021).

As such, teachers should be trained not only in active techniques and methodologies that engage students in their learning process (Guillén-Gámez et al., 2020a), but also in digital competences (Oguguo et al., 2023). This demands teacher training that goes beyond traditional methods, redefining the teacher's role as a facilitator of learning and proficient in using digital resources for teaching purposes (Fernández-Martín et al., 2023, Alastor et al., 2023).

The scientific literature has demonstrated that teachers who receive continuous training to enhance their digital skills effectively utilise ICT (Ruiz-Palmero et al., 2023), leading to improved academic performance among their students (Cabero-Almenara et al., 2023). However, achieving this goal necessitates the use of valid and reliable tools to assess teachers' levels of digital competence (Guillén-Gámez et al., 2023), with the aim of focusing on specific groups that require digital skills training (Martínez-Pérez et al., 2022).

With this in mind, there is a widely accepted consensus that initial teacher training should equip future educators to use ICT effectively in the classroom, aligning with the objectives outlined in the Horizon Reports (Valencia, 2023). This underscores the need for initial teacher training programmes to develop teachers' digital competence, covering skills such as the safe and ethical use of ICT, its integration into the curriculum and a critical approach to its use (Pinto-Santos et al., 2023). Additionally, these programmes should provide opportunities for future teachers to apply their skills in real-world environments (Aroca-Reyes and Llorente-Cejudo, 2023).

Bearing in mind the crucial need to digitally train future teachers in order to meet the demands of an increasingly digitised society, this study will address the following questions: What is the digital competence level of preservice early childhood and primary school teachers? Are there differences in the digital competence level among preservice early childhood and primary school teachers? Does the digital competence level of preservice early childhood and primary school teachers show positive changes during the teacher training course?

1.1. Other research on digital competence

Numerous studies have explored the digital competence of preservice early childhood teachers (e.g., Marimon-Martí et al., 2023b; Castiñeira-Rodríguez et al., 2022; Martínez-Serrano et al., 2021; Casillas-Martín et al., 2020). For example, Roig-Vila and Pascual-Luna (2012) analysed ICT use and proficiency in a sample of 61 students at the

University of Alicante, revealing a high level of digital competence. Similarly, Pinto-Santos et al. (2020) analysed the self-perception of digital competence among a sample of 218 Colombian students, finding high levels of digital competence, particularly among students in their final semester. Similar findings were reported by Casillas-Martín et al. (2020). However, these studies contrast with that of Casillas-Martín and Cabezas-González (2019), which analysed a sample of 307 students from Salamanca, Spain, and highlighted the need for addressing digital competence in the initial teacher training of early childhood education teachers (p. 1337). Similar findings regarding knowledge of educational technology were also reported by Guillén-Gámez and Mayorga-Fernández (2020), as well as Santos and Garcias (2022), who called for strengthening the digital training processes.

With regard to studies on preservice primary education teachers, Pascual et al. (2019) analysed the digital knowledge and skills of 559 students in the first year of primary teacher training courses at the universities of Granada, Jaén, and Oviedo,Spain. The authors found deficiencies among preservice teachers in information management, digital communication, and computer problem solving. Similarly, García et al. (2019) analysed the digital competences of 698 preservice teachers in primary education in terms of their ability to access, select, evaluate, and store information. They found that these preservice teachers did not have sufficient knowledge or skills to assess the reliability and veracity of the information they found online. In contrast, other authors have reported contradictory findings, including Guillén-Gámez et al. (2020b), who explored the use of digital resources among preservice teachers in Salamanca, Spain. Based on a sample of 108 participants, the findings showed extensive use of digital tablets, digital whiteboards, web browsers, and multimedia presentations. Similarly, for a sample of 153 preservice teachers at the University of Valencia, Spain, Colomer-Rubio et al. (2018) reported a high perception of their pedagogical knowledge. These results are similar to those of Llopis-Nebot et al. (2021), Aguilar-Cuesta et al. (2021), Marimon-Martí et al. (2023a) or Guillén-Gámez and Linde-Valenzuela (2022).

Furthermore, there are very few recent studies in the scientific literature comparing and analysing the digital competences of preservice teachers based on the educational stage they teach (Cózar-Gutiérrez et al., 2016). Among the existing studies, Cózar-Gutiérrez et al. (2016) compared a sample of 62 preservice teachers in early childhood and primary education in Albacete, Spain, and found that these competences were higher in the early childhood group. Similarly, Tárraga-Mínguez et al (2017) compared digital competences in a sample of 107 preservice teachers and found no significant differences between early childhood and primary teachers. Other education-related studies, albeit with in-service rather than preservice teachers, include the study by Basgall et al. (2023), which analysed digital competences in the use of YouTube. Based on a sample of 2157 in-service teachers from different educational stages, he found that primary teachers had superior skills in content creation, although their skills in searching for and communicating information were comparable. However, Portillo-Berasaluce et al. (2022) reported conflicting results, finding no significant differences between early childhood and primary teachers, as scores were similar. Given the scarcity and outdated nature of these studies, further research in this area is crucial for advancing our understanding and contributing to this field of science.

Finally, regarding studies that analyse whether there is an increase in the acquisition of new digital competences according to the academic year of education, López-Belmonte et al. (2019) examined the digital competence levels of 169 students in Ceuta, Spain, across various academic years. Their findings revealed a noticeable increase in digital competence—particularly in content creation and problem-solving—among students in their final year. Similar results were reported by Gabarda-Méndez et al. (2017) in a study involving 104 preservice teachers at the International University of Valencia, Spain. They observed a gradual, positive, and significant increase in digital competences between the first and fourth years of study. In addition, Galindo-Domínguez and Bezanilla (2021) also reported an increase in digital literacy from one academic year to the next among 200 students from the Basque Country, Spain, although the increase was not significant. Similarly, Demirtaş and Mumcu (2021) and Özcan (2022) also reported significant improvements in digital competences.

Examining the scientific literature on how digital competence has been studied in the last decade reveals that there are few studies dealing with and comparing the self-perceived levels of digital competence among preservice teachers in early childhood and primary education, considering the four academic years required for a teaching degree in Spain, and where ICT training is provided in different subjects and in a cross-cutting manner.

2. Method

2.1. Design and participants

In order to meet the objectives of this study, a quantitative non-experimental ex post facto design was used through surveys. Descriptive analyses using measures of central tendency and dispersion, as well as inferential analyses, were carried out based on the collected data. In addition, a non-probability, purposive sample was chosen for the study, comprising 897 preservice teachers from the Faculty of Education at the University of Malaga during the academic year 2022-2023. Concerning the categorical distribution, 77.90% of the students were female (n= 699), with a mean age of 20.793.27±. The remaining participants were male (22.10%, n= 198), with a mean age of 21.09±4.10. In terms of the type of education, 33.10% (n= 297) were taking early childhood education degrees, while 66.90% (n= 600) were taking primary education degrees. Table 1 shows the distribution by academic year.

Table 1. Sample distribution by academic year.

Curso	Early Childhood	Primary
First	30% (104)	70% (243)
Second	22.5% (38)	77.50% (131)
Third	33.20 % (65)	66.80% (131)
Fourth	48.6 % (90)	51.40 % (95)

2.2. Instrumento

Preservice teachers' self-perceptions were measured using an instrument developed by Cabero Almenara et al. (2020). This instrument analyses the strengths and needs related to digital learning through 20 items categorised into the following five dimensions:

Dimension A - technological literacy (4 items); Dimension B - communication and collaboration (3 items); Dimension C - information searching and processing (4 items); Dimension D - digital citizenship (3 items), and Dimension E - creativity and innovation (6 items). Each item was measured in the same way as the authors of the study, using an 11-point Likert scale, where 0 represents the minimum and 10 the maximum.

The instrument demonstrated satisfactory psychometric properties in both reliability and construct validity. In terms of construct validity, an exploratory factor analysis (EFA) was conducted using SPSS software, employing the principal components method with Varimax rotation. The results explained 74.6% of the variance across the five theoretical factors. In addition, the Kaiser-Meyer-Olkin criterion (KMO = 0.736) and Bartlett's test of sphericity (sig. < .05) were confirmed. For the confirmatory factor analysis (CFA), the weighted least squares (WLS) method was applied with AMOS software. Model fit was assessed by the authors based on the criteria recommended by Lévy-Mangin (2006) CMIN = 176.88 <500; GFI = 0.944 >0.7; PGFI = 0.758 > 0.7; NFI = 0.993 > 0.7; PNFI = 0.836 > 0.7. The theoretical model proposed in the EFA was tested using the CFA.

The internal consistency of the instrument was checked in this study to confirm that the items still showed homogeneity in their respective factors. Table 2 shows the coefficients obtained by the authors of the instrument and the coefficients obtained in this study. Although the overall reliability of the instrument was not initially calculated by the authors, it was included in this study. Both were analysed using Cronbach's alpha. The coefficients obtained in both studies confirm the reliability of the instrument.

Table 2. Internal consistency of the instrument.

	DIM. 1	DIM. B	DIM. C	DIM. D	DIM. E	Total
Cabero Almenara et al. (2020)	.838	.838	.889	.889	.889	-
For this study	0.768	0.727	.828	.831	.872	.930

The table shows the reliability values of the dimensions of digital competence in teaching according to the study by Cabero Almenara et al. (2020) and this study. It can be seen that the values are similar in both studies, although they are slightly higher in the study by Cabero Almenara et al. (2020) for dimensions 1, B and C, and slightly higher in this study for dimensions D and E. The overall reliability value in this study is very high (.930), indicating a good internal consistency of the instrument used.

2.3. Procedure

The analysis of the data involved several procedures, as described below:

a) To achieve the first objective, a descriptive analysis of the preservice teachers' self-perceived level was carried out for each academic year (1st, 2nd, 3rd, and 4th) and for each educational stage (early childhood and primary).

b) For the second objective, we examined whether there were significant differences between the digital competences of preservice teachers taking an early childhood education degree and a primary education degree, so as to proceed with further univariate or bivariate analyses.

c) Lastly, a multiple comparison analysis was conducted to determine whether there were statistically significant differences in the self-perceived level of digital competence of preservice teachers across the four years of the teacher training degree for both educational stages.

2.4. Objectives

O1. To determine preservice teachers' self-perceived level of digital competence for each educational stage (early childhood and primary).

O2. To compare whether there are significant differences in preservice teachers' self-perceived competence according to their degree.

O3. To determine whether there are significant differences in preservice teachers' self-perceived competence according to academic year in both early childhood and primary education.

3. Results

3.1. Descriptive analysis of preservice teachers' self-perceived digital competences

Table 3 presents preservice teachers' perceptions categorised by academic year and educational stage. This was measured by calculating the arithmetic mean of each instrument item, grouped by the dimension they belong to. Noteworthy findings include high scores for both degrees in technological literacy, specifically in synchronous communication tools. On the other hand, the use of simulations to explore complex systems and issues using ICT yielded the lowest scores in the dimension of creativity and innovation.

Table 3. Digital competences according to academic year and educational stage.

	Early Childhood		Primary	
	M	**SD**	**M**	**SD**
A. Technological literacy				
I can use different operating systems on computers.	7.66	1.90	7.67	1.99
I can set up and use an email manager.	7.73	2.22	7.78	2.12
I can use some audio editing software.	6.21	2.34	6.40	2.46
I can use some synchronous communication tools.	9.30	1.14	9.09	1.54
B. Communication and collaboration				
I can use Web 2.0 tools to share and publish resources online.	8.79	1.80	8.76	1.65
I can design, create, or modify a web page.	4.88	2.78	5.60	2.65
I can find, save, and tag internet resources.	6.22	2.47	6.87	2.23
C. Information searching and processing				
I can identify useful information by evaluating different sources and their sources.	6.73	2.13	7.23	2.01
I can organise, analyse, and ethically use information from different sources and media.	6.88	2.08	7.37	1.90

	Early Childhood		Primary	
	M	SD	M	SD
I can synthesise information and make appropriate choices for the production and assimilation of new content.	7.20	1.90	7.48	1.77
I use software to create concept and mind maps, diagrams, or charts to show the relationship between ideas and concepts.	8.36	1.86	8.22	1.92
D. Digital citizenship				
I advocate and practise the safe, legal, and responsible use of information and ICT.	7.79	1.98	7.91	1.87
I commit to lifelong learning using ICT.	7.68	1.90	8.07	1.77
I consider myself competent to offer constructive criticism, judgements, and contributions to the ICT work of my peers.	7.24	1.96	7.39	1.94
E. Creativity and innovation				
I can generate original, novel, and useful ideas using ICT.	7.37	1.95	7.68	1.84
I can produce original work using new ICT resources, such as augmented reality, robotics, etc.	5.63	2.97	6.35	2.68
I identify trends and forecast possible uses of ICT.	6.00	2.30	6.85	2.08
I use simulations to explore complex systems and issues using ICT.	4.90	2.96	5.54	2.63
I produce materials in which I use ICT creatively to support the construction of my knowledge.	6.73	2.41	7.31	2.14
I can adapt to new situations and technological environments.	7.69	1.84	7.83	1.85

3.2. Comparative analysis of the self-perceived digital competences of preservice teachers between the two educational stages

Table 4 shows the self-perceived level of the preservice teachers in both educational stages for each dimension of the instrument. Mean levels, standard deviations, skewness, and kurtosis for each dimension are provided. In terms of technological literacy, preservice teachers in the primary educational stage (M=7.29±1.82) scored slightly higher scores than their counterparts in the early childhood educational stage (M=7.20±1.70). Similarly, scores for digital communication and collaboration skills were higher in the primary stage (M=6.24±2.09) compared to the early childhood stage (M=5.55±2.26). Preservice teachers in the primary stage also demonstrated higher skills in information searching and processing using digital applications (M=7.36±1.70) compared to those in the early childhood stage (M=6.93±1.81). In relation to digital citizenship, scores were slightly higher for the primary educational stage (M=7.79±7.57) than for the early childhood stage (M=7.57±1.67). In creativity and digital innovation, preservice teachers in primary education (M=6.78±1.81) had slightly higher scores than those in early childhood education (M=6.19±2.05). Overall, preservice teachers in primary education demonstrated higher digital skills (M=7.09±1.46) than their counterparts in early childhood education (M=6.69±1.48).

The normality of the data was checked before making statistical comparisons between the two educational stages. Table 4 shows the statistics of central tendency (mean, standard deviation) and dispersion (skewness and kurtosis) for each dimension of the instrument, as well as for global competence (mean of all items). In addition, the normality of the data was tested using the Kolmogorov-Smirnov test. Since the values

of the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) statistics indicated that the assumption of normality was not met, the Mann-Whitney U-test was used to compare scores between the preservice teachers of both educational stages. In cases of significant contrast, effect sizes were calculated. Cohen (1988) classified effect sizes of less than 0.4 as small, between 0.5 and 0.7 as medium, and greater than 0.8 as large. Significant differences were found in the scores of the two types of teachers for dimension B (communication and collaboration), with a small effect size (d=0.292), for dimension C (information search and processing), also with a small effect size (d=0.224), for dimension E (creativity and innovation), again with a small effect size (d=0.271), and finally for the global score—which combines all the dimensions of the instrument—with a small effect size (d=0.262).

Table 4. Digital competences by dimensions and comparative analysis between educational stages.

		M	SD	A	C	KS	Mann-Whitney U	Z	Effect size (d)
DIM. A	Early Ch.	7.20	1.70	-0.754	0.482	0.103	85210.500	-1.067	-
	Primary	7.29	1.82	-0.849	0.757	0.107			
DIM. B	Early Ch.	5.55	2.26	-0.352	-0.409	0.073	73317.500*	-4.332	0.292
	Primary	6.24	2.09	-0.421	-0.250	0.090			
DIM. C	Early Ch.	6.93	1.81	-0.815	1.057	0.101	76945.500*	-3.336	0.224
	Primary	7.36	1.70	-0.797	1.061	0.099			
DIM. D	Early Ch.	7.57	1.67	-0.783	0.611	0.107	-82358.500	-1.851	-
	Primary	7.79	1.61	-0.735	0.381	0.093			
DIM. E	Early Ch.	6.19	2.05	-0.521	-0.52	0.069	74438.500*	-4.017	0.271
	Primary	6.78	1.81	-0.574	0.205	0.070			
GLOBAL CD	Early Ch.	6.69	1.48	-0.449	0.092	0.069	74882.000*	-3.893	0.262
	Primary	7.09	1.46	-0.529	0.290	0.051			

Note: M (mean), SD (standard deviation), A (skewness), C (kurtosis), KS (Kolmogorov-Smirnov). * Significance level at 0.05.

3.3. Multiple comparisons analysis of the use of ICT to teach, evaluate and research (UICT-TER) model

To address the third objective of the study, a non-parametric analysis was conducted due to the lack of normality in the scores for both types of teachers across each dimension of the instrument ($p < 0.05$). The Kruskal-Wallis test, suitable for three or more independent categorical groups, was employed. In this study, the grouping variable was the academic year in which the students were enrolled, ranging from the first to the fourth year. For cases where there were significant differences between the groups (academic years) in terms of the effect sizes, the eta-squared was calculated, with $\eta 2 = .01$ indicating a small effect; $\eta 2 = .06$ indicating a medium effect, and $\eta 2 = .14$

indicating a large effect (Richardson, 2011). However, as this coefficient tends to be biased in small populations, Cohen's d was also calculated.

Table 5 shows statistically significant differences (p. < 0.05) in all dimensions of the instrument and in the overall assessment for the four academic years of teacher training in both educational stages. Effect sizes were found to be small in the early childhood education stage and large in the primary education stage.

Table 5. Comparative analysis between the digital competences of preservice teachers and the four academic years of the teaching degree.

		DIM. A	DIM. B	DIM. C	DIM. D	DIM. E	GLOBAL
Early Childhood Education	Kruskal-Wallis H	13.747	8.946	26.490	10.477	10.196	19.006
	Sig.	0.003	0.030	0.001	0.015	0.017	0.001
	D Cohen (d)	0.390	0.288	0.590	0.324	0.317	0.481
	eta-squared	0.037	0.020	0.08	0.026	0.025	0.055
Primary Education	Kruskal-Wallis H	69.976	43,673	70,125	83,544	48,321	89,832
	Sig.	0.001	0.001	0.001	0.001	0.001	0.001
	D Cohen (d)	0.712	0.541	0.713	0.791	0.574	0.826
	eta-squared	0.112	0.068	0.113	0.135	0.076	0.146

The significant results found in the previous table do not allow us to determine exactly where these noteworthy differences lie, i.e. between which academic years such differences exist. Therefore, in the following procedure, the Mann-Whitney U test is used for each pair of levels of the grouping variable academic year, applying the Bonferroni correction to avoid increasing the probability of a type I error. When applying the Bonferroni correction, it should be remembered that contrast decisions must be based on a significance level of 0.05/4= 0.0125. In other words, two groups are considered to be significantly different if the critical level obtained is less than 0.0125. An asterisk (*) indicates that the differences were significant using this criterion.

For the pre-service teachers in early childhood education, significant differences were observed between the first- and fourth-year students for all dimensions of the instrument, as well as for the final assessment. The effect sizes found are in the small to medium range. Remarkable dissimilarities were also found between first- and second-year students for dimension C (information search and processing), with an effect size close to medium (d= 0.44). There were also noticeable differences between first- and third-year students in dimension C (information search and processing) with a medium effect size, in dimension D (digital citizenship) with a small effect size (d= 0.37) and in the overall assessment, with a medium effect size.

Table 6. Multiple comparisons between academic years and the digital competences of preservice teachers (early childhood education).

Year	Year	DIM. A		DIM. B		DIM. C		DIM. D		DIM. E		Global	
		U	d	U	d	U	d	U	d	U	d	U	d
1st	2nd	1630.50	-	1778,50	-	1416,50*	.44	1807.00	-	1751.50	-	1639.00	-
	3rd	2658.50	-	2723.00	-	2355.50*	.53	2539.50*	.43	2866.00	-	2445.50*	.48
	4th	3272.50*	.54	3604.00*	.40	2787.00*	.74	3682.50*	.37	3462.00*	.46	3076.00*	.62
2nd	3rd	1200.50	-	1104.50	-	1171.00	-	1005.00	-	1169.50	-	1122.00	-

	4th	1520.00	-	1473.00	-	1431.00	-	1454.50	-	1450.00	-	1421.50	-
3rd	4th	2681.00	-	2862.50	-	2638.00	-	2860.00	-	2572.00	-	2685.00	-

For preservice primary school teachers, significant differences were observed between first-year and third-year students, and also between first-year and fourth-year students in all dimensions of the instrument, as well as in the final assessment. The effect sizes were in the medium to large range. Significant differences were also found between second- and third-year students, and between second- and fourth-year students, with medium effect sizes in all cases.

Table 7. Multiple comparisons between academic years and preservice teachers' digital competences (primary education)

Year	Year	DIM. A		DIM. B		DIM. C		DIM. D		DIM. E		Global	
		U	d	U	d	U	d	U	d	U	d	U	d
	2nd	15627.00	-	15346.00	-	15127.00	-	14693.50	-	13955.50	-	14957.00	-
1st	3rd	10812.50*	.55	11418.50*	.48	9666.50*	.69	8477.50*	.84	9686.50*	.68	8730.00*	.80
	4th	5894.00*	.82	7180.00*	.62	6539.50*	.72	6308.00*	.75	7771.00*	.53	5657.50*	.86
2nd	3rd	5775.00*	.59	6341.50*	.46	5353.50*	.69	5095.50*	.75	6255.00*	.48	5177.50*	.73
	4th	3208.00*	.91	4007.50*	.64	3585.00*	.78	3768.50*	.72	4895.50*	.41	3363.00*	.85
3th	4th	5109.00	-	5728.50	-	6081.50	-	6193.00	-	5973.50	-	5775.00	-

4. Conclusion

This study analysed the perceived level of digital competences of preservice teachers of early childhood education and primary education. Specifically, the study examined whether there were significant differences in these competences between preservice teachers of both teaching degrees, and whether there were significant differences between students in the four academic years of a teaching degree in Spain, considering each degree separately.

Regarding the first objective, the results obtained in this study for the self-perceived level of digital competence among preservice early childhood teachers are in line with those of Pinto-Santos et al. (2020), as the level of self-perceived competence is higher among final year students, which is also in line with the results of Casillas-Martín et al. On the other hand, the results regarding the self-perceived level of students are not in line with those of Casillas-Martín and Cabezas-González (2019), Guillén-Gámez and Mayorga-Fernández (2020) and Santos and Garcias (2022). About preservice primary teachers, different results were obtained from those published by Pascual et al. (2019) and García et al. (2019). However, the results were in line with those of Guillén-Gámez et al. (2020b), Llopis-Nebot et al. (2021), Aguilar-Cuesta et al. (2021), Marimon-Martí et al. (2023a) or Guillén-Gámez and Linde-Valenzuela (2022), in that they considered themselves to be highly digitally competent.

In relation to the second objective, if we compare this study with the results of previous studies comparing the two educational stages, we find studies with contradictory results, such as that of Cózar-Gutiérrez et al. (2016), where higher competences were found in early childhood teachers. The remaining studies analysed which do not agree with our results did not find significant differences between the two degrees.

Regarding the third objective and the differences between academic years, this study found that there are differences between the first year and the later years, in line with López-Belmonte et al. (2019), Gabarda-Méndez et al. (2017), Demirtaş and Mumcu (2021) and Özcan (2022). Moreover, Galindo-Domínguez and Bezanilla (2021) also found an improvement as students progressed from one academic year to the next, albeit with non-significant differences. A plausible explanation for these results can be found in the subjects covered by the degree, in particular the related subjects. While the early childhood education degree does not have a specific ICT subject at the university in question, the primary education degree does include training in information and communication technologies applied to education, which is taught in the second semester of the first year.

The lack of homogeneity between the results of the comparative studies may be due to a variety of factors, such as age, gender, previous experience with ICT, approach to teacher training, context, curriculum, and instruments used, all of which should be carefully analysed in future studies. These differences in digital competence levels may have implications for the quality of future teaching and learning.

It is also important to mention that the COVID-19 pandemic created an extraordinary situation in society that affected all areas of life, including the emotional, family, social, academic, and educational lives of students (Gómez-Gómez et al., 2022). This, in turn, may have influenced their self-perception of their preservice teacher competences.

This study has shown that, in general, preservice teachers in primary education have better digital competence than those in early childhood education. Students in the first year of primary education teacher training score significantly lower than students in the third and fourth years of primary education on all dimensions of the instrument. The effect sizes of these differences are medium to large, indicating that they are significant. Significant differences were also found between second- and third-year students and between second- and fourth-year students, with medium effect sizes. In other words, primary students improve their preservice teacher competencies as they progress through their education. The differences between first-year students and third- and fourth-year students are particularly striking. On the other hand, first-year students in early childhood education score significantly lower than fourth-year students on all dimensions of a preservice teacher assessment instrument. The effect sizes of these differences are small to medium, indicating that they are significant. Significant differences were also found between first- and second-year students in dimension C, with an effect size close to medium; and between first- and third-year students in dimension C, with a medium effect size; in dimension D, with a small effect size; and in the overall assessment, with a medium effect size. And, as with primary students, early childhood students improve their preservice teacher competencies as they progress through their education.

The present study has a number of limitations that should be taken into account when interpreting the results. One of the main limitations is that the study is not longitudinal, so the results must be interpreted with caution, as the participants across years are not dependent but independent samples and there may be different predictors that influence these differences. Therefore, further studies are needed with longitudinal studies on the digital competences of preservice teachers from the first to the last academic year, with the aim of determining whether there is a significant

improvement in the digital competences of preservice teachers as they are trained in educational technology in the different subjects of the teaching degree. Another limitation of the study is that the sample used is not probabilistic, i.e. it was not selected randomly, so it would be useful to carry out random sampling in order to be able to extend the results to the entire population of preservice teachers in these two educational stages. In addition to these limitations, the study also has other constraints that need to be considered, such as the use of a single assessment instrument.

Other future work could be proposed, such as a comparative study between preservice teachers from different universities or countries to identify dissimilarities in the development of digital competence; a qualitative study to better understand the experiences of preservice teachers in developing their digital competence, and an intervention study to implement a specific training programme to improve the digital competence of preservice teachers. This work would deepen our knowledge of preservice teachers' digital competence development and contribute to refining teacher training in this area.

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ARTICLE / ARTÍCULO

Analysis of the concept of Digital Teaching Competence: a systematic literature review

Análisis del concepto de Competencia Digital Docente: una revisión sistemática de la literatura

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Received: 9 november 2023
Reviewed: 22 november 2023
Accepted: 24 november 2023

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Abstract: The technological revolution experienced in today's society has led educational organisations to assume the responsibility of training skills and abilities for this new context. Despite the high degree of complexity within technology-mediated ecosystems, the scientific literature seems to agree that the development of teachers' digital competence is identified to be a key variable of success. The definition of digital competence is however not clearly delineated. Moreover, direct and indirect interactions within this technology-mediated teaching and learning process are not clearly identified. The objective of this study is to define the concept of Digital Teaching Competence through a Systematic Literature Review published between 2017 and 2022, using the Scopus and Dialnet databases. A total of 316 references in English and Spanish were identified, of which 32 were selected for the final analysis, following the PRISMA protocol guidelines. The results confirm the existence of a high degree of conceptual fragmentation, as well as the lack of agreement on the terminology to be used. There is a need to reach a consensus on a taxonomy that facilitates, on one hand, the analysis of the elements that make up Digital Teaching Competence, and on the other hand, the improvement of the capacity to analyse specific contextual variables that contribute to enhancing technology-mediated teaching and learning processes.

Keywords: Educational Technology, in service Teacher Training, Information and Communication Technologies, Digital Teaching Competence, Digital Literacy.

Resumen: La revolución tecnológica que experimenta la sociedad actual ha favorecido que los sistemas educativos de todo el mundo asuman la responsabilidad de formar individuos con capacidades y destrezas suficientes para desenvolverse de manera exitosa en este nuevo escenario. A pesar del alto grado de complejidad de las interacciones generadas en ecosistemas mediados por tecnologías, la literatura científica parece coincidir en que el desarrollo de la competencia digital docente se articula como una variable de éxito en dichos procesos. Sin embargo, no parece estar claramente establecido cómo se define la competencia digital docente y qué agentes interactúan con ella de forma directa o indirecta en los procesos de enseñanza-aprendizaje mediados por tecnologías. El objetivo de este estudio es definir el concepto Competencia Digital Docente a través de una revisión sistemática de la literatura publicada entre los años 2017 y 2022, usando las bases de datos Scopus y Dialnet. Se identificaron 316 referencias en inglés y español de las cuales 32 fueron seleccionadas para el análisis final, siguiendo las directrices del protocolo PRISMA. Los resultados confirman el alto grado de fragmentación conceptual existente, así como la falta de acuerdo en la terminología a utilizar. Se evidencia la necesidad de consensuar una taxonomía que facilite, por un lado, el análisis de los elementos que conforman la Competencia Digital Docente, y por otro, la mejora en la capacidad de análisis de las variables contextuales específicas que contribuyen a mejorar los procesos de enseñanza-aprendizaje mediados por tecnologías.

Palabras-Clave: Tecnología educativa, Formación Permanente del Profesorado, Tecnologías de la Información y la Comunicación, Competencia Digital Docente, Alfabetización digital.

1. Introduction

From its earliest manifestations, technology has conditioned the evolution of civilisations in the modern world. This constant has been maintained over centuries, establishing an inseparable binomial between the concepts of technology and progress. However, it is only in recent decades that we have witnessed an unprecedented revolution that began at the end of the last century with the birth of the digital era, the emergence of consumer computing and the spread of the Internet, and which extends to the present day with the rise of mobile technologies, social networks, as well as emerging technologies such as artificial intelligence, robotics, quantum computing and extended reality (Giron Escudero et al., 2019; Brown et al., 2020; Lindfors et al., 2021). We are witnessing a Fourth Industrial Revolution (Schwab, 2016) that will mark a turning point in the way we experience leisure, learning, culture, and human interactions at all levels (Cabero Almenara et al., 2020; UNESCO, 2023).

Despite the above, today's technological landscape is not a recent development. It is the result of a long process that began several decades ago. Many studies have supported the attractiveness of technologies for learning (Caena and Redecker, 2019), but it took several years for this to become a feasible reality. The initial cost of the technology was exorbitant, the equipment was not intuitive to operate, and there was no software designed for teaching purposes, which is recognised in the current literature as a variable of success (Aagaard et al., 2022).

While some of these barriers were overcome, governments around the world embarked on a technological race marked by highly instrumental policies. One generalised challenge has been to achieve 1 to 1 connected classroom (One Laptop Per Child (OLPC)). On the other hand, it was essential to train teachers in the use of this technology and the progressive creation of resource banks that would allow the didactic implementation of these new tools. After years of effort, the long-awaited pedagogical revolution, as well as the improvement of the quality of the teaching-learning processes, did not take place.

Research from around the world has reached similar conclusions, namely that the adoption of technologies does not guarantee improved results or a revolution in teaching-learning processes, and that many aspects related to their organisation and practice need to be rethought (Barajas and Rossi, 2018; Silva Quiroz et al., 2019; Caena and Redecker, 2019; Cabero and Palacios, 2020). The publication of the report Technology in education: a tool on whose terms? (GEM Report UNESCO, 2023) shows that the way in which technologies have been incorporated in education obeys more to corporate interests than to the analysis of the reality of each educational context. Similarly, it shows that their true potential lies in their adaptability as a resource for generating different approaches in different contexts for different students (Castañeda et al., 2018).

1.1. Digital Teaching Competence in the knowledge society

The relationship between technology and society has followed a very different path than the evolution experienced in the academic sphere. Evidence from the literature shows a high level of citizens' exposure to technologies (UNESCO, 2023). A study by Almås et al. (2021) mentions that 97% of Norwegian aged 9 to18 year have their own

mobile phone. This is in line with usage levels experienced in Spain, where 94.5% of the population aged 16 to 74 have recently used the Internet in 2022 (Instituto Nacional de Estadística, 2022). As technology has become simpler to use and more socially widespread in use, educational research has shifted the focus to the role that teachers and future teachers-in-training should play in integrating technology into teaching. In other words, it is no longer just about using technology, but about how it will be adapted and integrated into teaching and learning processes, as well as the consequences of these (McDonagh et al., 2021; Yoon, 2022).

Educational research indicates that teachers must develop their Digital Competence to carry out successful integrations that promote quality learning in their students. This facilitates a transfer that fosters their development and empowerment (Marín Suelves et al., 2019; Pozo Sánchez et al., 2020; Jiménez Hernández, 2021; Aagaard et al., 2022). However, when analysing the most recent literature, it is observed that although there are systematic literature reviews on the study of Digital Competence in Teaching from different perspectives, the conceptual analysis of dire Digital Competence has not been specifically addressed (Pettersson, 2018; Starkey, 2020; Falloon, 2020; Jiménez et al., 2021).

It is therefore of importance to analyse the concepts surrounding the Digital Competence in Teaching and, above all, to open the door to rethinking current models of technological integration. This will allow us to evolve towards a holistic conception that considers the complexity of technology-mediated ecosystems, with the goal of improving teaching-learning processes.

2. Method

The present study was carried out by means of a Systematic Literature Review (SLR). The PRISMA protocol was used for the identification of sources, strategies for approaching the search, as well as in the process and analysis of the resulting data.

The PRISMA protocol was published in 2009 with the aim of facilitating research and establishing clear and rigorous methodological foundations for this type of research. It has recently undergone a series of updates in its 2020 version (Valverde-Berrocoso et al., 2022). Accordingly, the phases that have been addressed in the study are as follows:

- *Phase 1: Development of the research questions*. This research is based on the resolution of a main research question: How is the concept of Digital Competence in Teaching defined through the literature review? Following on from the main question, other specific questions arise (see Table 1).

- *Phase 2: Eligibility criteria.* The present research includes the selection of articles that have been published in scientific journals published in English or Spanish, between January 2017 and December 2022. Filters linked to the social sciences were applied and limited to article and review. We selected those that addressed the terms "digital competence", "digital literacy" and "teacher education", as well as their translations into Spanish, both in their title and/or in their abstract. The exclusion criteria were manuscripts that do not consist of educational evidence linked to the development of digital

competence for teachers, digital literacy for teachers or teacher education. Exclusions were classed in three categories: (1) The manuscript does not answer the research questions; (2) the manuscripts deviate from the content stated in the title and abstract; and (3) the manuscript is of an informative nature or lacks method and rigour in its approach to the research.

Table 1. Research questions.

Item	Question	Coding
Q1.1	What are the concepts used in the selected literature to define the teacher-technology relationship?	Digital and Media Literacy (DML) Digital Competence in Education (DCE) Digital Professional Competence (DPC)
Q1.2	Do the authors of the selected manuscripts provide a definition of the concept that defines the teacher-technology relationship?	Own definition Definition of third parties
Q1.3	What are the competency "frameworks" or "models" identified in the selected literature to define the teacher-technology relationship?	No prior coding
Q1.4	Do the authors of the selected papers provide a definition of the concept that defines the teacher-technology relationship within a competency "framework" or "model"?	Own model Third-party model

- *Phase 3 Search.* The Scopus and Dialnet databases were used for the development of this research. Considering the limitations of each platform's search engine, the keywords have been limited and the search has been narrowed down as much as possible according to the aforementioned criteria. The date range is from January 2017 to December 2022. The full search syntax is detailed in Annex I.

- *Phase 4 Selection.* The selection phase was carried out in two sequential screens: (a) First screen (initial search): the initial search yielded a total of 316 results with 4 duplicate articles. Subsequent exclusions were performed based on the titles and abstracts, enabling a total of 196 articles to be excluded from the initial 312 articles, including 116 for this initial search. (b) Second screening (detailed reading): a thorough reading of the manuscript was conducted, and the exclusion criteria was applied. The "snowball" method was used to identify additional references of relevance to the study. Two articles were considered as candidates for inclusion by this method. After analysis and consensus, 1 article is added to the list, resulting in the final inclusion of 32 manuscripts for the conduction of this systematic literature review.

– *Phase 5 Data coding*. The management of all references is carried out with the Zotero bibliographic manager. For the detailed extraction of relevant information, a spreadsheet was developed including a total of 29 categories. Of the total of 32 references analyzed, 17 (53.12%) are obtained from the Dialnet database and 14 (43.75%) from Scopus. The additional manuscript added by Snowball method represents 3.12% of the total references identified.

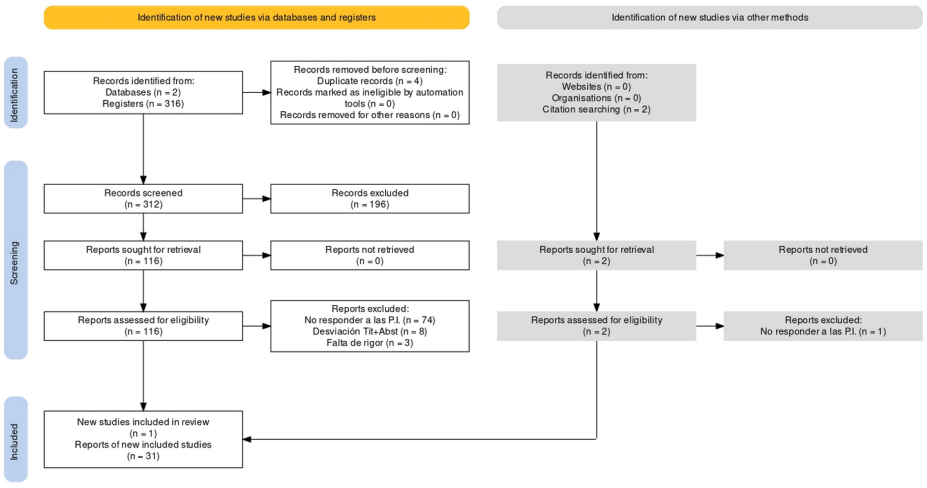

Figura 1. Systematic Literature Review Flowchart - Document Selection Process. Source: Prepared by the author based on app (Haddaway et al. 2022).

3. Results

The results are presented below in response to each of the research questions posed as objectives of the study.

3.1. Q1.1 What are the concepts used in the selected literature to define the teacher-technology relationship?

Three fundamental concepts have been identified in the definition of the teacher-technology relationship in the documents analysed: (1) Digital and Media Literacy (DL); (2) Digital Competence in Teaching (DTC) and (3) Digital Professional Competence (DPC).

Digital and Media Literacy

The term "Digital Literacy" is first defined as "the ability to use and evaluate digital resources, tools and services appropriately and apply them to lifelong learning processes" (Gilster, 1997, p. 220). The social nature of the concept is broadened by the incorporation of technology in the classroom. Although an attempt is made to delimit the needs that are considered essential for adequate professional development, the term remains imbued with an instrumental nature that has marked its evolution over

the years. Along these lines, Ng (2012, p. 1067) provides the following definition: "technical and operational skills for using Information and Communication Technologies (ICT) in learning and everyday activities".

The rapid evolution of technology requires its conceptualisation to constantly be updated. This leads to the emergence of new definitions that consider more complex dimensions. Hobbs et al. (2011) defines digital literacy as "a constellation of life skills" (Hobbs et al., 2011, p.7). In the same vein, further research argues for the complexity of the term by noting the interconnectedness of multiple media literacies (Botturi, 2019; List et al., 2020). Evidence shows that some definitions consider digital literacy to be at the intersection of different types of linked competences: technical, cognitive and socio emotional.

With respect to teacher training, the use of the concept of Digital Literacy has been related to the development of technical skills and training in the use of digital media. Some educational research has supported that these skills have been considered sufficient to favour the transfer of knowledge for pedagogical application. Many authors have however criticized this definition as being detrimental to the quality of the training offered, as being deficient and limited, and relying on an excessively technified vision (Aagaard et al., 2022).

The literature seems to agree that the term Digital Literacy has gone through two evolutionary stages. The first stage encompasses definitions that allude to a series of eminently technical skills and capabilities (Botturi, 2019). The second stage tends to value the complexity of the educational ecosystem, considering other dimensions such as security, ethics, etc. (Yoon, 2022).

However, this categorisation is far from definitive. Similarly, the persistence of the concept is compromised by those who define new conceptualisations such as 'Digital Competence in Teaching', which better describes the reality of technology-mediated ecosystems (Janssen et al., 2013, p.480). Authors such as Srnicek (2017) argue that it is not only about adapting to the new media that appear, but also about assessing with a more holistic prism a reality that affects many more elements, apart from the functional ones.

Digital Teaching Competence

The concept of "Digital Competence in Education" has emerged from research in the Nordic countries, especially Norway. Great efforts have been made to analyse this terminology and the challenges associated with it, but there seems to be no consensus on its definition. Several definitions conceptualising Digital Competence in Education were identified in the reviewed literature.

The first group of definitions is characterised by a highly instrumental focus, for example, Krumsvik (2009) understands Digital Teaching Competence to be related to the use of ICT for teaching and learning with didactic criteria. Another definition describes it as "a teaching competence for the digital world" (Castañeda et al., 2018, p. 14).

Specifically, Lázaro-Cantabrana et al. (2019) determined that there are capacities, skills and attitudes related to technology and education. According to

Insteford and Munthe (2017), digital competence is articulated as essential to achieve pedagogical effectiveness. This selection of definitions represents a first category focused on the possession of skills and abilities, mainly technical, linked to the efficiency of teaching practice and professional development (Instefjord and Munthe, 2017; Lázaro-Cantabrana et al., 2019; Colás Bravo et al., 2019).

In a second set of definitions, some authors argue that the digital competence in teaching involves a much more complex set of skills compared to the digital competences needed in other areas of society (NMC, 2017; Håkansson and Pettersson, 2019). McDonagh et al., for instance, states that "digital competence is not limited to a narrow set of technical skills but encompasses a much broader range of knowledge and attitudes" (McDonagh et al., 2021, p.6). This conceptualisation recognises the complexity of educational contexts, which represent a broader set of interactions than initially conceived (Krumsvik, 2008; From, 2017). The evolution of technology and the simplification of its management have led to a focus on the transfer of knowledge to learners. Following this line of thought, Tourón et al. (2018) propose the following definition for Digital Teaching Competence:

> "The set of skills and abilities that lead us to incorporate and properly use ICT as a methodological resource, becoming Technologies for Learning and Knowledge (TAC) with a clear didactic implication" (Tourón et al., 2018, p.28).

Other studies agree with this idea (Gisbert Cervera and Lázaro Cantabrana, 2014; Falcó Boudet, 2017; Girón Escudero et al., 2019; Massoumi, 2021). Therefore, we are faced with a conceptualisation with a more holistic approach, where digital Teaching Competence goes beyond individual and educational dimensions (Domingo Coscolla et al., 2020). For example, some research focuses on a contextual dimension (Pettersson, 2018; Silva Quiroz et al., 2019), while others advocate the analysis of interactions with social practices, political, environmental, and economic factors (McDonagh et al., 2021).

In a third group of definitions, as was the case for Digital and Media Literacy, there is an emphasis on the rapid technological evolution and the complex interactions that are generated in educational ecosystems. This makes it very difficult to establish a cross-cutting definition that encompasses all possible technology-mediated scenarios.

Despite the conceptual evolution described over the years, as well as the efforts invested in defining Digital Teaching Competence, a stream of studies using a more critical approach has begun to emerge. The term Digital Competence in Education is viewed as being framed with a deterministic approach and the need to rethink this type of competence is emphasised. using an instrumental perspective at the micro level and, in parallel, promotes a deterministic conception at the macro level (Castañeda et al., 2018).

A final point of consideration for the findings presented above are the the disparity of approaches among the definitions of Digital Competence in Education. The degree of differences between the different conceptualisation emphasises a possibility of fundamental weakness that make it impossible to conceptualise.

Van de Oudeweetering and Voogt (2018) argue that a great deal of inconsistency underlies the definitions, interpretations, terminologies, and dimensions

of 21st century competences. This ambiguity is evident in the difficulty of translating them into didactic objectives, as there is a constant evolution of the term. It is a dynamic concept that is linked to the context and the variability of digital technologies. An example of this is the paradigm shift in relation to teacher competence development standards.

Professional Digital Competence

In 2012, the Norwegian Centre for Information and Communication Technologies in Education coined the term 'Professional Digital Competence' (Kelentrić et al., 2017). This term arises due to the discrepancies experienced by students in teaching education. The challenges faced by students in developing teaching practice may not be addressed by initial academic training (McDonagh et al., 2021).

Ketil Engen's study on the conceptual evolution of Professional Digital Competence shows that many practitioners have noted limitations related to the concepts of Digital Competence and Digital Literacy (Ketil Engen, 2019). The main problem lies in trying to make general categorisations. Over time, these shortcomings become evident through a "dialectical process". The author proposes as a solution to use concrete situations to determine different types of digital competences, that are defined by the nature of the context and the situation. Lund et al. (2014) argue for the need to have two types of competences, generic ones that are valid for all situations, and others that are specific to the teaching profession.

Starkey (2020), however, seeks a deeper understanding of Digital Competence in education. The main challenge lies in defining not only generic instrumental skills but also to consider context-sensitive skills (Almås et al., 2021). Lund and Aagaard (2020, p. 68) qualify this conceptual application of Professional Digital Competence through the term "transformative digital agency", which refers to the ability of identifying difficult educational situations and address them using appropriate digital resources, thus turning a difficult situation into a learning opportunity. It is interesting to mention that the term Digital Professional Competence shows some similarity with the widely known TPACK model (Mishra and Koehler, 2006), as it includes technical skills in the use of technology as well as pedagogical skills.

In line with Ketil Engen (2019), work such as that of Lindfors et al. (2021) advocates "moving away from understanding digital competence as a set of generic skills applicable to all situations". A broader understanding is sought that encompasses generic and teaching-specific skills.

Andreasen et al. (2022) point out that while there has been an evolution from terms related to the use of digital devices to broader conceptualisations such as Digital Competence and Digital Literacy, the nature of Professional Digital Competence is broader, encompassing cognitive, emotional, and sociological knowledge. Of particular interest is that Professional Digital Competence seeks not only appropriation from the perspective of the teacher, but also transfer and appropriation by the learner (Lindfors et al., 2021).

The concept of Digital Professional Competence has had a great impact on the Norwegian educational environment. The success of this initiative has materialised in subsequent years through the Norwegian Comprehensive Framework for Teachers'

Professional Digital Competence (Kelentrić et al., 2017). The literature however emphasizes that the concept of Professional Digital Competence is under construction, emerging from the contributions of researchers, policy makers, trainers, and students (Almås et al., 2021), and can still further evolve (Aagaard et al.,2022).

3.2. Q1.2 Do authors from the included manuscripts provide a definition of the concept that defines the teacher-technology relationship?

As previously mentioned, the line of research related to the conceptual definition of the terms "Digital Competence in Teaching", "Digital and Media Literacy" and "Professional Digital Competence" is highly productive. Both "Digital and Media Literacy" and "Digital Teaching Competence" have generated a large amount of literature, depending on the orientation of the researchers. In the case of "Professional Digital Competence", this is a relatively new term that is beginning to be widely accepted by the scientific community, although its use is mainly localised in Nordic countries.

However, this systematic literature review reveals an interesting fact. Of the 32 references analysed, only four have provided their own definitions of the concepts reviewed, which means that 87.5% of the manuscripts do not provide any new developments to the study concepts.

Of the four references mentioned, three provide their own definition of the term "Digital Competence in Education" and one for "Professional Digital Competence". With regards to the definition of "Digital Competence in Teaching", no new contribution can be observed differing from the synthesis above. All of them have a strong instrumental character, except the definition provided by Cabero-Almenara and Palacios-Rodríguez (2020):

> "Such competencies, coined as Digital Competencies, can be defined as the ability to consistently apply the attitudes, knowledge and skills required to plan, manage, evaluate and continuously review ICT-supported instruction, based on theory, current research and proven experience" (Cabero-Almenara and Palacios-Rodriguez, 2020).

Nagel defines (2021, p.107) however Professional Digital Competence with an emphasis on the importance to the transfer of knowledge to learners: "PDC is understood as a twofold process, in which teachers continuously develop their own and their students' digital competence".

Given the results obtained, it is worth questioning the idea put forward by Botturi (2019), which warns of the possibility of a terminological collapse. Also, the very nature of the concepts, especially the concepts of Digital Literacy and Digital Competence in Teaching, makes them more susceptible to change due to their dependence on technological evolution (Buckingham, 2019).

3.3. Q1.3 What are the competency "frameworks" or "models" identified in the selected literature to define the teacher-technology relationship?

The literature has provided evidence on the relevance of teachers' digital competence as a variable of success. This evidence has materialised in various initiatives that systematise, organise, and categorise this competence through conceptual frameworks and models. These frameworks facilitate the design of in-service training by having a

precise categorisation of what digital competence and its dimensions entail. It also helps teachers to be aware of their level of professional development in technology and their training strengths and weaknesses. A study by Padilla-Hernández (2019) has identified three lines of research on digital competence frameworks and models:

1. Weaknesses in approaches to digital competence frameworks: they reflect a limited view of educational ecosystems, the complex interactions that occur within them and the over-instrumentalization of technology (Castañeda et al.
2. Questioning the existence of a single framework for all educational realities and teacher profiles: it is difficult to address the different realities in educational settings in a single framework. Moreover, teacher profiles are complex and influenced by multiple environmental variables (Sosa and Valverde, 2020).
3. Need for a deeper analysis to focus on digital competence in the development of teaching practice: It is essential to carry out a thorough analysis to focus on digital competence in the development of teaching practice. This analysis will identify areas for improvement and opportunities for growth in digital skills for teachers.

The literature has proposed multiple models and frameworks for conceptualising digital competence, aimed at different educational levels and linked to governmental and private initiatives. Among them, two theoretical models stand out:

- The TPACK (Technological, Pedagogical and Content or Disciplinary Knowledge) model: formulated by Mishra and Koehler (2006) from Shulman's (1986) model, it argues that teachers must develop three types of knowledge to achieve successful technology inclusion. Falloon (2020) extends this model to include personal-ethical and personal-professional competencies.

- The model proposed by Krumsvik (2007): stems from the need to understand the nature of digital competence to integrate it efficiently into educational policies. It is based on three levels of competence: basic ICT skills, ICT didactic competence and learning strategies.

In terms of frameworks, two initiatives are the most referenced:

- DigCompEdu (European Commission, 2017). This initiative provides detailed guidance for the development of education policy and capacity building in diverse regional contexts, considering complex scenarios such as non-formal learning. It is based on rigorous research and best practices, providing relevant recommendations and guidelines to improve the quality of education in each region.

- Common Framework of Reference for Professional Digital Competence (Marco Común de Referencia para la Competencia Digital Docente; INTEF, 2017). This initiative, promoted by the Ministry of Education, Culture and Sport (MECD) of the Spanish Government, has gone through several versions since 2012. It has counted on the collaboration of autonomous communities, experts, teachers, consultancies and universities. The framework is organised into 5 areas, 21 competences and 6 levels, and to date represents a solid, consensual, and far-reaching initiative. It has now been replaced by the

Framework of Reference for Digital Competence in Teaching, in its January 2022 version.

In addition to these, there are other relevant frameworks that have been identified, such as the Norwegian Comprehensive Framework for Teacher PDC (Kelentrić et al., 2017), Project Links (SITEAL, 2018) or DigLit (Hall et al., 2014).

3.4. Q1.4 Do the authors of the included manuscripts provide a definition of the concept that defines the teacher-technology relationship within a competency "framework" or "model"?

In response to this research question, the results of the systematic literature review describe a similar picture to the previous question. Out of the 32 references reviewed, only three conceptual models or frameworks of their own character were found that address the topic:

1. Integral Teaching Competence in the Digital World (Castañeda, Esteve and Adell, 2018): this model was born because of the deficiencies found, in the main models reviewed. But they do not start from a teaching action model, ignore the complexity of educational contexts mediated by technologies, amd finally, they are generally based on an instrumentalist and deterministic vision. Their scope of application is centred on basic education.
2. Socio-cultural model for the development of digital competence in teaching (Colás et al., 2019). Their proposal stems from the detection of the lack of a pedagogical approach. The model provides a sociocultural vision for the development of digital competence in teaching.
3. McDonagh's PEAT model (McDonagh et al., 2021). This model focuses on capturing the different dimensions of teachers' professional digital competence.

These models provide a theoretical basis for understanding and developing teachers' digital competence in the current context. However, more research is needed to comprehensively address this subject area.

4. Conclusions

The main objective of this article is to answer the question of how the concept of Digital Competence in Teaching is defined through a review of the literature. To address this question, four research questions have been posed related to the conceptualisation used by the literature in terms of "Digital and Media literacy", "Digital Competence in Teaching" and "Professional Digital Competence". We have also sought to analyse the extent to which conceptual frameworks and models have been used to answer the main question. Given that the line of research addressed has a high degree of saturation, an attempt has been made to determine new contributions made in the last six years.

The first notable aspect of the findings of this study is the high level of conceptual disintegration. There are many vaguely differentiated concepts, such as "Information Literacy", "Computer Literacy", "Internet Literacy", "Media Literacy" or "Multimodal Literacy", as well as others with a wider scope in the literature, such as

"Digital Media Literacy", "Digital Competence in Teaching" or "Professional Digital Competence".

Beyond the differentiation in nomenclature, the review shows that there is no clear consensus on the dimensions covered by each concept, which leads to indiscriminate and undifferentiated use, making it difficult to establish their precise nature. What does seem to emerge from the literature is that the terms 'Digital Literacy' and 'Digital Competence' have a strong instrumental character, as well as a two-stage evolution: an initial stage focusing on operational and technical aspects, and a more complex conceptualisation later.

It is also noted that this conceptual disintegration is due to linguistic preferences and geographical differences, with the term 'Digital Literacy' being more common in the Anglo-Saxon world and 'Digital Competence in Teaching' in the European context. However, according to McGarr and Mcdonagh (2021), several authors advocate the use of both terms interchangeably.

The next aspect to consider is the low volume of new contributions to the definition of the concepts mentioned above. Most of the manuscripts reviewed in the SLR use definitions and conceptualisations s made by other authors. These results invite reflection on the state of the question, as one one hand, it could also indicate a saturation of the line of research, with few possiblenew contributions. On the other hand, it could confirm the idea that the line of research, far from being closed, is facing a loss of focus. With the exception of the Norwegian initiative providing the term "Professional Digital Competence", which is already a decade old, no highly relevant contributions can be observed. Conceptual and competence frameworks seem to be a new way to categorise and define digital competence in teaching, but they also face a high volume of contributions with specific aims, approaches, and interests. It is important to bear in mind that, although they may represent a new way of categorising the concept of digital competence in teaching, it is necessary to reflect on the underlying interests, as they may subject the evolution of education to corporate interests that are diverted from the ultimate purpose of education: to provide quality education (GEM Report UNESCO, 2023).

Another conclusion derived from the study is that there is a need for the scientific community to concretise the taxonomy related to technologies in education. Janssen et al. (2013) point to the need to find a "common language". The review of the literature suggests multiple ways in defining and understanding digital competence. This conclusion feeds into a new initiative already underway, in the form of a study being carried out in connection with the main work of this research.

Finally, it is worth mentioning that teacher education seems to be the factor that most influences the development of digital competence in teaching. Both at the entry-level education for teacher university training programmes, and as continuing education, once joining the profession. It is important to design education programmes with a vertical approach to enable more coherent professional development (Petko et al., 2015). It is also important to consider context specificity as a key to more efficient training designs. The connection between entry-level programmes and the reality of the classroom seems to be a factor to consider adapting teaching at university level and achieve greater impact (Aagaard et al., 2022). In this

sense, it agrees with the idea that it is necessary to reformulate and review the subjects related to technology education in university programmes.

These results highlight the importance of being precise when talking about the relationship between teachers and technology. The complex picture described in this review makes it necessary for the scientific community to reach a consensus to establish a starting point for a more holistic and context-specific approach to technologies in educational settings.

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Revista Latinoamericana de Tecnología Educativa, 23(1)
https://doi.org/10.17398/1695-288X.23.1.43

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Revista Latinoamericana de Tecnología Educativa

ARTICLE / ARTIGO

Student engagement in the Flipped Classroom model implemented in online learning

O envolvimento do aluno no modelo Flipped Classroom implementado na aprendizagem online

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Received: 30 april 2022
Reviewed: 31 july 2023
Accepted: 14 september 2023

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Abstract: Student engagement is a determinant factor of students' academic success, with added relevance for online learning. The aim of this study was to analyse students' cognitive, affective, and behavioural engagement in a pedagogical proposal based on the Flipped Classroom model, with Portuguese secondary school students. The study, conducted during the COVID-19 pandemic, combined asynchronous and synchronous lessons divided into learning episodes (Summary, Quiz and Rooms). Mixed methods were used to analyse students' discourses, behaviours, perceptions of the experience and academic performance. The results showed that the proposal enhanced a high level of behavioural engagement in the students as expressed by the indicators of task completion, peer interaction and participation. Students showed higher levels of cognitive engagement in the Rooms episodes as they were conducive to peer interaction, explicitness of knowledge and reflection facilitated by interaction with the teacher. Satisfaction was the most prominent indicator of student affective engagement. This study offers a better understanding of the factors that influence student engagement in the Flipped Classroom model and suggests practical implications for enhancing it in online learning.

Keywords: Student engagement, Flipped Classroom, Online learning, Student-centred Learning, Student experience.

Resumo: O envolvimento do aluno é um fator determinante do sucesso académico dos alunos com acrescida relevância na aprendizagem online. Este estudo teve como objetivo analisar o envolvimento cognitivo, afetivo e comportamental dos alunos numa proposta pedagógica baseada no modelo Flipped Classroom, com estudantes do ensino secundário português. O estudo realizado durante a pandemia COVID-19 conjugou aulas assíncronas com síncronas divididas por episódios de aprendizagem (Resumo, Quiz e Salas). Através da utilização de métodos mistos analisaram-se os discursos, comportamentos, perceções sobre a experiência e o desempenho académico dos alunos. Os resultados mostraram que a proposta potenciou um elevado nível de envolvimento comportamental dos alunos expresso pelos indicadores realização das tarefas, interação com os pares e participação. Os alunos apresentaram níveis superiores de envolvimento cognitivo nos episódios Salas por serem propícios à interação com os pares, explicitação de conhecimentos e reflexão facilitada pela interação com a professora. A satisfação foi o indicador mais proeminente do envolvimento afetivo do aluno. Este estudo contribui para um melhor entendimento dos fatores que influenciam o envolvimento do aluno no modelo Flipped Classroom, apresentando implicações práticas para o aprimorar na aprendizagem online.

Palavras-Chave: Envolvimento do aluno, Flipped Classroom, Aprendizagem online, Aprendizagem centrada no aluno, Experiência do aluno.

1. Introduction

When integrated into educational systems, Digital Information and Communication Technologies (DICT) broaden the concept of education by generating new learning spaces and changing the role of the agents involved (Ruiz, 2021). In this sense, online education overcomes geographical limitations by offering students ubiquitous learning opportunities. In this context, student engagement has been identified as a critical factor for learning success, as it is associated with student satisfaction and academic performance (Xu et al., 2020).

Since there is no guarantee that the widespread use of technology will promote active learning and improve school results (Bond & Bedenlier, 2019), it is important to investigate methods to enhance the effectiveness of online learning and, consequently, student engagement (Xu et al., 2020).

Although student engagement is extensively researched, there is no consensus about its exact nature and composition (Eccles, 2016), with various definitions and conceptualisations emphasising the multidimensional character of this concept (Xu et al., 2020). In this sense, student engagement reflects the student's internal psychological state, including behaviour, cognition and emotion (Kahu, 2013). It relates to the student's behaviour, experience and thinking about the learning content (Schindler et al., 2017). It is the energy and effort that students use within their learning community, observable through behaviours, cognitive and affective indicators in a continuum and shapable through the complex interactions of the environment, relationships and learning activities (Bond & Bedenlier, 2019).

There are substantial overlaps and similarities in the definitions presented, namely the existence of three dimensions of engagement: cognitive (CE), affective (AE) and behavioural (BE) (Fredricks et al., 2004). According to these authors, BE refers to students' participation in a learning activity, such as completing a task, attending classes or contributing to discussions. AE relates to students' emotional responses or feelings towards teachers, peers, learning and school. Lastly, CE refers to students' psychological investment in tasks and how they use self-regulatory and metacognitive strategies to understand and master knowledge.

When we talk about engagement, we also have to consider the existence of the opposite, i.e., disengagement, evidenced when students are not committed to their own learning, showing little interest and low academic results (Rumberger & Rotermund, 2012). Therefore, each dimension of engagement is associated with a series of indicators of student engagement and disengagement that fluctuate in a continuum depending on their activation and valence (Bond, 2020), and that can be measured as they are attributes that belong to the construct.

In online learning, pedagogical approaches that have adopted the Flipped Classroom Model (FCM) have proven to be pedagogically effective (Ribeirinha & Silva, 2021). Theoretically based on collaborative learning theory and constructivism (Bishop & Verleger, 2013), the model proposes an inversion in the order in which activities are presented to students. In this sense, it shifts the process of transmitting knowledge (factual knowledge) to virtual environments by simply reading or watching educational videos, reserving the processes of expanding knowledge for meetings with the teacher

and peers (Ribeirinha & Silva, 2021). The model offers students several pedagogical advantages (Lai et al., 2021): (1) it allows for reading flexibility associated with the pre-lesson component, where the wide variety of formats through which content can be made available caters to students' different learning styles; (2) it integrates technology, as the properties of technological resources (platforms and educational videos) allow students to take greater control of their learning, both through the pace and frequency with which they interact with the content, as well as the feedback they receive, and (3) it facilitates active learning, which is associated with meaningful interactions with peers and the teacher. However, the success of the model is heavily dependent on student engagement (Lai et al., 2021).

This study adopted the bioecological model of student engagement in technology-enhanced learning environments proposed by Bond and Bedenlier (2019), which was later adapted by Bond (2020) for the FCM. According to the author, the classroom where FCM is applied constitutes a microsystem. In this microsystem, the student occupies a central place and interacts with the teacher, classmates, technology, activities and the learning environment (identified as facilitators of student engagement). The action of each facilitator on the student's engagement takes place through a series of influencing factors. So, for example, with regard to the teacher, the following are influencing factors: presence, feedback/support, time invested, digital skills, acceptance and use of technology, previous experience of DICT, expertise in curriculum content, professional development and professional networks. [Other influencing factors can be found in Bond (2020)]. Influencing factors can affect various indicators of student engagement, for example, task fulfilment (BE), comprehension (CE), satisfaction (AE) (Bond, 2020).

Although this conceptual framework was designed for blended learning environments, it was adopted to study student engagement in an online environment. Given that the FCM is flexible enough to adapt to the needs and restrictions of this context and robust enough to maintain its identity and the inherent advantages of its use (Ribeirinha et al., 2022). In addition, by including the interactions that the student establishes within the learning community that shape student engagement, it is in line with studies on interactions in distance education (Moore, 1989).

Studies on FCM and student engagement have revealed not very consistent results (Bond, 2020). O'Flaherty et al. (2015) found very limited evidence to support increased student engagement, suggesting future research to examine other engagement indicators. The study by Bhagat et al. (2016) showed that students perceive themselves as more involved and active in the FCM. However, Lo and Hew (2021) found no significant differences in student BE between flipped and traditional classrooms. In a systematic review of 107 studies in K-12 education, Bond (2020) indicated that in 93% of the studies analysed, the FCM positively affected at least one dimension of student engagement. The indicators positive collaboration and peer-to-peer learning were particularly boosted, as were the increase in satisfaction, participation and the improvement in student-teacher relations. However, it also pointed out that 50% of the studies showed at least one side of student disengagement, with the most cited indicators being incomplete tasks, frustration, lack of will and confusion. In this sense, further research is suggested to understand exactly how the FCM improves student engagement (Bond, 2020). Therefore, this study attempts to overcome the abovementioned limitations by exploring multiple resources to investigate student engagement in a pedagogical proposal based on the FCM in

online learning. The aim was to assess student engagement by analysing student discourse, behaviour, perceptions of the experience and their academic performance in a study guided by four research questions: (1) What is the student's level of BE in the presented pedagogical proposal? (2) What levels of student CE were found in the different episodes of the synchronous sessions? (3) Is there any relationship between the student's level of CE in the synchronous sessions and their academic performance? (4) How do the different facilitators influence students' CE, BE and AE in the context of online learning?

2. Method

This is an evaluative research orientated towards change, with the aim of understanding and interpreting the educational reality to propose actions for improvement. This research used an exploratory sequential mixed methods approach (Cresswell & Clark, 2013). It began with the collection and analysis of qualitative data, followed by quantitative analyses and finally, the interpretation of the entire analysis, integrating qualitative and quantitative results.

Mixed methods research can be particularly revealing in exploring the complexity of a constantly evolving concept such as student engagement (Bond, 2020), aiming to understand better how the different facilitators present in the learning environment influence it. In addition, the mutual contribution of the potential of each method generates more comprehensive and robust answers to the initial questions (Cresswell & Clark, 2013).

2.1. Participants and the context

The research was carried out with 24 students (14 female and 10 male students, with an average age of 16.25 years) in the 11th year of Portuguese secondary education. Data collection took place in the Physics and Chemistry subject, between February and April 2021, corresponding to the second closure of schools in Portugal caused by Covid-19.

In this context, a pedagogical proposal based on the FCM was implemented with two components: asynchronous lessons (AssL) and synchronous lessons (SL). For the AssLs, the Edmodo platform was used, where the programme content was made available in the form of educational videos accompanied by a set of slides, a monitoring quiz, the pages of the class book related to that content and the list of exercises to be solved.

The SLs were held on the Zoom web conferencing platform. They were organised in learning episodes, the first few minutes of which were for welcoming and monitoring the tasks set out in the AssL. Then, through dialogue with the students, a summary of the AssL content was constructed, and the aspects that had raised the most queries were explored (Summary). Afterwards, the quiz (Quiz) questions were analysed and corrected with the participation of the students. Lastly, the students were randomly assigned to six breakout rooms to work in groups on a set of activities that included solving problems, exploring simulations, and analysing experimental results (Rooms). The timetable for the subject included two AssLs, one of 50 minutes and another one of 100 minutes, interspersed with two SLs of 100 minutes each.

2.2. Data collection and processing

Data was collected from four sources to answer the research questions: records from the Edmodo platform and the teacher, discourse produced on the Zoom platform, knowledge assessment tests and a group interview. The semi-structured interview was conducted using a script organised into two main areas of information: the AssL and the SL. The different types of interactions were explored in each area: teacher-student, student-student, student-content and student-technology. Twenty-one students volunteered to take part in the interviews. They were interviewed virtually and in groups of three. The average length of the interviews was 35 minutes, and the audio was recorded with the participants' permission. After transcribing the interviews, a categorical content analysis was carried out (Bardin, 2011). The data was classified according to the categories corresponding to the different facilitators of student engagement proposed in the Conceptual Framework for Student Engagement in the FCM (Bond, 2020). This analysis aimed to identify the influencing factors of each facilitator present in the students' discourse and describe their effect on student engagement. Content analysis was also conducted on the students' discourse produced during the SLs. The students' discourse was transcribed, and then the units of analysis were categorised using the analytical framework proposed by Zhu (2006) (table 1).

Table 1. Analytical framework for student CE in online group discussion adapted from Zhu (2006)

Category		Description
Question	Vertical (QV)	Question that has a direct and correct answer.
	Horizontal (QH)	Question that has no direct and correct answer. Inquiring or starting discussion.
Statement	Responding (SR)	Statement that is made in direct response to a previous message(s).
	Informative (SI)	Statement that provides information (anecdotal or personal) related to the topic under discussion.
	Explanatory (SE)	Statement that presents factual information with limited personal opinions to explain previous messages.
	Analytical (SA)	Statement that offers analytical opinions about the topic under discussion.
	Synthesizing (SS)	Statement that summarises or attempts to provide a summary of discussion.
	Evaluative (SEv)	Statement that offers evaluative or judgmental opinions of key points in the discussion.
Reflection	Reflective of changes (RC)	Statement that reflects on changes in personal opinions and behaviours.
	Reflective of using cognitive strategies (RS)	Statement that explains or reflects on one's use of cognitive strategies/skills in accomplishing certain learning tasks.
Scaffolding	Scaffolding (S)	Statement that guides students in discussing concepts and in learning content materials by offering suggestions.

According to this structure, each categorised unit of analysis can be assigned a score based on how cognitively deep it is. Thus, QV was assigned a value of 1, QH a value of 2 and so on up to S with a value of 11 (Xu et al., 2020). As each SL was divided into three learning episodes, this categorisation made it possible to assess the number of interactions per student and the student's level of CE (based on the score awarded) in each episode. Subsequently, the possibility of a correlation between the student's CE and his/her academic performance (obtained through knowledge assessment tests) was analysed.

The evaluation of the students' BE used the number of students who answered the various quizzes (Edmodo platform), the number of students who summarised the AssL (records of the teacher of the subject) and the results of the analysis of the students' interviews. The student's AE was only assessed based on the results of analysing the interviews. To ensure the consistency of the analysis procedures, 20% of the coding of the interview content and the students' discourse in the SL was done simultaneously by two coders, with the agreement level between the two being respectively 0.79 and 0.87.

3. Results

3.1. Records of the Edmodo platform and the teacher

In each AssL, the students had to answer a monitoring quiz and summarise the materials provided. The average number of students who completed all the quizzes (23.3 students) and all the summaries (23.8 students) was calculated by adding up the number of students who completed these tasks and dividing it by the number of AssLs.

3.2. Speeches produced on the Zoom platform

Table 2 shows the number of students' discursive interactions categorised in each learning episode and the respective duration of the episodes.

Table 2. Number of interactions categorised in SL.

		Summary		*Quiz*		Rooms	
SC	N (students)	n (interactions)	t (minutes)	n (interactions)	t (minutes)	n (interactions)	t (minutes)
1	24	23	18,28	9	6,46	20	12,10
2		25	14,85	15	9,35	35	18,27
3		11	9,01	11	7,87	49	30,41
4		23	26,55	5	9,84	56	26,99
5		8	7,72	12	6,94	33	45,72
6		25	22,04	15	12,96	67	32,03
7		29	25,04	19	18,57	22	19,91

Given that the duration of the episodes varied throughout the SLs, in order to check whether the number of discursive interactions varied with the type of episode, it was necessary to normalise the data. To do this, the number of interactions of each

student was divided by the duration (in minutes) of the learning episode. The total number of discursive interactions per minute for each student was then calculated by adding up their interactions in the seven episodes of the same type. Table 3 shows the descriptive analysis of the total number of interactions per minute for each student in the three learning episodes.

Table 3. Descriptive analysis of the total number of interactions per minute of each student in the three learning episodes and respective statistical analysis .

	N	Minimum	Maximum	Median	Shapiro-Wilk, W	Shapiro-Wilk, p	Friedman test		
							χ^2	df	p
Resumo	24	0	1,09	0,211	0,880	0,008			
Quiz	24	0	1,14	0,309	0,917	0,051	3	2	0,223
Salas	24	0,0371	2,41	0,350	0,679	< 0,001			

The results of the Shapiro-Wilk test showed that the data did not have a normal distribution ($p < 0.05$), so the medians of the total number of interactions per minute in the three episodes were compared using the Friedman test. The Friedman test showed no statistically significant differences in the medians of the total number of interactions per minute in the three learning episodes.

Table 4 shows the categories of student CE present in the different learning episodes. There is SR in all the learning episodes, but there is a broader spectrum of the student's CE in the Rooms.

Table 4. Categories of CE of the student observed in the three learning episodes.

SC	Summary	*Quiz*	Rooms
1	QV; DR; DI; DE; DA	DR	QV; DR; DI; DA; RM
2	QV; DR; DI; DA	DR; DI; DE; DA	QV; QH; DR; DI; DE; DA; DS; DAv; RM
3	DR; DA	DR; DE	QV; DR; DI; DE; DA; RM
4	QV; DR; DI; DE; RM	DR; DI	QV; QH; DR; DI; DE; DA; DS; RM; RE
5	DR	QV; DR; DI; DE; RE	QV; DR; DI; DA; RM
6	QV; DR; DI; DE; RM	QV; DR; DI	QV; QH; DR; DI; DE; DA; DAv; RM
7	QV; DR; DI; DE	QV; DR; DI; DE; DA	QV; QH; DR; DI; DE; DA; RM

When comparing the student's level of CE in the three learning episodes, the level of CE achieved in each episode was determined for each student. To do this, we added up the values (attributed according to the indication given in 2.2) of their discursive interactions produced in that learning episode. Subsequently, for each student, the value of the CE in the seven episodes of the same type was added up. Table 5 shows the descriptive analysis of the total value of the student's CE in the three learning episodes and the statistical procedures used to compare them.

Table 5. Descriptive analysis of the total value of the students' CE in the three learning episodes and the respective statistical analysis.

	N	Minimum	Maximum	Media n	Shapiro-Wilk, W	Shapiro-Wilk, p	Friedman test		
							χ^2	df	p
Resumo	24	0	79	14	0,800	< 0,001			
Quiz	24	0	37	10	0,888	0,012	14,5	2	< 0,001
Salas	24	1	251	28	0,598	< 0,001			

The results of the Shapiro-Wilk test showed that the data did not have a normal distribution ($p < 0.05$), so the student's level of CE in the three episodes was compared using the Friedman test. This test showed statistically significant differences in the student's CE level medians in the three learning episodes. Subsequently, the Durbin-Conover test was carried out, which showed that the students' level of CE in the Rooms is statistically different from the CE in the Summary and the Quiz (table 6).

Table 6. Comparison between peers (Durbin-Conover test).

	Statistics	p
Resumo - Quiz	1,12	0,270
Resumo -Salas	3,18	0,003
Quiz -Salas	4,29	< 0,001

Combining the results of table 6, which show a higher median student CE in the Rooms, with the result of the Durbin-Conover test, it can be seen that the student CE in the Rooms was higher than the student CE level in the Summary and in the Quiz.

3.3. Academic performance results versus student's CE

The possibility of a correlation between the student's CE and his/her academic performance was analysed using the results of each student's assessment tests (on a 200-point scale) and the respective total CE value obtained in the seven SLs (table 7).

Table 7. Descriptive analysis of the student's total CE value and the assessment tests combined with the results of the correlation between the two.

	N	Min.	Max.	Median	Shapiro-Wilk, W	Shapiro -Wilk, p	Spearman's correlation, ρ	Spearman's correlation, p
teste	24	46	196	117	0,933	0,113	0,005	0,982
EC	24	8	338	54,0	0,668	<0,001		

The results of the Shapiro-Wilk test showed that the data did not have a normal distribution ($p < 0.05$), so Spearman's correlation was used. This showed that there was no correlation between the student's CE and his/her academic performance.

3.4. Interview analysis

The interview analysis allowed to assess the action of the different facilitators present in the learning environment on student engagement. This action was described through the influence factors of each facilitator identified in the students' discourse, which

could be positive, negative or both (in tension), depending on the indicators of student engagement or disengagement that they promote.

Teacher

The influencing factors identified were *presence/feedback/support* and *use of technology/digital skills,* both of which positively affected student engagement. The action of the first factor facilitated *comprehension* through *reinforcement/consolidation, focus/explanation* and *reflection on prior knowledge (self-perception).* The action of the second appeared associated with the videos made by the teacher and promoted *attention* and *comprehension*.

Curriculum activities

Two factors of influence were identified *design/quality/usefulness/relevance* and *alignment*, both in tension. The *alignment* between the materials provided and the tasks facilitated *carrying out the tasks* and enabled *comprehension* of the content, and, in the SL, allowed more time for *interaction with peers*. The negative valence arose from the need to search for additional information to carry out some AssL tasks, which led to *disinterest* and *not carrying out the tasks*. Regarding *design/quality/usefulness/relevance*, the positive action was related to the design of the curriculum activities being based on the FCM, which provided *satisfaction* with the activities, made it possible to take *responsibility* for learning, creating *study and work habits* that translated into a *positive self-perception.* In addition, the design of the SL fostered *participation* of the students, *quality interactions with the teacher*, *learning with peers, understanding of the content and positive self-perceptions.* The negative action was associated with the obligatory nature of the AssL's tasks, which translated into *disinterest*.

Virtual learning environment (VLE) and technology

Regarding this facilitator, the following influence factors emerged in the students' discourse: *content size*, *evaluation* and *accessibility/usability/support*. The fact that the videos provided were short had a positive effect on the *interest* and *attention* with which the students viewed them. In *evaluation,* both positive and negative actions on student engagement were found. The application used to carry out the knowledge assessment tests *did not allow reflection* on the answers given (it was impossible to go back to the previous answer), and the immediate self-correction of the response caused *anxiety* and *stress* in the students. The positive action came in the self-correction of the AssL's *quiz*, which made it possible not only to gauge the quality of the self-study, *self-efficacy*, but also to decide on the need for more in-depth study of the content, *self-regulation*. The factor *accessibility/usability/support* also had positive and negative effects on student engagement. Some students were *satisfied* with this environment because it was more comfortable, allowed for greater autonomy, made it possible to investigate content and *ensured interactions with the teacher and peers*. The functionalities of the videos (pause, rewind, fast forward) helped in *understanding* the content and maintaining *attention* levels. The virtual rooms facilitated interaction with the teacher and *peers*, as they created a more private environment. The negative actions were associated with the distracting factors of the VLE, which *hindered study and work habits* and translated into *non-understanding* of the content, generating *dissatisfaction*. In addition, the excessive exposure of the students in the main VLE

room caused *discomfort* in the more introverted students, making it difficult to *interact with the teacher*. In addition, it was difficult to clarify doubts in more complex exercises, with several stages of resolution, which led to *dissatisfaction*.

Classmates

The influencing factor identified was the *opportunity for collaboration,* in tension. The positive action arose from the possibility of the AssL activities being carried out virtually in groups at the students' initiative. This promoted *interactions with peers*, allowed *reflection* on discrepancies in how tasks were solved and *learning with classmates*. In the SL, the random formation of the working groups allowed them to *manage expectations* since completing the task was the group's goal, and although there was no affinity in the group, this promoted *joint learning*. In other cases, the lack of affinity created awkward environments, where students *didn't feel comfortable*, *decreasing the interaction between them*.

Student

The influencing factors related to this facilitator were *motivation* and *personality,* both in tension. For Bond and Bedenlier (2019), motivation is the force that energises behaviour, an antecedent to student engagement, and can have external (extrinsic) or internal (intrinsic) causes for the student. Thus, the positive action of the *motivation* of the students appears to be associated with the organised, sequential and interactive structure of the proposed activities that made sense and made them *complete the tasks, interact and participate*. In addition, the need for *comprehension* of the content enabled them to perform better in the lessons and contribute more effectively to group tasks. On the contrary, the fact that it was a repeated experiment and implemented over a longer period had negative repercussions on the *enthusiasm* with which the students carried out the activities. Regarding *personality*, some students, regardless of the working group, *felt good and interacted with the group and the teacher*. Others, although they didn't interact on their own initiative, liked group activities because it "forced" them to *interact with their classmates*. However, the more reserved students or those who preferred to carry out the tasks individually found it more difficult to *interact with the working group*.

4. Discussion

4.1. Behavioural engagement

In the evaluation of the student's BE, the data collected showed that a large number of students always carried out the asynchronous tasks, namely the summary and the quiz. This result somewhat contradicts previous studies, as non-completion of tasks is the most prominent indicator of student behavioural disengagement in FC environments (Bond, 2020). However, this result can be justified by analysing the interviews, where the indicator carrying out tasks appeared to be associated with the positive action of alignment of curriculum activities and the positive action of student motivation. The following statement illustrates this:

> It was a very methodical study because everything was organised; to do the task ahead, we had to do the previous task, which was motivating because it made sense (Student1)

Although previous research indicates that extrinsic motivation can hinder BE in the FCM (Lai et al., 2021), as its increase leads to activities being carried out due to psychological pressure, the *alignment* of activities, translated by the use of the results of asynchronous learning to direct the student's synchronous learning, seems to have generated an integrated learning experience giving meaning to the work of the AssL, as it promoted student autonomy and a change in learning habits (Lo & Hew, 2017). The positive action of the group of influencing factors *design/quality/usefulness/relevance* of the curriculum activities supports this, as it enabled students to take *responsibility* for their learning by creating *study and work habits*.

In the literature, the *increase in interactions with peers* is the BE indicator most often quoted as a result of the FCM (Bond, 2020). In analysing the interviews, this indicator is present and resulted from the positive action of various influencing factors present in the different facilitators. It was associated with the *alignment* of the curriculum activities, which made it possible to optimise lesson time, the *accessibility/usability/support* of the VLE, which made it possible to create breakout rooms, and the *opportunities for collaboration* with classmates generated by the AssL tasks, which led to students coming together virtually to complete them.

In the AssL component, the videos made by the teacher positively affected the BE attention indicator, as can be seen in the following statement:

> In the video, the teacher explained everything in a slow, thorough way so that we understood everything. I think videos are essential, especially when she makes them (Student2)

This result is in line with the literature, which indicates that videos that are not made by the teacher are more likely not to be watched (Bond, 2020). Of course, the students' *attention* when watching the video will have repercussions on their *participation* and the *quality of interactions* (Olakanmi, 2017). The interviews suggest that, by indicating that these BE indicators are present in the SL.

4.2. Cognitive engagement

The evaluation of the student's CE showed that there was no influence of the learning episode on the number of interactions per minute produced by the students. However, the level of student CE in the *Rooms* was higher than that achieved in the *Summary* and the *Quiz*. The teacher led these two learning episodes, i.e., they were based on a question-answer dynamic, the categorisation of which led to a smaller spectrum of students' CE, with a superficial level of information processing (Zhu, 2006). In the *Rooms* there was a different learning dynamic; the interaction came from the student to the teacher. The sequence of interactions, as well as making it possible to "visualise" the process of building knowledge, supported it, as the teacher's actions boosted the cognitive processing of information. As a result, the *Rooms* have a more comprehensive range of interactions and a higher level of student CE. A result corroborated by the analysis of the interview, in which the positive action of the influence factors *presence/feedback/support* of the teacher facilitated *comprehension* through *reinforcement/consolidation*, *focus/explanation* and *reflection on prior knowledge*. Thus, when the teacher acts as a facilitator of learning, students exhibit greater behavioural and cognitive engagement, which is consistent with the results of previous research (Xu et al., 2020). The interviews also highlight the influence of the

VLE's *accessibility/usability/support* factor on student engagement, as the *Rooms* facilitated interaction with the teacher and colleagues by creating a more private environment. This contrasted with the excessive exposure the students felt in the main VLE room (*Summary* and *Quiz*), which caused *difficulties in interacting with the teacher* in the more introverted students.

A quarter of the studies on the FCM and student engagement indicate that the model improved indicators of student CE, *positive self-perceptions* and *self-efficacy* (Bond, 2020). These two indicators are also present in the analysis of the interviews and appeared in relation to the positive action of the *design/quality/usefulness/relevance* of the curriculum activities that created *study and work habits*; with the possibility of gauging the quality of autonomous study, provided by the self-correction of the *quiz* and in the SL, with the teacher's questioning. Therefore, this result reinforces the idea that the process of knowledge construction does not occur naturally in the VLE, but rather due to the careful planning of activities and teacher facilitation during the learning process (Zhu, 2006).

Another consequence of the FCM is an increase in the student's CE indicator *comprehension* of the content (Kong, 2015). In the interviews, this indicator was associated with the *presence/feedback/support* of the teacher, as well as her videos, the *alignment* and *design/quality/usefulness/relevance* of the curriculum activities and the *intrinsic motivation* of the student himself/herself.

There is a greater likelihood of understanding content when students' discourse shows deeper levels of information processing associated with the elaboration of concepts and the debate or negotiation of meaning (Zhu, 2006). Whether or not there was a correlation between the student's CE in the online environment and his/her academic performance was checked. The results of this analysis showed that the students who showed the most CE during the SL were not necessarily the ones who achieved the best results in the knowledge assessment test.

One possible explanation lies in the skills that help them learn. The students who learnt more easily didn't interact as much with the teacher to facilitate *comprehension* of the content, so they performed well academically without exhibiting high levels of CE. This result contradicts the study by Pietarinen et al. (2014), who found a positive correlation between the student's CE and his/her academic performance. However, it is in line with studies that indicate that the correlation between CE and academic performance is weak or that it is positively correlated with the student's BE and AE (King, 2015).

4.3. Affective engagement

Analysing the interviews showed that the most frequent AE indicator in the students' discourse is *satisfaction*. This indicator was associated with the *design/quality/usefulness/relevance* of the curriculum activities, which, being based on the FCM, provided *satisfaction* with the activities. This fact reported in the literature (Bond, 2020) is illustrated in the following statement:

> If we were told to answer questions from the book, we would, but it was more boring. So, as it was more interactive, I enjoyed doing the tasks (Student3)

The interactivity resulting from the *quiz* or educational games in the pre-lesson component of the FCM is a critical factor for the model's success (Van Alten et al., 2019). *Satisfaction* was also associated with the influence factor *accessibility/usability/support* of the VLE. Some students were *satisfied* with this environment because it was more comfortable, allowed for greater autonomy, made it possible to investigate content and *ensured interactions with the teacher and peers*. However, this influencing factor was also the cause of the student's affective disengagement because the distracting factors of the VLE *hindered study and work habits*, which translated into *non-understanding* of the content, generating *dissatisfaction*.

Previous research has shown that students' personal beliefs influence how they experience factors related to their learning, with negative beliefs being the basis of a spiral of student disengagement. In a study carried out during the Covid-19 pandemic, Pelikan et al. (2021) concluded that students with high perceived competence were better able to cope with learning in an online context because they exhibited self-regulation strategies. These students often reported success in autonomous learning and even enjoyed greater self-sufficiency because they could learn at their own pace and time. Meanwhile, the group with low perceived competence needed more support.

Although *satisfaction* is also associated with working with peers (Olakanmi, 2017), in analysing the interviews in relation to this facilitator, other indicators of the student's AE were found. In the SL, the formation of the working groups was random, which allowed them to *manage expectations* when there was no affinity in the group to complete the tasks. The following statement clarifies this:

> Randomness 'forces' us to know how to work with different people who think differently from us. In the future, it will be like this, in the labour market, we don't choose (Student4).

However, some students mentioned that randomness sometimes created *uneasiness*, as the following statement indicates:

> There are people who prefer to work alone, and in that case, the whole group does [the tasks] individually, leaving an awkward atmosphere. It's strange (Student5).

These statements alert us to the need to adjust pedagogical strategies in the online context to avoid a spiral of disengagement.

4.4. Implications for practice

Given that most of the different facilitators' influencing factors also negatively affected student engagement, it is essential to rethink some of the strategies adopted in the online context. Some students referred to the *non-completion of tasks* of the AssL due to the need to search for additional information to complete them. Others emphasised the *disinterest* resulting from the compulsory nature of the tasks.

In this context, the flexibilisation of learning paths associated with AssL can respond to these challenges, and it may include: (1) providing additional materials that allow for a more in-depth reading of the content and (2) allowing for a flexible exploration of the materials that meets the different learning styles of the students,

since the existence of different options encourages them to practise learning processes inside and outside their comfort zone (Fauzi & Hussain, 2016).

In the SLs, the distracting factors of the VLE *hindered study and work habits*, which translated into *non-understanding* of the contents, generating *dissatisfaction*. The difficulties in clarifying doubts on more complex exercises also caused *dissatisfaction*. In addition, the excessive exposure of the students in the main VLE room caused *uneasiness* in the more introverted students, *making it difficult to interact with the teacher*.

In this sense, it is important to promote self-regulated learning strategies, which involve helping students to set achievable goals, manage their time and monitor their execution. So, by achieving them, they experience greater perceived competence, with repercussions on intrinsic motivation and learning success (Pelikan et al., 2021). Another possibility is to increase the channels and forms of communication so that everyone feels comfortable interacting, also allowing the teacher to send feedback, which can boost self-efficacy and the teacher-student relationship.

The application used to carry out the assessment tests did not allow *reflection* on the answers given, and the immediate self-correction of the response caused, according to the students' perceptions, *anxiety and stress*. Also, the randomness in forming the working groups sometimes created awkward environments where the students *didn't feel comfortable,* decreasing the *interaction between them*.

Based on these results, it should be noted that the choice of learning applications and platforms should be cautious and adapted to the profile of the students. Building a profile of each student's engagement, which brings together multiple pieces of evidence from their journey, could be a more viable option for assessing students in this context (Riordan et al., 2016) and alternating between working groups chosen by the students and random groups could boost student engagement.

5. Conclusion

This study has certain limitations that make it unrepresentative, and its conclusions can't be generalised. The sample size is very small, only 24 students. It was implemented during a critical period (the Covid-19 pandemic), which may have influenced some of the students' behaviours and perceptions, skewing the results obtained.

Additionally, the *Zoom* platform only recorded the breakout room where the host (the teacher) was, not allowing access to the students' discourse produced in her absence, which could lead to a different spectrum of interactions. However, the use of mixed methods to research student engagement in a pedagogical proposal based on the FCM and presented in online learning enabled greater acuity in analysing and understanding the phenomenon under study. In addition, it provided, in the students' own words, concrete information on the aspects to be improved in online learning.

The pedagogical proposal led to high levels of student BE expressed by the indicators *task fulfilment*, *interaction with peers (and teacher)* and *participation*. This

was made possible by aligning the tasks proposed in the AssLs and the SLs, whose effect on student motivation created *study and work habits*. The characteristics of the videos made by the teacher and the optimisation of the SL's time, when combined with the technological support of the VLE, ensured *participation* and *(quality) interactions with peers and the teacher*. The students showed higher levels of CE in the *Rooms* compared to the other two learning episodes. The *Rooms* created a more private learning environment, where students had a more active learning dynamic, favourable to interaction with peers, the *explanation of knowledge* and *reflection* facilitated by interaction with the teacher. No correlation was found between the student's CE levels in the synchronous sessions and his/her academic results.

The most prominent indicator of the student's AE was *satisfaction*, but most of the facilitators analysed also negatively impacted the student's AE. In this context, the increased importance of the teacher in supporting the students' emotional development and the construction of knowledge is highlighted.

6. Acknowledgments

This work is funded by Life Quality Research Centre (LQRC-CIEQV) under project no. UID/CED/04748/2020 through national funds from FCT/MCTES-PT.

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Revista Latinoamericana de Tecnología Educativa, 23(1)
https://doi.org/10.17398/1695-288X.23.1.61

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Contributions of a blog to the identity, development and professionalisation of Social Education

Contribuciones de un blog a la identidad, el desarrollo y la profesionalización de la Educación Social

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Received: 21 january 2023
Reviewed: 24 october 2023
Accepted: 14 november 2023

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Abstract: Social media have a special role in today's society and this is being reflected in the development of the professions. Social Education does not escape from this reality and to this we can add the lack of studies on the subject. This article presents part of the analysis carried out as part of a wider investigation into the contribution to Social Education of a blog called "Educablog", which has been running for more than 15 years. The aim is to analyse the contribution of the blog to the identity, professional development and professionalisation of Social Education, from the perspective of professional users. In this research we have opted for a qualitative methodology and we have used the lifeline where we have relied on the use of photographs to gather information. The discourse generated in the development of the dynamic shows significant contributions from "Educablog" in the professionalization, professional identity and professional development of Social Education. In the same way, it has been shown that digital media have significantly accompanied the evolution of Social Education within and outside this object of study.

Keywords: Social education, Professional identity, Professional development, Professionalization, Lifeline, Blog.

Resumen: Los medios sociales tienen un especial protagonismo en la sociedad actual y esto está teniendo su reflejo en el desarrollo de las profesiones. La Educación Social no escapa ante esta realidad y a esto podemos añadir la falta de estudios al respecto. Este artículo presenta parte del análisis realizado en el seno de una investigación más amplia sobre la contribución a la Educación Social de un blog con más de 15 años de andadura denominado "Educablog". El Objetivo es analizar la contribución del blog a la identidad, al desarrollo profesional, y a la profesionalización de la Educación Social, desde la percepción de los y las usuarias profesionales. En esta investigación hemos optado por una metodología cualitativa y se ha utilizado la línea de vida donde nos hemos apoyado en el uso de fotografías para recabar la información. El discurso generado en el desarrollo de la dinámica evidencia aportes significativos desde "Educablog" en la profesionalización, la identidad profesional y el desarrollo profesional de la Educación Social. Del mismo modo, se ha evidenciado que los medios digitales han acompañado de manera significativa la evolución de la Educación Social dentro y fuera de este objeto de estudio.

Palabras-Clave:: Educación Social, Identidad profesional, Desarrollo profesional, Profesionalización, Línea de vida, Blog.

1. Introduction

This study is situated within the professional field of Social Education, focusing on analyzing the impacts on identity, professional development, and professionalization facilitated by a blog. The exploration of these concepts is crucial to comprehending the intricate dynamics of identity formation, professional growth, and professionalization within the field of Social Education.

Exploring professional identity in social education remains a relatively understudied and evolving theme. Constructing professional identity is an ongoing and dynamic process shaped by sociocultural interactions within the environment, as highlighted by Aguirre et al. (2015). It is essential to recognize that identity is a multidimensional concept, as emphasized by García-Vargas (2021). According to Aguirre et al. (2015),

> "professional identity creates solid ties between the individual and the social; one cannot separate the individual from the other, neither can one speak of individual change or progress without taking into account the idea of social change and consequently a representation of the professional self" (p. 87).

Professionals start from a self-perception of their work, which they identify and relate to their professional performance (Eslava-Suanes et al., 2018b). In this regard, Azevedo (2019) points out that as Social Education professionals, educating human beings with autonomy is essential. Specifically, through socio-educational intervention, the emancipation of the individual is recognized, providing them with the capacity for transformation.

Professional internships in Social Education offer an opportunity relevant to initial training, influencing the development of the future professional identities of Social Education professionals (García Vargas et al., 2016). Within this framework, Eslava-Suanes et al. (2018a) analyzed the competency profile associated with the Social Education professional, identifying 23 competencies categorized into communicative, critical-reflective, social, disciplinary, functional, and defining professional identity dimensions. The study highlights the need to design a specialized lifelong learning program to fill the gaps in initial university training (Eslava-Suanes et al., 2018b). Along these lines, Ricci Caballo et al. (2022) are committed to training from the perspective of systemic competencies, prioritizing curricula with diverse practices that adapt to change.

The training needs of the social educator constitute the foundation for shaping their intervention (Sánchez, 2015). For example, Cordón Sierra (2017) recognizes the importance of gradually integrating digital competencies into the professional development of Social Education. In this regard, he advocates for including ICT in the training process from a lifelong learning perspective. In our hyper-connected society in which we are increasingly "connected" to the network (Pallero & Sierra, 2021), information and communication technologies (ICT) have grown in popularity in recent decades, with the Internet offering an infinite number of resources (Marín et al., 2020). "The Internet is seen as a channel for dialogue, an enhancer of interaction, and a generator of new approaches and spaces for collaboration and cooperation" (Marín et al., 2020, p. 115). For example, while educational blogs, referred to as "edublogs," stand

out as powerful tools, Cabezas and Casillas (2019) argue that educators and social educators are not adequately prepared to navigate the challenges of educating in the network society. Against this backdrop, Martín and González (2021) call for an approach influenced by Freire. Consequently, it is crucial to recognize that discussion forums are highly interactive and collaborative digital resources and are especially beneficial when applied to social studies (Vázquez-Cano et al., 2015). Furthermore, it should be stressed that networking represents an opportunity to improve socio-educational practices (Varela Crespo, 2021).

Thus, professionalization is based on a process through which an individual's activity or occupation is considered a profession. Specifically, in Social Education, this process has been complex, gaining recognition over time (Sánchez, 2012). Social Education has not always existed (Caride, 2020), beginning in the 20th century with vast potential for the future. It has developed into a profession that dynamically evolves and adapts to the evolving needs of society (García-Vargas, 2021). Furthermore, it is recognized that each society has its own way of understanding it (Pérez et al., 2020). In this regard, a study in Spain has drawn attention to potential factors contributing to the deprofessionalization of Social Education, such as the profession's fragmentation and precarity due to insufficient funding (Cid-Fernández & Borges-Veloso, 2022). Furthermore, Ruiz Román (2017) emphasizes the fundamental role of Social Education in exposing and bringing attention to situations of social inequality. Table 1 presents various relevant definitions in the context of Social Education.

Table 1. Different definitions of Social Education.

Authorship	Definition
National Agency for Quality Assessment and Accreditation (ANECA)	"The social educator is defined as an agent of social change, a dynamiser of social groups through educational strategies that help people to understand their social, political, economic and cultural environment and to integrate appropriately" (2005, p.127).
State Association for Social Education (ASEDES)	"The right of citizenship that is embodied in the recognition of a profession of a pedagogical nature, generating educational contexts and mediating and training actions, which are the field of professional competence of the social educator, enabling: the incorporation of the subject of education into the diversity of social networks, understood as the development of sociability and social circulation; cultural and social promotion, understood as opening up new possibilities for the acquisition of cultural goods, which broaden educational, employment, leisure and social participation perspectives" (2007, p. 12)
Pérez et al.	"Based on the set of legislative, regulatory and legal elements and components that in turn make up the set of public social and educational policies, implemented in the set of micro territories and municipalities, from a local point of view, taking into account the geo-social criteria. Public policies are developed by a set of plans, programs, services, and projects of the different entities, institutions, agencies, and public and private agents that have been shaping the process, phenomenon, profession, action, and definition of Social Education" (2020, p.652).

In the 21st century, the figure of the social educator is becoming established, with increasing recognition of its pedagogical potential. This recognition is evident in the proliferation of studies and doctoral courses in Social Education, signifying its status as a recognized profession governed by deontological and legal standards (García-Vargas, 2021). However, concerns persist regarding the lack of clear regulation of the profession, and it is considered a versatile field that sometimes overlaps with the work of other, more established professions. In addition, both the profile and the fields of action of Social Education professionals are varied (Martínez-Pérez & Lezcano-Barbero, 2020).

1.1. Rationale and objectives

As previously mentioned, the work presented here forms part of a doctoral thesis with the following main objectives:

- To conduct a diagnosis of the contribution of Educablog to the identity, professional development, and professionalization of Social Education as perceived by professional users.

- To draw up a decalogue that includes actionable proposals aimed at promoting Educablog's role in fostering professionalization, identity, and professional development within Social Education.

Within this framework, it became essential to revisit the starting point for the Educablog" case. And what better way to do this than by gathering the contributions of its promoters? For this purpose, employing the lifeline methodology, supplemented with photographs, was deemed the most suitable approach. The objectives guiding the use of this methodology were:

- To analyze the contribution of "Educablog" to professional identity from the perspective of its promoters.

- To analyze the contribution of "Educablog" to professional development from the perspective of its promoters.

- To analyse the contribution of "Educablog" to professionalization from the perspective of its promoters.

- To explore the historical evolution of "Educablog".

2. Method

This research adopted an interpretative paradigm, seeking to delve into the perceptions of the professional followers of the blog. The primary focus was on analyzing the contribution of "Educablog" to social education from their perspective. Utilizing a case study methodology, the study sought to understand and explain a specific reality and, therefore, did not seek to generalize the results.

This is a qualitative type of research, with a focus on collecting the meanings people attach to the history in which they are involved (Hernández-Sampieri & Mendoza, 2018). Embedded within a broader research project, forming part of a

doctoral thesis, its role is to provide historical context through the lens of individuals who promoted the blog. Moreover, this research was reported favorably by the Ethics Committee for Research on Human Subjects (CEISH) at the University of the Basque Country, under the reference number M10_2020_218. Parrilla Latas (2010) advocates for an ethical culture, urging a critical and responsible attitude in research. It should be noted that this research aims to incorporate the diverse voices and perspectives of those involved in the subject of study (Busher & Fox, 2022).

The research was based on a case study. Following Stake (2005, 2013), this is characterized as an intrinsic case study since it is relevant and of interest in its own right. Moreover, according to Rodríguez et al. (2016) it can be regarded as a unique case within the historical-organizational modality because it is based on the evolution of a project such as "Educablog".

Instruments

Life stories are known by different names across various disciplines, each having its distinct purpose (Gramling & Carr, 2004). According to Tapia and Muñoz (2019, p.5) the lifeline provides "a brief biographical narrative that in turn enables the reflection and interpretation of meanings about relevant milestones in their life history". It is a qualitative and holistic account of a life, emphasizing experiences and presenting them chronologically in a visual representation of a person's life, noting their significance (Gramling & Carr, 2004). According to Moriña (2017), lifelines offer the opportunity for multiple narratives, allowing the presentation of data to focus on pivotal moments for its protagonists by analyzing the meanings of the events in the context where they occur. The lifeline is a visual representation of a life story, marking events chronologically and noting the significance or importance of such events (Gramling & Carr, 2004). This methodology is currently used in both professional and research settings (Moriña, 2017; Moriña & Cotán Fernández, 2017) and can be triangulated with other data collection methods (Gramling & Carr, 2004).

In the present research, photographs were chosen as a means to visually capture and illustrate significant milestones. Photo-elicitation involves incorporating a photograph (or other visual material) into a research interview (Mott et al., 2020). In this regard, the participants were given the freedom to select the images and articulate the accompanying discourse.

The rationale behind this choice was that photographs have a strong capacity to evoke and activate memories of the participants who are the protagonists of the depicted reality. The choice of a particular snapshot, along with the context in which it was taken, becomes crucial in gaining perspective and understanding its overall significance (Moriña, 2017). Similarly, as Banks (2010) points out, utilizing images is particularly fitting in today's society, in which images play a central role.

Participants

For the lifeline survey, four current promoters of "Educablog" were chosen. This decision was guided by the fact that it is considered key to grant the protagonists a voice in this type of technique. This approach empowers them to freely express their personal histories, transforming them into active research subjects (Moriña, 2017). The selected participants are male, aged between 43 and 46 years. They hold degrees in

Social Education, Pedagogy, Teacher Training, and Physical Education, as well as experience in other domains, including the education of children and young people on the streets, child protection, leisure, social services, and cultural management.

Procedure

Before the session, an application protocol was designed. The people involved in "Educablog" were then asked to compile photographs pertaining to the history of "Educablog." Each participant chose the 10 photographs they considered most representative of the key moments or milestones in the blog's history. Upon completion of the selection process, a date and venue were scheduled for the lifeline session, which lasted approximately two hours and was video recorded.

The process began with the sharing of the selected snapshots by each participant. Subsequently, the lifeline of "Educablog" was constructed through dialogues. Participants reached a consensus on the "milestones" in the blog's history and illustrated each one with one or two consensual photographs, accompanied by the narration of the respective protagonists (see Figure 1). In the process of selecting the photographs, careful consideration was given to analyzing the context in which they were captured (Moriña, 2017).

Figure 1. Lifeline development process.

Subsequently, the narrative was transcribed and visually accompanied by the lifeline and selected photographs. While the researcher directed the narration, this was primarily based on the voices of the protagonists, positioning the narrative in the first-person plural. In any case, the narrative and interpretation were reviewed and agreed upon by the entire group.

Analysis

The qualitative analysis was conducted using NVivo V. Release 1.5, extracting relevant information for the contextualization of the research and significant results to address the research objectives.

The mixed analysis proposed by Moriña (2017) was used, combining structural and narrative analyses. The structural analysis used the categorical system constructed to analyse the data collected during the fieldwork, enabling a comparison with data collected through other instruments. The author's omni-comprehensive model was also used, which includes five different perspectives— 1. holistic, 2. focused, 3. thematic, 4. chronological, and 5. subjective.

The categorical system (see Figure 2) consisted of two overall frameworks: "Contributions," approached inductively by applying the categorical system used throughout the research, and "Milestones." The latter included various subcategories that emerged deductively, referring to key moments in the history of the blog, which were identified by the promoters in the process of drawing up the lifeline.

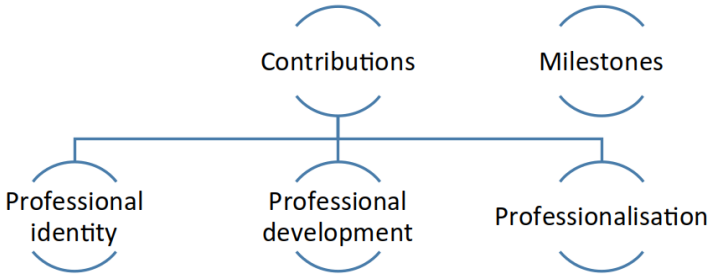

Figure 2. Categorical system (Main categories).

Concerning the analysis of contributions, specific categories emerged. For "Professional development" only significant references were found for "Training-conferences-workshops" and "Forums". For "Professional identity" noteworthy aspects included "Creating a collective network" and "Explaining-defining our work". In the context of "Professionalization", significant references included "Recognition-visibility" and "Complaints and demands" (see Table 2).

Tabla 2. Sistema categorial: Apartado de contribuciones. Fuente: elaboración propia.

Categorical Framework	General Categories	Subcategories	Definitions
Contributions	Professional Development	Forums	Spaces for reflection and professional communication
		Training-conferences	Continuous training in its different modalities (courses, congresses), offers and training needs of the group, supervision and external validation.
	Professional Identity	Explaining-defining our work	Ways of explaining/defining the work of a social educator.
		Create a collective network	Feeling of being part of a collective, fostering a sense of unity between professionals and generating a network both in person and virtually.
	Professionalization	Recognition - Visibility	Society's knowledge and appreciation of the work carried out by educators.
		Complaints and demands	Complaints and/or professional demands

Concerning "Milestones" 25 subcategories were identified (see Table 3). These subcategories refer to the key moments recognized by the promoters in the construction of the lifeline. The categorization involves grouping the discourse related to each of these milestones.

Table 3. Categorical system: Milestones section.

Categorical Framework	Subcategories				
Milestones	2005 BSide Educational Association	→	2006 Creation of the blog	→	2007 1st Bolunta Training
	2007 Blogstival	→	2009 Social networks	→	2011 Gijón Meeting
	2011 Libro De la red al papel	→	2011 First CEESPV course	→	2012 Valencia Congress
	2012 Training at the University of the Basque Country	→	2012 Presentation Barcelona	→	2013 Article third sector
	2013 Edusoday Basauri	→	2013 Galicia	→	2014 Edusoday Deusto
	2015 #Edusohistories + documentary	→	2016 Seville Congress	→	2016 Article Cuaderns
	2016 Tenth anniversary blog	→	2016 Agintzari Training	→	2017 Edusoday Barakaldo
	2018 20 University of the Basque Country Anniversary	→	2018 Imago	→	2020 #Edusolive Instagram
	2021 Nuevo blog				

3. Results

The results are presented on the basis of 4 categories: "professional identity", "professional development", "professionalization" and "milestones".

3.1. "Professional identity" category

The highest number of contributions emerged in this category, with a total of 41 references across three subcategories: "Creating a collective network" (35 references), "Explaining-defining our work" (5 references), and only one reference to "Vocation." Figure 3 illustrates the words carrying the most weight.

The subcategory "Creating a collective network" has the highest presence with regard to the contributions of "Educablog". Within this subcategory, emphasis is placed on the devirtualization of the network that was initially generated virtually:

> "Devirtualization. We start from a virtual blog, from a 2.0 space, a virtual space for networking together and also creating face-to-face networks. I think that is also key" (LV4).

In addition, this presence is linked to the trips made by the "Educablog" team to increase the visibility of the profession.

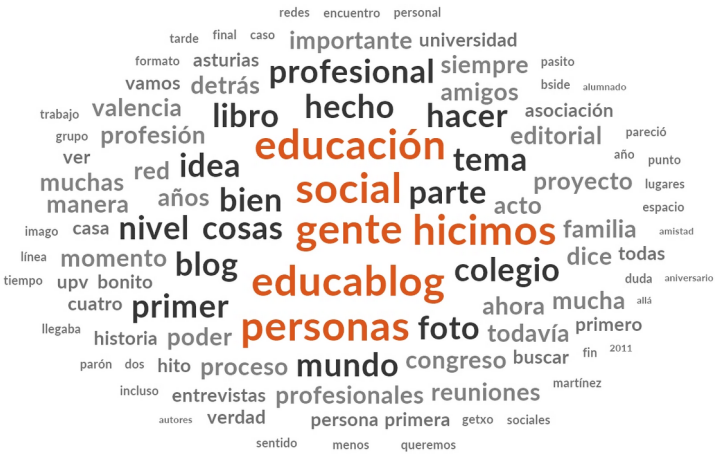

Figure 3. Word cloud related to the "Professional identity" category.

> "I think it was Asturias first, then we went from here to Barcelona. But from here on, there was an endless list of places to which we were invited, and we were delighted to be involved and to bring Social Education to wherever we were invited" (LV1).

The idea of creating a sense of collectiveness is prominent in the organization of Edusodays (see Figure 4). Edusodays hold significant importance, being considered a key identity event in the professionalization process, to which the blog has made a substantial contribution.

> "But at the collegiate level, October 2 was institutionalized as the World Day of Social Education. And if we were at these events (...) not only to go to a place to present a first book or whatever, or to provide training but to do something more relaxed, which the profession was demanding, which was to pause, to reflect, with technicians, with the university..." (LV1).

The literary projects initiated by "Educablog" have played a role in generating a network and instilling a sense of belonging within the profession. This is evident not only in the presentations but also in the creation process itself, especially in the case of #Edusohistorias, which required the collaboration of professionals from various fields:

> "None of the authors we asked told us that they did not want to participate. On the contrary, there were people who were left out and still asked why they were not told. We will take this into account in the future without any problem" (LV1).

This network not only involves Social Education professionals but has also collaborated with professionals from other disciplines:

> "The photographer was in a professional period of excessive creativity. But I also believe that he provided us with a series of crucial insights.The image is more his than ours, I would say" (LV3).

Figure 4. Eduso Day 2014

Moreover, within this network, professional and personal dimensions have been merged, as evident in the frequent references to friendship:

> "I feel that "Educablog" is a space that, yes, we have created it, the four of us, or five with Mertxe, but many more people are living behind... those words, those comments, all of that. So, first, there are those who put up with us, tolerate us, and then there is the whole network" (LV4).

With regard to the generation of this network, it is noteworthy that it is mixed with friendship:

> "And this photo reminds me of the strengthening of a friendship. We go there, we feel at home, they treat us very well, they invite our partners, they don't deprive themselves of anything, in terms of hotels, everything, they take us all over the country... I also think there is a lot of brotherhood between Basques and Asturians; I feel very much at home" (LV1).

In this generation of networks, emphasis has also been placed on the social networks of "Educablog," which have also had a significant impact on Social Education:

> "This (...) is a screenshot of an application to see a little bit, in the Valencia conference, if I'm not mistaken, a little bit of what had been tweeted, a tag cloud, and here we were, the ones who had tweeted the most. In the conference and with other friends: Marimar, Sera Sánchez, Oscar, the one we talked about before, Miquel Rubio...(...) it seemed to me to be very significant, the network and all of this, and also because another of the milestones has to be the social networks. I don't know if 2009 we entered Facebook or Twitter, so that's why it's here" (LV4).

We speak of people with their names:

> "I'm listening to us, and I'm amazed that we could make a list with all contacts or agents who are in any way part of this lifeline..." (LV2).

The following subcategories were identified concerning the "Explaining - defining our work" subcategories. These mainly relate to trips organized to different places, where the aim is to bridge the gap between the profession and society, enabling the collective to be identified and the profession to be visible:

> "And here, from this small formalization, we move on to what we have come to sometimes call Social Education On Tour, which is nothing other than to give shape to this central idea wherever we were allowed, and people from different parts of the region felt that they could identify with it, people from the academic world as well, and with more economic possibilities in this case, made it easier for us to work with them and take this message to other places." (LV1).

There is also talk of explaining the profession concerning the #edusohistorias project, in which twenty-five professionals wrote stories about various areas of Social Education:

> "At the end of the day, that's what it is, they are life stories, there's no more mystery, but It was very much part of the profession, and we made it choral, the people received it super well" (LV1).

Use is also made of the media and other publications to explain the profession:

> "But what this double-page spread in the Courier allowed us to say, we believe, was that our profession deserves it; we believe that someone has to be there for us to try to explain it (...) Raúl was more connected to the media; Iñigo, too, regularly attended some of the Ser's talk shows. But it had such an impact that, at the provincial level, it was possible to make what we were doing visible and put it in our own words. I think that was the most beautiful thing we could take away" (LV1).

Or social networks such as Instagram:

> "We were born with social networks, and which one is the most powerful and the most significant at the moment? Let us see if we can put another grain of sand in the profession with young people, something that it seems we are still struggling to achieve in terms of discourse; I don't know what discourse and whether it will be a bit old-fashioned or not, but at least let them know what they will encounter in their professional work" (LV1).

3.2. "Professional Development" category

This category of contributions emerged with the least intensity, with 28 references, of which the majority (24) refer to the subcategory "Training-conferences-workshops" and four refer to "Forums." Figure 5 shows the words with the greatest presence.

Within the subcategory "Training-conferences-workshops," the references predominantly center around the initiatives undertaken by "Educablog," in the implementation of training courses in relation to ICT and Social Education. The promoters actively collaborated with various professional schools and private entities within the third social sector.

> "This is a turning point in that sense. The school, then, that's why we have marked it. We did two courses in two years in 2011, 2012". (LV4).
>
> "In 2016 as well, the Agintzari training is very significant" (LV1). "If you remember, we talked about Bolunta, which is half institutional. There, there is the academic part, and then Agintzari, which is a private entity that has also worked with us" (LV2).

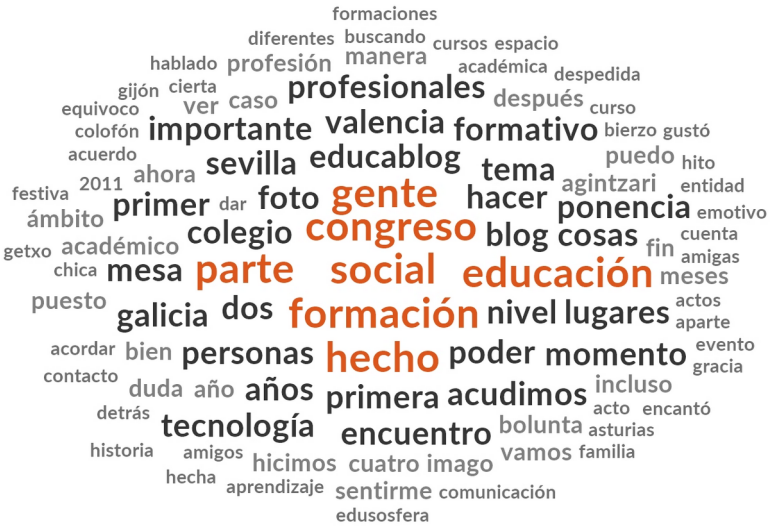

Figure 5. Word cloud relating to the "Professional development" category.

It is also worth highlighting the presentations given at meetings and workshops, mainly those dedicated to Social Education at the state level:

> "To top it off, what he said... this last photo of the Seville conference, I could not attend the one in Valencia that they both attended. Here, we were even invited as speakers; we have the presentation given by Raúl, although we prepared it between the four of us" (LV1).

And at conferences, some of which were held in collaboration with different universities (see Image 3), as an indicator of the increased professionalization of the team:

> The lecture at the University of Murcia, which Iñigo and I attended. I have highlighted this again, but now, with more maturity, I would say than those first Edusoday events. The events have matured, whether we have been invited to a class or to give a talk or lecture at universities (LV1).

In relation to the "Forums" subcategory, "Educablog" is recognized as a place for meeting, interaction, and professional reflection, and it is defined as a space that allows for "continuous learning and reinventing oneself and continuing to search" (LV4), while:

> "To be able to let off steam, to be able to look for a platform where I can go to build my professional foundations during the years that I have been working (...) to be able to transform the reflections of the working groups, multidisciplinary teams, taking them from the ground, to bring them from the floor to the table, put them on the table, but with a language that was

a little less academic, a little bit more common to professionals working in the field, and in the field of Social Education" (LV1).

Figure 6. Lecture given at the University of Murcia.

3.3. "Professionalization" Category

Within this category, three subcategories emerged, of which "Recognition-visibility" is predominant with 30 references, followed by "Complaints and demands" with eight, and finally, "Diploma-Degree" with two. Figure 7 visually represents the words that emerged with the greatest weight.

Figure 7. Word cloud related to the "Professionalization" category.

"Recognition-visibility" emerges as the second most prominent subcategory in terms of "Educablog" contributions after "Creating a collective network." This might be

expected, considering that the visibility of the profession is one of the major objectives of the creators of "Educablog":

> "It seems that talking about sales could distort the character that we want to imprint on Social Education, what it means to make it visible as much as we can, to contribute a little bit of dignity, visibility, and standardization' (LV1).

Also noteworthy are the events that "Educablog" has organized to give presence to the profession, such as Edusodays:

> For World Social Education Day, I chose another photo. It was taken in Basauri, Asier's village, in the Antzoki. We put up a sign there and took a photo before people came in. We wanted to fill that room with Social Education (LV2).

Or the media presence, both on the radio and in the written press (see Figure 8) or on television, reflecting the scope of the space, especially in relation to the publication of the book #Edusohistorias:

> "This was a very cool moment I shared with Raul at the Cadena. Another milestone, a media outlet with Azul Tejerina, in which we were able to appear" (LV2)

> "He would go to ETB, we would go to Radio Nacional or Euskadi Irratia, Jorge would go to Ser. And I think it was the high point when Francino contacted us two years ago. Also, he called us, and they call us as consultants, as people who know what is new (...) the fact of putting Social Education where we believe it deserves to be" (LV1).

26 CIUDADANOS

EL CORREO

Historias de la trastienda de la vida

Cuatro educadores sociales vascos recopilan en un libro casos reales a los que se enfrentan cada día en su profesión

MARÍA JOSÉ TOME

Raúl Luceño (izda) y Jorge Ruiz, en una calle del centro de Bilbao.

La «aventura» de autoeditar un libro

Figure 8. *Article in the newspaper El Correo*

Concerning the visibility efforts undertaken by "Educablog," it is worth mentioning its geographical reach by means of the presentations conducted throughout the region, indicating that the space was recognized as a reference point in the field of Social Education:

> "Next stop: Edusohistorias. I have put it this way because this platform has really been in so many places in the world, especially with this book tour. This is the biggest milestone in bibliographic or publication terms, and it is still the one with the highest sales and the greatest impact for social education, which I think is significant" (LV4).

Directly related to the presentations are publications such as:

> "Imago, which also seemed like a very nice idea, to switch from the editorial format...to make an exhibition that travels throughout the world" (LV3).

Or Edusohistorias, of which there have been notable sales:

> "we've gone over a thousand and some, probably over fifteen hundred." (LV3). "More than 2000" (LV1).

Similarly, the social networks and the blog itself have emerged as instrumental in raising the profile of the profession and transferring participation to the social networks of the space:

> There has always been this dilemma over the years as the blog was more, it was like more of a 2.0 space that originally had much weight, but then the social networks have become more powerful, but well, it has been seen that they are different and complementary spaces (LV4).

In the Complaints and demands subcategory, it is worth mentioning the freshness at the beginning of the trajectory combined with activism and professional and social demands:

> "Educablog" was born with this freshness, which I think is very significant and exemplifies very well what "Educablog" was. A bit from the ground up, from pure and hard activism and youthful enthusiasm, without really knowing where this could lead (LV1).
>
> In fact, "(...) on some occasions more and on some less, we wanted to take part in certain actions, social actions, demands. In this case, the aim was to join the orange wave against the cutbacks" (LV3).

3.4. "Milestones" category

Within this category, 25 subcategories emerged, and in terms of the number of references, "Imago," "Blog creation," and "Blogstival" stood out above the others with 16, 13, and 12 references, respectively, indicating that these are the milestones to which the "Educablog" team attaches most importance.

The prominence of "Imago" as a milestone for the "Educablog" team can be attributed, in part, to its status as one of the last projects promoted by the blog, published in 2018. The presentation of the photobook itself is also noteworthy, as it provided an opportunity to observe the evolution of the team in terms of their ability to organize a high-quality event:

> "I believe that here, there was a qualitative leap in terms of preparation and design to how well everything went at the presentation of Imago. The people's interventions were super-powerful, and everything surrounding us was very good. I don't know, it was all very pro, like a jump from something, which a few years ago was very amateurish" (LV3).

Continuing with the milestones, the creation of the blog marked a before and after since it became the main project of the association from 2006 to the present day, being a pioneer in combining Social Education with blogs:

> "A bit like what you were saying before, yes, this work is very good, but maybe we could give it a twist, and I think you also mentioned it before, in those years when my friends Jon and Raúl were setting up a technology company, and they wanted to create a network of blogs, we suggested to each other to create one on Social Education. So that's when we formed the first association" (LV3).

Likewise, the members of "Educablog" emphasized the organization of the "Blogstival" in Getxo in 2017, marking the team's first "big" event. This event combined the subject of blogs with training and leisure activities, bringing together the formal with the informal, establishing a formula that would continue to shape the trajectory of 'Educablog" in the years that followed:

> "This is from the beginnings of an event we did in Getxo, and it was undoubtedly our first milestone of something we did. There are also some photos I've seen around. And well, here's our partner Mertxe and some other friends, and I think it's important" (LV2).

4. Conclusions

The use of the lifeline methodology based on photographs (Moriña, 2017) has made it possible to address the stated objectives of analyzing the evolution of "Educablog," identifying the milestones in its history while at the same time examining its contributions to Social Education from the voices of its promoters.

In addition to its role in constructing the dedicated blogosphere known as the "Edusosphere" (Martínez-Pérez, 2019), the founders of "Educablog" highlight several aspects that emphasize the significance of its contributions to Social Education. Specifically, in terms of professionalization, emphasis is placed on the blog's role in "Recognition-Visibility." This aspect is closely connected to the complex process undergone by the profession itself (Sánchez, 2012). Particularly in the early years of "Educablog," there was a crucial need to navigate toward visibility and recognition of a "young" profession. This was a period during which the profession initially defined its functions and competencies (ANECA, 2005; ASEDES, 2007). In our view, "Educablog" serves as an exemplary illustration of how social media can contribute to making a profession visible, connecting it with society, and advocating for its recognition.

Concerning professional identity, the findings highlight the blog's contribution to "creating a collective network." This is particularly significant given the need for spaces that facilitate the formation of professional networks of identification in a diverse, highly atomized social sector. The social sector, inhabited by numerous small private entities, is in the process of redefinition and taking on increased responsibilities from public institutions concerning the development of the welfare state (Marbán

Gallego & Rodríguez Cabrero, 2006), circumstances that create challenges for professional cohesion. We believe that "Educablog" serves as a space that addresses the collective need for professionals to convene, engage in dialogue, and share insights about their daily practices within the profession. Educablog has emerged as a virtual space fostering a shared identity in this context.

Educablog's contribution to professional development is related to the training and presentations offered through the platform, primarily focusing on the connection between ICT and Social Education. This issue is particularly important in a domain marked by resistance and limited development of the professional digital competence necessary for education in the network society (Cabezas & Casillas, 2019). In addition to formal training, we would highlight that "Educablog" serves as a space for reflective practice, allowing professionals to engage in discussions, share experiences, and contribute to lifelong learning.

According to its founders, pivotal milestones in the history of "Educablog" (Tapia & Muñoz, 2019) include the creation of the space itself (2006) and the organization of a blog-related event (Blogstival, 2007), a pioneering initiative during the emergence of the blogosphere in the state (Cerezo, 2006). Likewise, the publication "Imago," combining photography and Social Education, is highlighted for its presentation of these milestones, reflecting the meticulousness and maturity of the event. Additionally, "Educablog" is credited with contributing to writing works on Social Education, both virtually and through various books[1].

Finally, we would like to emphasize the significance of employing a methodology that takes the protagonists' perspectives when examining the history of a social platform such as a blog. By identifying the key milestones, the founders have become more aware of their trajectory, gaining perspective on their history and enabling the researchers to gain a deeper understanding of a particular reality (Gramling & Carr, 2004; Moriña, 2017; Tapia & Muñoz, 2019), which, in this case, is narrated by the "Educablog" team itself.

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[1] In addition to the aforementioned "Imago," the team behind "Educablog" has published two other books: "Educablog" 2006-2011: De la red al papel and #Edusohistorias.

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Revista Latinoamericana de Tecnología Educativa, 23(1)
https://doi.org/10.17398/1695-288X.23.1.81

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Revista Latinoamericana de Tecnología Educativa

ARTICLE / ARTÍCULO

Pre-service Teachers' Perceptions of Acceptance of Mobile Technologies in Teaching-Learning Processes. A Case Study

Percepciones de Maestros en Prácticas sobre Aceptación de Tecnologías Móviles en Procesos de Enseñanza-Aprendizaje. Un estudio de caso

Received: 3 diciembre 2022
Reviewed: 24 octubre 2023
Accepted: 14 noviembre 2023

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Abstract: The pandemic crisis highlighted the need for a technological and digital transformation of the university, a process that has already begun and that has marked a before and after in the incorporation of technologies in the teaching-learning processes. On the other hand, teachers in training are a privileged group as they are at the end of their training process, in contact with active teachers and will be pillars of social training. For this reason, this study aims to analyze the perceptions of trainee teachers at the University of Granada on the acceptance and inclusion of smartphones in teaching and learning processes, as a result of the Covid-19 pandemic crisis. A qualitative methodology (focus group) was implemented with a sample of 16 trainee teachers belonging to the area of social sciences. The results showed an incorporation of technologies in future teachers, the need for the implementation of smartphones, as well as mobile literacy for students and teachers. In the same way, generational differences, the relevance of motivation and perception in usefulness and ease of use of devices are highlighted. It is concluded that there is a need for training actions in teachers and educational centers to provide an effective response to social and educational needs. For this reason, universities, educational institutions and teachers must strive to understand the scope of mobile teaching and the possibilities of smartphones in increasing motivation and the acquisition of basic skills. Future studies are needed to broaden the scope of analysis to different areas and contexts

Keywords: Mobile teaching, Teachers in training, Qualitative research, Focus group, smartphone.

Resumen: La crisis pandémica evidenció la necesidad de una transformación tecnológica y digital de la universidad, proceso ya iniciado y que ha supuesto un antes y un después en la incorporación de las tecnologías en los procesos de enseñanza-aprendizaje. Por otro lado, los maestros en prácticas suponen un colectivo privilegiado en tanto que se hallan al final de su proceso formativo, en contacto con docentes en activo y serán pilares de la formación social. Por ello, este estudio pretende analizar las percepciones de los maestros en prácticas de la Universidad de Granada, sobre la aceptación e inclusión de smartphones en los procesos de enseñanza-aprendizaje, a raíz de la crisis pandémica de la Covid-19. Se implementó una metodología cualitativa (focus group) con una muestra de 16 maestros en prácticas perteneciente al área de ciencias sociales. Los resultados mostraron una incorporación de las tecnologías en futuros docentes, la necesidad de implementación de smartphones así como la alfabetización móvil de estudiantes y profesores. Del mismo modo, se subrayan diferencias generacionales, la relevancia de la motivación y de la percepción en utilidad y facilidad de uso de los dispositivos. Se concluye la necesidad de acciones formativa en docentes y centros educativos para dar una respuesta eficaz a las necesidades sociales y educacionales. Por ello, la universidad, instituciones educativas y maestros, deben esforzarse por comprender el alcance de la enseñanza móvil y las posibilidades de los smartphones en el incremento de la motivación y la adquisición de competencias básicas. Se precisa realizar estudios futuros que amplíen el ámbito de análisis a distintas áreas y contextos.

Palabras-Clave:: Enseñanza Móvil, Maestros en prácticas, Investigación cualitativa, Grupo Focal, Dispostivo movil inteligente.

1. Introduction

The broad technological evolution, the indispensability of internet access, and the immediacy, both communicative and in accessing information, have brought about a radical change in the way we relate socially and with information. To a large extent, the development of mobile technologies has contributed to these changes, becoming a matter of prime importance in education, especially higher education. Today, information access, communication, and teaching-learning processes cannot be conceived of without smartphones. These processes have been accelerated by COVID-19, which forced a change to virtual teaching (Chen & Tsai, 2021). Undoubtedly, this situation has led to changing attitudes towards the necessity. Similarly, various limitations have been evident, including generational gaps, lack of resources, and the need for instruction. Therefore, discrepancies exist between rapid social adaptation to new realities and the adaptation by universities.

Information access and management are conditioned by three significant characteristics: connectivity, immediacy and ubiquity. The widespread use of smartphones has significantly affected higher education learning not only because they make learning environments more attractive and motivating but also because they have educational value (Krouska et al., 2022; Yun et al., 2022). Increasingly precise smartphone applications contribute to task optimization, making smartphones a useful tool for teaching This fact has been intensified as a result of the pandemic crisis. There is an exponential increase in the use of smartphones for academic purposes, with a positive impact on teaching-learning processes (Wali & Omaid, 2020; Batch et al., 2021).

Smartphones affect educational theory and practice, linking information, social intercommunication and pedagogical methodologies. Mobile devices act as an ally for motivation and have become a necessary component in classrooms. Various authors emphasise the relationships between motivation, the use of mobile technologies and effectiveness in learning (Pinto et al., 2020; 2021; Park et al., 2021; Latham et al., 2022).

The general objective of this research is to analyse through a qualitative methodology (i.e., focus groups) the adaptation and inclusion of smartphones in teaching, focusing on the perceptions of preservice teachers towards the inclusion of smartphones in classrooms and the perception they have of their teachers (i.e., the university professors who taught classes in their postgraduate training and teachers who were their mentors during internships). Thus, preservice teachers and teachers responsible for training future teachers are the objects of this study-

This is a novel approach, as there are still few publications on the topic. A qualitative methodology is better suited for this study, providing data difficult to obtain with quantitative method. In addition, comparing smartphone use before and after the pandemic provides significant data for the scientific community aspects before and after the pandemic crisis yields results that can provide significant data for the scientific community. It is essential to note that qualitative techniques in general, and focus groups in particular, have not yet achieved widespread adoption. Finding research that integrates the variables considered in this context, such as preservice teachers, mobile teaching, and qualitative analysis (through focus groups), is a challenging task. Likewise, regarding the impact of the COVID-19 pandemic, there is little research

comparing the use of smartphones in classrooms by preservice teachers before and after the pandemic (Rosli et al., 2022).

Additionally, the Technology Acceptance Model (TAM) – with its two dimensions of perceived usefulness and perceived ease of use (Al-Rahmi et al., 2022) – can be considered a valuable tool for understanding the adoption of smartphones. This model helps evaluate how users, in this case, future teachers, perceive the ease of using these devices (Habes et al., 2022). This approach is essential not only for analysing the attitude of preserve teachers about using smartphones in teaching but also for understanding the role of smartphones in education in general. In this way, the specific objectives of this study are as follows:

OE1. To understand the perceived usefulness and use of smartphones by preservice teachers.

OE2. To analyse the use of smartphones for academic purposes.

OE3. To identify the resources available to the university and the library for mobile learning.

OE4. To understand the changes that have occurred because of the COVID-19 crisis regarding mobile teaching.

OE5. To analyse the detected needs regarding the implementation of smartphones in teaching.

1.1. Literature Review

Three main thematic areas have been identified: the technological acceptance model (TAM), mobile teaching and smartphone technologies.

Technological Acceptance Model

Davis first developed TAM (Technological Acceptance Model) in the late 1980s (Walker et al., 2020). The theory is based on two dimensions: perceived ease of use and perceived usefulness. The former is defined as «a measure by which the use of technology is believed to provide benefits to the person using it» (Hsu Chang, 2013, p. 215). The latter is based on the belief that using the system would be easy (Davis, 1989, p. 320). Perceived ease of use has a direct impact on the perception of usefulness. The investment in time and effort becomes a guarantee of motivation, success and effort optimisation (Walker et al., 2020; Buabeng-Andoh, 2021). Both aspects involve three fundamental axes: attitude (towards use), adoption (of use) and current use of technology (García-Martínez et al., 2019; Kumar et al., 2020; Wong et al., 2022). Attitude describes the set of perceptions before adopting technology, and adoption defines the materialisation of technological use. After a positive perception, the tools are incorporated. Various studies have echoed this issue, emphasising the importance of motivation (Adov et al., 2018; Al-Emram et al., 2020). Social use, interaction and ease of access are key to understanding the acceptance of mobile technologies (Chahal, & Rani, 2022; Wong et al., 2022).

Mobile teaching and TAM

Regarding the combination of TAM and the use of mobile technologies, various authors have highlighted the applicability of TAM to understand the integration and adoption of devices in higher education (Zhonggen & Xiaozhi, 2019; Chahal & Rani, 2022). The positive impact of the perceived ease of use on the overall perception of the advantages of its integration is emphasised.

The keys of the TAM model (perceived usefulness and perceived ease of use) would become useful elements for measuring both acceptance and implementation. The advantages of smartphones are interconnected with the perception of usefulness, perceived ease of use, and accessibility. Mobile education is based on the concept of mobility, understood as the possibility and ability to access information, establish communication, or avail various services through the use of smartphones. Al-Emram (2020) adds a characteristic: on the go. This property, along with connectivity, implies the ubiquity and immediacy of smartphones. The use of smartphones has contributed to optimizing teaching and learning processes in general and at the higher education level in particular.

Preservice teachers and technological acceptance of smartphones

The development of mobile teaching is contingent upon the role of educators in the acceptance and integration of technologies. Thus, preservice teachers serve as a significant indicator, situated between recent postgraduate university teaching and imminent professional teaching practice. One of the initial studies applying the TAM model to preservice teachers was conducted by Valtonen et al. (2015), during a still nascent period. The model developed by Nikou and Economides (2017) applies TAM to smartphones, emphasizing motivation and interest in technological acceptance. Additionally, this model is combined with the Self-Determination Theory of Motivation (SDT) (p. 84).

Annamalai (2018) employed focus group techniques to analyze smartphone usage among preservice teachers. Despite some reservations within certain sectors, advantages were found in its implementation. Kearney & Maher (2019) examined the interest generated by smartphone use among students and preservice teachers, highlighting the pivotal aspect of preparing future educators in technology. Similar lines of inquiry were pursued by Ata & Cevik (2019) and Sánchez-Prieto et al. (2019). Gunawan et al. (2020) conducted an online focus group with teachers on the implementation of smartphone applications in teaching during the Covid-19 pandemic lockdown, demonstrating the utility of specific applications. Alubthane (2021) also implemented the focus group to measure smartphone acceptance among preservice teachers, underscoring the digital divide and the challenge of distinguishing between academic and social contexts.

The pandemic crisis underscored the utility of smartphone devices in teaching and learning processes. Recently, Hafour (2022) conducted research through focus groups, grounded in the ACRL framework, comparing a sample of preservice teachers with experienced professors. Motivation emerged as a conditioning factor. Asio et al. (2021) emphasized the effectiveness of focus groups in analyzing attitudes and training of preservice teachers in the context of the pandemic crisis. Trninic et al. (2022)

highlighted the relevance of focus groups for «the ability to collect empirical material necessary for the subject of the research» (p. 6).

In summary, no research based on focus groups was found that compared pre- and post-Covid attitudes among preservice teachers in the social sciences regarding the use of mobile phones in teaching and learning processes.

2. Method

This section outlines the focus group instrument utilized, the selected sample, its implementation, and the analysis method.

To measure preservice teachers' perceptions regarding the incorporation, usage, and competencies in mobile education (ME) during their training period, a qualitative methodology based on the use of focus groups was employed. While widely used, this method remains innovative in scientific research, particularly in its application to the social sciences. Its utility lies in capturing elements that may not be achievable through quasi-experimental quantitative methods due to the interactions and dialogue that occur among participants.

The focus group design was informed by a specific literature review in specialized databases (ProQuest, ERIC, WoS, Scopus), focusing on the intersection of keywords such as mobile technology, smartphone, higher education, preservice teacher, teaching methodologies, and qualitative research. Studies that utilized focus groups and served as a basis for developing our focus group script were selected (Table 1).

Table 1. Synthesis of Studies Informing the Focus Group Script.

Authors	Year	Title	Methodology	Item (script of this research)
Savros Nikou & Anastasios Economides	017	Factors that influence behavioral intention to use mobile-based assessment: A STEM teachers' perspective.	Mixed	Item 1[a]
Nagaletchimee Annamalai	018	How Do We Know What is Happening in Whatsapp: A Case Study Investigating Pre-Service Teachers	Qualitative: focus group	Items 1 y 2
Mathew Kearney & Damian Maher	019	Mobile learning in pre-service teacher education: Examining the use of professional learning networks.	Qualitative	Items 3-4

Authors	Year	Title	Methodology	**Item** (script of this research)
RidvanAta & Mustafa Cevik	019	Exploring relationships between Kolb's learning (2019) styles and mobile learning readiness of pre-service teachers: A mixed study.	Mixed	Items 8-10
José Carlos Sánchez-Prieto	019	Exploring the unknown: The effect of resistance to change and attachment on mobile adoption amongs econdary pre-serviceteachers	Mixed	Items 9-10
Marwa F. Hafour	020	The effects of MALL training on preservice and focus group in-service EFL teachers' perceptions and use of mobile technology.	Qualitative: focus group	Item 10
Johan Backlund, Hugo, Martin; Ericson, Kerstin	021	Pre-Service Teachers' Experiences Of The Transition From Analogue To Digital Learning During The Covid-19 Pandemic	Qualitative: focus group	Items 3-5-7-9
María Pinto, David Caballero, Dora Sales, Alicia Segura	021	Belief in importance of information literacy abilities among undergraduates	Qualitative: focus group	Items 3-5-7-9

The focus group sessions were conducted following ethical guidelines, ensuring participant confidentiality and obtaining informed consent. The discussions were recorded, transcribed verbatim, and subsequently subjected to thematic analysis. The iterative process involved coding and categorizing emerging themes, fostering a comprehensive understanding of preservice teachers' perspectives on mobile education.

Table 2. Semi-Structured Interview Components.

Script of the semi-structured interview		
Motivation in Smartphone Use and Perceived Utility (OE 1)	Use of Platforms, Programs, Devices.	Perceived Utility.

Script of the semi-structured interview		
Academic Use of the Smartphone (OE 2)	Perceptions of Teachers and Practicing Teachers Regarding Its Use. (considering that pre-service teachers are on both sides).	Academic Utilities Inside and Outside the Classrooms.
University-Library Resources and Mobile Learning (OE 3)	Adaptation of Universities and Their Libraries to Changes Resulting from the Inclusion of Smartphone Technologies and their Generalization.	Apps, Training, Guidance, and Coordination Between Teachers and Librarians.
Post-Covid-19 Health Crisis and Smartphone Utility (OE 4)	Pre- and Post-Covid-19 Crisis Evaluation in the Acceptance and Inclusion of Smartphones.	

The script was designed to thoroughly explore the perceptions, experiences, competencies, as well as perceived barriers and facilitators among preservice teachers regarding mobile education. The semi-structured format allowed flexibility to delve into specific aspects emerging during the focus group sessions.

2.1. Sample and implementation

The sample consisted of preservice teachers, postgraduates in Education from the University of Granada, during the academic year 2021-22. Participants needed to meet basic criteria: being a postgraduate in the field of Education and currently undergoing the practicum. Additionally, methodological guidelines included a commitment to actively participate in the research, adherence to pre-established norms (such as sincerity, respecting turn-taking, opinions, etc.), and consent to anonymous recording for research purposes.

A non-probabilistic convenience sample was selected, and 16 participants voluntarily took part in two focus groups, comprising 9 and 7 preservice teachers concluding their practicum, respectively. The participants, aged between 23 and 30, had pursued postgraduate studies in various specialties, including Physical Education, Foreign Language, Computer Science, Humanities, Arts, and Natural Sciences.

Two focus group sessions were conducted at the Faculty of Education on March 7 and 12, 2022, involving two researchers. The first researcher facilitated the session, following the script, and the second researcher observed and intervened when necessary. The discussions adhered strictly to the script, with the moderator redirecting the conversation if needed. Each session lasted 75 minutes, with the first 15 minutes dedicated to explaining the activity, emphasizing the significance of such studies, and outlining the employed methodology. Consent for audio recording and observational note-taking by the second researcher was reconfirmed during this period.

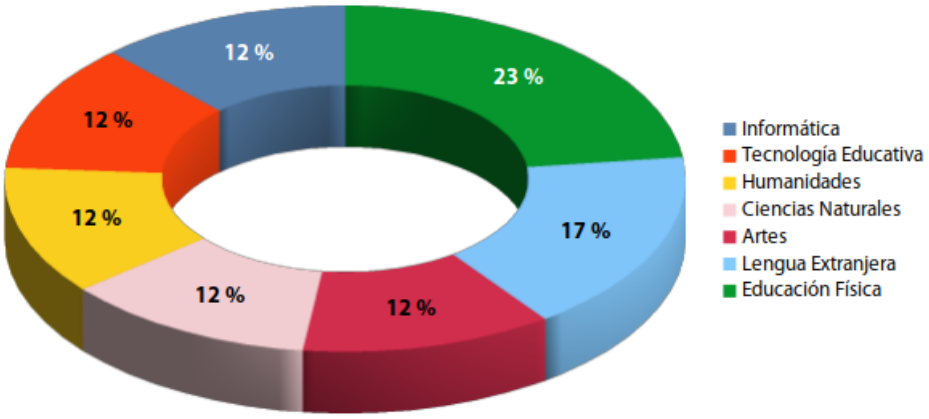

Figure 1. Distribution of Selected Specialties in the Sample.

2.2. Data analysis

For data analysis, the following procedure was followed: transcription of recordings into an analysable-readable format; data coding; identification of thematic areas; and subsequent interpretation of the information. To ensure consistency and rigor in the results, two procedures were employed. Firstly, three experts from the fields of education, linguistics, and information technologies conducted the analysis, categorization, and interpretation. Secondly, the QDA Miner software was used to break down categorizations and refine or validate results. The most prominent topics were presented in various verbatim tables.

3. Results

The results were organized following the focus group script to address the specific research objectives: motivation for and towards use; academic utilities of smartphones and apps; university and library resources for smartphone teaching; evidence of usefulness after the pandemic experience; needs and proposals.

3.1. Motivation in the use of smartphones and perceived utility (OE1)

Use of Platforms, Programs, Devices

The integration of mobile devices in higher education is linked to the perceived utility of their incorporation and the motivation derived from their use. The pandemic crisis highlighted that mobile technologies are here to stay, emphasizing both the quantity of available resources and the need to adapt to new social and academic demands (Pinto et al., 2021). Similarly, it revealed that the adaptation processes are not at the level of current needs and the speed of changes, although academic institutions have made multiple resources available (Table 3).

Tabla 3. Uso de plataformas, programas, dispositivos.

	Platforms	Devices	Programmes
Teachers in training	Talent SLM	Laptops	Word
	Canvas SLM	Computers	PPT
	NEO LSM	Smartphone	Prezi
	Moodle	Tablet	MovieMaker
	Blackboard		Adobe Reader
	Schoology		Word Pad
	Edmodo		Canvas
	Twiducate		Slideshare
			Software for interactive whiteboard
Teachers	Canvas SLM	Portátiles	Word
	Moodle	Smartphone (search)	PPT
	Blackboard		Adobe Reader
	Twiducate		Slideshare
			Software for interactive whiteboard

Analysis of Competence and Attitudes Toward Technology Use

There is a consistent use of applications, devices, and software by preservice teachers, reflecting a self-perceived improvement in digital and mobile competence for various reasons. The participants express

> a habit of searching and finding what they need at any given moment (ED 5).

It is perceived that practicing teachers are more constrained by the tools and resources provided and required by educational institutions, while preservice teachers demonstrate a broader search for instruments. The generation gap continues to be seen as a distinctive factor, as expressed:

> It's not the same for someone who has just started as a teacher as for someone who has been teaching for thirty years and doesn't know how to find information on a mobile phone (ED 17).

This distinction appears to have been accentuated after the pandemic crisis. The evidence of generational difference has also manifested in the relationships between teacher-tutors of preservice teachers and the future teachers themselves, who have been

> questioned by their supervisors when they wanted to use an app, and were told that it's not serious (ED 10).

Regarding the level of competence among preservice teachers, the participant sample highlighted disparity based on various factors. (a) Age: the generation gap

remains a significantly excluding element. (b) Motivation for use: participants show divergent attitudes,

> with some expressing surprise when colleagues lack certain apps or do not know how to use them (ED 16).

And (c) Area of specialization in the field of Education. According to responses, areas such as Arts and Humanities demonstrated a lower level of competence. Similar observations were made for foreign languages:

> I showed my teacher that there was an app for pronunciation and phonetic correction, and she was surprised (ED 14).

However, Physical Education, Educational Technology, and Computer Science revealed a higher level of competence.

Figure 2 . Attitudes Before and After the Pandemic Crisis.

Perceived Utility

Regarding perceptions of teachers, participants expressed that the motivation on the part of the teaching staff for using smartphones in the classroom did not meet their expectations. However, there is a perceived change, driven by the forced adaptation to technological use during the last two years of the COVID-19 crisis:

> We have to acknowledge that at least now they ask us to download some questionnaire or do some activity with the smartphone. (Having a smartphone in class) was almost as serious as cheating on an exam (ED 8).

It is important to note that the teachers participating in this study have experienced several years of regular in-person teaching at the university pre-pandemic, during the pandemic crisis, and in the post-pandemic period. Therefore, it is emphasized that

> now they send us many documents and articles via smartphone and ask us to download them in class. Before that was unthinkable (ED 4).

In general, there is a perceived shift in the use of smartphones for academic purposes.

3.2. Academic use of smartphones (OE2)

Perceptions in Practicing Teachers and Preservice Teachers

Participants were asked to describe both self-perceptions of the utilities and perceptions they had about the teaching staff, based on their training experience and practicum.

Table 4. Synthesis of Perceptions Regarding Smartphone Use.

Perceptions on the teacher´s adaptation to mobile technologies	Perceptions on the teacher´s in training adaptation to the use of mobile technologies in the classrooms
Better atittudes	Generalization of use for academic purposes
Increase of technological skills	Combined and complementary use of devices (smartphone-laptop; smartphone-tablet; tablet-laptop)
Evidence of insufficient adaptability	Increased attention in the lessons
Generational gap (teachers-young teachers/teacher interns	Increase in the distinction of uses (academic in university; social, outside the classroom).
Relationship between greater and lesser use and areas of specialization	Gaps in access and information management, despite connectivity/ubiquity and immediacy

In general, smartphones were considered to offer significant advantages. They were seen as a necessary and highly suitable tool in the current context, as they

> help to search for information quickly (ED 3).

Additionally, participants mentioned,

> if the Wi-Fi in the school is bad, I can use mobile data (ED 12).

On the other hand, they also mentioned,

> we can make video calls among students and create workgroups (ED 3).

Despite the increased use and competence in using smartphones, participants also described certain limitations in information management, despite the advantages of ubiquity and connectivity:

> training in sources and how to distinguish good ones from those that are not useful should be increased (ED 7).

Regarding Perceptions of Teachers the participants emphasized that

> there is much work to be done. The teacher doesn't understand that we have an age. We have done everything with smartphones since we were little. Teachers have lived in another era, and they don't understand that everything has changed. Some younger teachers use it, but they are few (ED 5).

The greatest divergence was found in one of the collected statements:

> the teacher thinks that using the smartphone in class will make us more distracted. And some think that good information cannot be found on the internet. In part, we struggle to find the correct information because no one has taught us (ED 12).

There is a widespread feeling that teachers are at the beginning of the path toward true adoption of smartphone teaching. Preservice teachers still have significant gaps to address:

> we have a long way to go. We only know how to handle what interests us or what we need. But if we are like this, imagine how the teachers are (ED 13).

> Thus, ´we have to learn to use the smartphone as a teaching tool´ (ED 1).

Academic utilities in and out of the classroom

The participants' responses (preservice teachers and teachers) about the uses of mobile devices in and out of the classroom are summarized in Table 5.

Once again, the educational specialization areas emerge as a relevant factor in smartphone use. It was perceived that preservice teachers attach greater importance to the use of applications, both inside and outside the classrooms.

Regarding perceptions of the teaching staff, despite the transformations observed after the pandemic crisis, it is emphasized that

> teachers make little use of mobile devices because they have little mastery. They have improved somewhat during the pandemic (ED 14).

It is emphasized that this is a mistake because it is possible to return to the starting point, i.e., a situation similar to the pre-pandemic era in the use of smartphones and technological competence in general, and even increase the pre-existing gap.

In a similar vein, Hamidi & Chavoshi (2018) indicate that the understanding of the two central factors of the TAM model is comprehended through self-efficacy. Similarly, Aharony & Gur (2019) applied the TAM model to the implementation of smartphones in classrooms. Sitar-Taut & Mican (2021) and Camilleri & Camilleri (2022) conduct various analyses, grounded in the TAM model, on the acceptance of smartphones and their utility during the pandemic, as well as the impact for subsequent generalization.

Specialised educational areas relevant factors in smartphone use. Student teachers were perceived to attach greater importance to using mobile applications inside and outside the classrooms.

Table 5. Academic Utilities of Smartphones.

Mobile uses in the classroom	Teachers in training	WhatsApp groups for teachers in training
		Apps for interactive whiteboard
		Educative apps
		Créate educative and multimedia contents
		Search for information
		Difusión of contens
		GammificatioU+006e
	Teachers	WhatsApp groups
		Apps for interactive whiteboard
		Search for information
		Take pics and film clips for academic purposes
		Gammification
Mobile uses outside the classroom	Teachers in training	Interpersonal communication (instant messaging and WhatsApp groups)
		Búsqueda de Informacion
		Bureaucratic-administrative applications
		Social networks
		Information search
		Creation and dissemination of content
	Teachers	Interpersonal communication (instant messaging and WhatsApp groups)
		Bureaucratic-administrative applications Information search
		Social networks

Regarding perceptions about the teaching staff, and despite the transformations perceived after the pandemic crisis, it is emphasised that

> teachers make little use of mobile devices because they have little expertise. They have improved somewhat during the pandemic (ED 14).

It is emphasised that this is a mistake because it is possible to return to the starting point, that is, to a situation like the pre-pandemic period regarding the use of smartphones and technological competence in general, and even increase the pre-existing gap.

3.3. University-library resources and mobile learning (OE3)

Adaptation of universities and their libraries to changes resulting from the inclusion of smartphone technologies. Adapting to a digitised university governed by current technological needs has been observed (Figures 3 and 4).

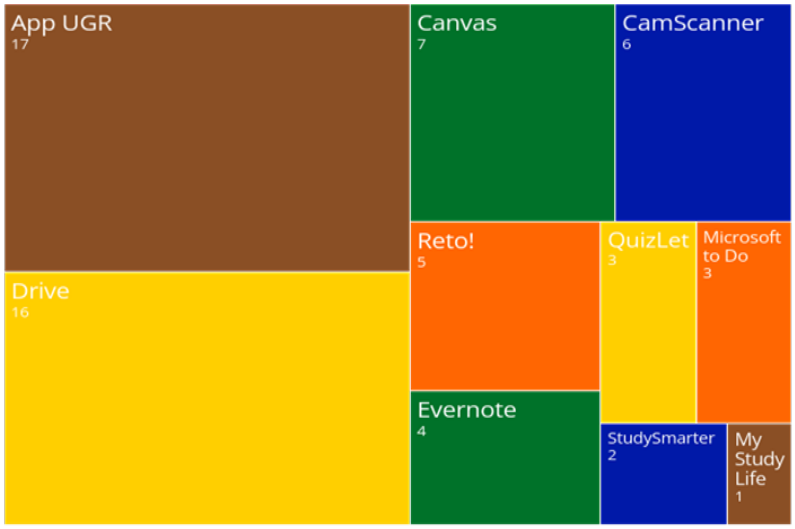

Figura 3. Adaptation of universities and their libraries to changes. Most used apps.

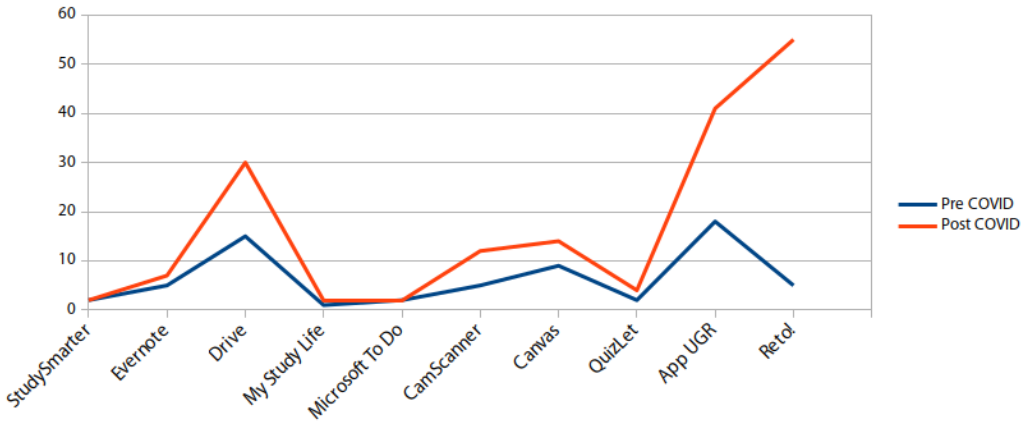

Figure 4. Evolution in the use of apps after the Pandemic.

The participating student teachers reported a gap between the speed of changes at the social level due to the pandemic and the degree of implementation or development of technologies at the university. This was even more pronounced in the case of smartphone technologies. 'As one participant stated,

> Yes, there has been a lot of progress. There was no plan B. The step had to be taken' (ED 2).

> The pandemic forced teachers to use mobile technology in the classroom (ED 5).

However, participants insisted that it is necessary to persevere with these changes because

> this might stay here until another crisis comes. We had to learn from what happened (ED 12).

Mobile applications, training, guidance and coordination between teachers and librarians becomes a prioririty.

The aspect in which the participants show the greatest weakness is the perception of libraries, their role, and the function of librarians:

> I don't really know what a library is currently for. You can find everything on the internet (ED 2).

There is a lack of knowledge about the possibilities offered by both libraries and librarians:

> I only go to the library to study because it's quiet and you can work well (ED 7).

Deficiencies are perceived. As one participant emphasised,

> Libraries offer few services to students (ED 12)

another stated,

> libraries do not help students search for source (ED 8).

Participants discussed the importance of libraries in the development of activities. Student teachers with a background in humanities showed a more positive attitude towards the library and its staff:

> When we go to look for some books, the librarians always guide us (ED 4).

In general, the participants only used library applications for their final degree products. Techniques and strategies to choose quality sources are needed. Some participants said that they knew about some of the mobile applications offered by their university, including ones focusing on self-learning, time management and process optimisation. Others mentioned that they had to find appropriate mobile applications on their own:

> I discovered most of them myself, researching on Google or asking my colleagues. They are not the ones the university offers. I had to find my way (ED 10).

Other participants stated that they have access to a variety of online learning resources offered by the university and its libraries (Table 5). However, regarding their use, some participants indicated that

> it depends on the teacher and the subject, a greater mastery of the apps and resources made available by the university is seen (ED 2).

Table 6. Training, guidance and coordination between teachers and libraries.

University (libraries)	Libraries
StudySmarter	Citation Generator
Evernote	Ex Libris Library
Drive	Mobile (Ugr)
My Study Life	Mendeley (desktop app/Progressive)
Microsoft To Do	
CamScanner	
Canvas Estudiantes app	
Quizlet	
App general de la UGR	
Reto! (EF)	

3.4. Post-COVID-19 health crisis and smartphone utility (OE4)

The process of adapting to the changes introduced by COVID-19 and the positive aspects regarding the use of smartphone technologies were described. Regarding adapting to the COVID-19 context, it is considered that there was an acceptable adaptation of the educational community. The use of smartphones contributed to optimising learning when in-person teaching was impossible.

In comparing smartphone use before and after the pandemic, the participants noted some transformational aspects. These changes are summarised in Table 7.

Although laptops are still considered the most complete educational tool post-pandemic, smartphones play an increasingly important role in searching for and. On the one hand, laptops continue to dominate the use. They are considered the most complete working tool in and outside the classroom. However, the smartphone plays a role in searching for and disseminating information. As one participant explained,

> Since the information is in the cloud, it is easier to directly enter our email or the drive and download the document or share it (ED 10).

Online work became a priority during the COVID-19 pandemic:

> We had to get used to some having to stay at home due to quarantines. We worked online with drive, video calls or Zoom (ED 7).

The role of smartphones in distance education is evident (with some group members present and others at home) is evident:

> None of us can say that we cannot meet because we can connect and work wherever we are (ED 8).

In this sense, the pandemic was a turning point in optimising technological competencies, particularly smartphones. As one participant explained

> with the pandemic and so much cmmunication through the smartphone, what one could not find, another did . A lot of information passed through the group (ED 5).

The differences are mainly based on greater smartphone use in classrooms and a better attitude among student teachers. Generational gaps, motivation and preparation continue to be fundamental factors.

Tabla 7. Aceptación e inclusión del Smartphone. Evolución tras la crisis pandémica.

	Before the Pandemic Crisis		**After the Pandemic Crisi**	
	Software/apps	*Devices*	*Software/apps*	*Devices*
In the classroom	Word PPT Adobe Reader Word Pad	Laptops Computers SmartPhone	Word PPT Adobe Reader Word Pad PDF Google Drive Inercom Scoop	Laptops SmartPhone Tablet White blackboard
For academic purposes	Word PPT Adobe Reader Word Pad Slideshare Programas de Pizarra Digital	Computers Tablet / SmartPhone (search)	Drrive Living Drive Word PPT Adobe Reader Word Pad Zoom (platform) Google Drive (platform) Scratch Scoop	Computers SmartPhone (search) White blackboard Tablet
For presentations	PPT Prezzi MOVAVI Movie Maker Popplet Camtasia	Laptops SmartPhone Tablet	PPT Prezzi MOVAVI Movie Maker Vismi Genialis PowToon Emaze Canva	Laptops SmartPhone (docs in the cloud)
Information search	Mozilla Firefox Chrome Internet Explorer Gestores de información: Mendeley, Zotero	Laptops SmartPhone Tablet	Mozilla Firefox Chrome Google Scholar Managers App de bibliotecas App de Universidad Mendeley WPA	Laptops SmartPhone

3.5. Needs and proposals (OE5)

The focus group also requested self-perceived preferences and needs and those perceived among the teaching staff. In this case, it was evident that there is an attachment by a sector to traditional teaching methods, despite the technological influx imposed by the pandemic.

Table 8. Needs and proposals.

	Needs	Proposals
Needs perceived by students on themselves	PDF brief and simple. Gráphics and mind maps. Informative pills in clips Discord. Interactive apps . Summarized contents.	Resources and software of virutal and augmented reality. Combine master lessons and smartphone resources. Gamificación apps. Educative videogames. Videos-tutorials and lessons prepared both by teachers and students (visualization in apps).
Needs perveived in teachers	Training. More investment in technologies and resources. Greater involvement of the teachers in training. Increase hours of practices. Apps to ease the assesment.	Magister lessons. Traditional resources. Theorical-practical lessons. Face to face lessons.

Student teachers expressed the importance of increasing knowledge of mobile technologies among teachers, particularly older ones. ´Therefore, the current number of practice hours are perceived as insufficient. Similarly, there is still inertia:

> The pandemic hasn't helped much because most teachers still want to give their classes as before: 'I talk and you listen' (ED 7).

Student teachers proposed increasing the use of digital educational resources to motivate student learning. They considered that schools should have interactive, augmented reality, and application resources that adapt to the new profile of future students. Only then can society's needs be met.

Regarding the needs perceived among teaching staff, they emphasised improved technological training:

> I don't know if it's out of necessity or because they have realised that they have to use technology one way or another, but some of my professors are still training. They claim to need more preparation (ED 1).

Participants proposed a methodology that

> alternated lectures with new technologies and changes of scenarios. In this way, everyone would be given the opportunity to work well and achieve better results (ED 6).

Thus, among the most relevant proposals, the use of mobile applications, flipped lessons and augmented reality stood out. However,

> training is needed, especially the appropriate and enjoyable use of the smartphone for learning purposes (ED 5).

Although there is still a long way to go in incorporating smartphones in the classroom, advancements can be seen in certain areas. One area is awareness:

> It is essential that both teachers and students focus on mobile technology (ED 6).

Training remains the weakest aspect, as indicated by one participant,

> Teachers remain unprepared for using smartphone technology in the classroom (ED 4).

4. Conclusions

The data from this study show that the pandemic resulted in an increased use of smartphones in education. The analysed sample highlights that smartphones have become an effective ally in education. Student teachers can offer unique perspectives. They are at the beginning of their teaching practice, with a broad capacity for observation of the teaching staff in practice, and their university training stage is recent. Regarding attitude, this study found that the pandemic changed the perspective of the teaching staff regarding smartphones and their applications in the classroom. Student teachers, in contrast, maintained positions like those before the pandemic. The crisis confirmed the importance of smartphone use for learning optimisation. In both cases, the pandemic served to reinforce the need for training.

The results obtained in our analysis are similar to those of Aharony and Gur (2019), Sitar and Mican (2021) and Camilleri and Camilleri (2022). Thus, three factors influence the effective use of smartphones: preparation, motivation and generational gap. According to the studies, the generational gap tends to be overcome with motivation. These recent studies also converge with our analysis of the privileged position of student teachers and true barometers to measure trends and needs. The novelty of our research is its comparison between student teachers and the teaching staff. Regarding incorporating smartphones into the classroom, there was a change in attitude after the pandemic, but it is still perceived as insufficient. Significant proposals were made for implementing smartphones and mobile applications. Annamalai (2018) and Kearney and Maher (2019) highlighted, like our study does, gaps in training for teachers and librarians. Similar findings were found by Ata and Cevik (2019) and Sánchez-Prieto et al. (2019), who used a mixed-method methodology compared to our exclusively qualitative research. Gunawan et al. (2020) and Alubthane (2021) also highlighted that following the pandemic, classrooms started incorporating smartphones in class, indicating a partial change of attitude after returning to face-to-face teaching. These studies also emphasised generational gaps in preparation and motivation for instruction and used TAM as a reference for their analysis. In our study, teachers did not fully respond to the high expectations regarding mobile teaching.

Similarly, Bäcklund et al. (2021) and Hafour (2022) showed that smartphones had become important for teaching during the pandemic. However, some teachers only considered smartphones as a transitional tool for times of crisis, although their utility was evident and are here to stay. Hafour (2022) highlights greater motivation among teachers than among student teachers. This represents a significant difference from our study. Generational conflict and attitudinal, motivational and inclusion differences in mobile devices are highlighted in numerous studies (Alubthane, 2021; Bäcklund et al.; 202; Asio et al., 2021; Pinto et al., 2021).

Although qualitative research has shown the validity of smartphones in education and provided data that are difficult to obtain with other methodologies, there is still a shortage of studies based on qualitative methods. The focus group, despite its difficulty in execution and analysis, is not yet a generalised technique. It is difficult to find studies combining the variables considered in this study: student teachers, mobile teaching and qualitative analysis (i.e., focus groups). Similarly, no studies have compared the use of smartphones in classrooms by student teachers before and after the pandemic crisis. In line with the objectives set out in this research, we present the following conclusions:

- Student teachers perceive a correlation between motivation, the use of smartphones in classrooms and the level of preparation. The participant group showed the advantages of these devices and their applications for optimising teaching.

- The basic structures of TAM continue to be a reference for measuring technological acceptance, in this case, mobile technology. There is a direct relationship between motivation and effectiveness in the search for training (OE1).

- Smartphones are used in classrooms for various purposes. Their application has considerably increased. The most relevant uses continue to be the search for information, the creation of groups, the dissemination of content and the completion of assignments. Motivation and generational differences were important for incorporating smartphones (OE2).

- Significant changes have occurred in recent years in terms of universities and libraries acting as preparation spaces for teachers. These changes have translated into improvements in infrastructure, resources and training. However, they are still insufficient. The pandemic crisis highlighted limitations (OE3).

- During and after the pandemic, there was a need to adapt to the new scenario of non-face-to-face teaching. Student teachers are more competent than teachers in using mobile technologies in class (OE4).

- Regarding needs and proposals, participants highlighted the development of learning applications, gamification and augmented reality as important educational objectives. Emphasis was also placed on including learning capsules, simple and motivating resources and specific training for practising and student teachers. Regarding

limitations, this research has a small sample (N=16) and focuses on a specific context (trainee teachers). Consequently, even though the focus group methodology is based on limited groups, and the object of study is student teachers, this is a limited sample. Therefore, an expansion of groups and degrees is proposed for future work to carry out a contrastive analysis between different university sectors. Likewise, it opens the perspective of comparing intern teachers with those who are already in the teaching profession.

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ISBN: 9788419690845

Received: 15 december 2023
Accepted: 20 december 2023

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REVIEW / RESEÑA / RESENHA

Pablos Pons, J. y Gómez Camacho, A. (2023). *Escritura digital y educación: el m-learning* . Octaedro

Manuel Area Moreira *

This work entitled «Digital writing and education: m-learning» is a collective book derived from a research project carried out in Andalusia where the authors have studied the characteristics of written expression through mobile devices (tablets and smartphones) in adolescents and how to work on it didactically in the context of secondary education. The book, in a broader or generic way, deals with what is internationally known as m-learning or mobile learning, which consists of developing training actions from anywhere and at any time through wireless technologies.

It begins with an introductory chapter written by the two coordinators and from there the book is structured in two main parts. The first part, entitled «M-learning in educational contexts», is made up of three chapters that focus on the analysis, both theoretical and practical, of the didactic functionality of these technologies in secondary education classrooms and schools. It begins with a chapter that addresses the debate on mobile technologies as educational tools in the hands of students, analysing how this controversy is made visible on social networks. It continues with another chapter that compiles and presents different real experiences on the use of mobile technologies in educational contexts, establishing some recommendations, especially in relation to the Sustainable Development Goals (SDGs) of UNESCO's Agenda 2030. And it ends this first part with a chapter focused on the didactic use of these technologies with adolescent students, offering practical examples of the use of mobile applications to work on linguistic competence in the classroom.

The second part entitled «Digital Writing and New Forms of Communication» is also organised into three further chapters. These focus on the new expressive formats of writing brought about by these digital artefacts. It begins with a conceptual analysis chapter on new genres of electronic communication and teaching. Specifically, this chapter deals with the concept of digitalk understood as the new codes written and conveyed through screens that present distinctive and different features from the normative written text. It continues with another chapter on multimodal writing and the construction of digital identity online, establishing some of its key pedagogical coordinates. It also offers recommendations for classroom practice in teaching multimodal writing based on a case study. It is followed by another chapter on digital writing in relation to inclusive language and how to work on it didactically in secondary education classrooms. The book ends with a Glossary with almost fifty terms and concepts specialised or specific to m-learning, which are highly clarifying and conceptually helpful for readers.

It is noteworthy that this academic work, well-structured and based on available knowledge, is published at a time of strong and intense social debate, both in the Spanish and international context, regarding the prohibition or restriction of mobile technology by students. Its topicality and relevance is unquestionable. There is a lot of media noise in which families, administrations, experts and teachers express divergent, and sometimes contradictory, positions on what would be desirable in school contexts in the face of the impact and influence of mobile technologies on adolescent pupils. Many of the positions or perspectives that defend the suppression or prohibition of these technologies in both primary and secondary education arise as an impulsive reaction to the fear or fears generated by the disruptive changes that are taking place in 21st century culture and society, where digitalisation is an unstoppable process.

Underlying the prohibitionist positions is the belief, naïve by all accounts, that vetoing or banning the presence of mobile technologies in schools will almost magically protect minors from the harmful effects of these devices. Furthermore, it is assumed

that preventing their use in school time will increase learning and neutralise undesirable phenomena such as cyber-bullying, techno-addiction, lack of concentration in studies or the consumption of inappropriate content for children and adolescents. These are all assumptions or beliefs.

Therefore, this book is highly recommended and its reading will be very useful for experts, teachers and administrations so that they can base any educational legislation on the use of mobile technology on the rationality of knowledge. In short, in this book we will find many arguments and proposals for educating and training adolescents adequately with mobile technologies in the classroom.

ISBN: 9788418936296

Received: 19 december 2023
Accepted: 26 december 2023

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REVIEW / RESEÑA / RESENHA

López Gómez, S., Rodríguez Rodríguez, J., Vidal Esteve, M.I. y Marín Suelves, D. (2023). *Videojuegos y oportunidades educativas. Orientaciones para su diseño, análisis y uso*. Editum

Mario Cerezo Pizarro *

«Video games and educational opportunities. Guidelines for their design, analysis and use» by Silvia López Gómez, Jesús Rodríguez Rodríguez, Mª Isabel Vidal Esteve and Diana Marín, researchers and university lecturers, present a work aimed at teachers, novice researchers, professionals, families, users or people interested in the educational use of video games to provide them with a set of guidelines regarding their use, analysis and design, from an educational perspective.

Silvia López Gómez and the other researchers and co-authors of this book represent, from the authority and consonance that their academic-professional curricula within the university and their lines of research give them, a more than well-founded expository and argumentative validity of the interpretations, associations and relationships that arise between the world of video games and education today. Aiming to bring the educational community closer to this object of study and analysis, they use their experience in the field of research with video games and teaching to offer a set of guidelines that help to interpret the video game from an educational perspective.

The book is divided into eight chapters, which can be interpreted in two large differentiated sections. In the first of these, the initial chapters explore the current considerations and knowledge regarding the validity of video games as a didactic resource, considering the importance of recognising the value of this medium in contemporary society, and basing this on the idea that its premeditated, structured and evaluated use is not only beneficial, but also well-founded and necessary. To this end, they explicitly present a series of research carried out in recent years on the possibilities and benefits of video games and their didactic application, trying to respond to all the positive and negative questions that video games raise in society and in the current educational context by means of facts and well-argued affirmations.

On the other hand, the book does not seek to convince or argue too much, because it is aimed at an audience already interested in the field, which is why the justifications and arguments occupy less space in it, compared to the tools, guides and guidelines on the use of video games for the classroom. To this end, the second part of the book presents guides for the design, analysis and selection or use of the video game, in which the authors directly address the professionals and teachers who seek to develop or include a video game for the classroom, not only to convince them to do so, something that should already be clear to them, but also to provide them with tools and resources so that when that moment arrives, they can return to this book to decide and choose the most suitable video game for their objective. In this sense, the double perspective presented in the guides, one for the development and the other for the evaluation and direct use of video games produced by third parties, is very interesting, because it focuses on the two most relevant parts of the process, how to design a video game for educational purposes and how to identify and implement them. The book stands out in this aspect, because although when it talks about design it claims to be aimed mainly at professionals, it also provides teachers who venture to design their own video game with tools and strategies of great value. The guides, although comprehensive, are structured in clearly differentiated sections, so it is easy to find specific sections such as: the rules system or the technical characteristics. And in the case of the user guide, it goes into the different devices, the classification codes

or the basic instructions for selecting a good video game.

Finally, they kindly present a repository of video games or ideas for implementation, catalogued according to typologies and genres of video games, which although it is only a small sample of the possibilities of the medium, it combines very well with the final culmination of 15 recommended readings, most of them known by those who work in this area, which not only attest to the quality of the previous arguments of this book, but will allow anyone to go deeper into the field of research and interrelationship between video games and education.

The book thus becomes an excellent guide for professionals, families and teachers at all educational levels who wish to learn about the implications and possibilities of video games in the classroom, providing them with tools and initial conceptions that will allow them not only to identify and select which games they can use, but also gives them the necessary tools to develop their own proposals and implementations. This book is also a good starting point for researchers and novice students approaching the scientific field, because it brings together some of the basic precepts and offers tools and resources with which to develop their own research and experiences.

FOR AUTHORS

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ARTICLES

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ISSN

1695-288X

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