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Trends and perspectives on technology in early childhood education: analysis of teachers' perceptions in Spain

Tendencias y perspectivas sobre tecnología en Educación Infantil: análisis de las percepciones docentes en España

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Abstract: Today's generation of children is immersed in the digital environment from the moment they are born, and a reality devoid of technology is alien to them. These tools make up a significant part of their leisure time, and their consumption occupies a prominent place in their routines. However, in the educational environment, they occupy a less predominant position. In this research, we analyse the perspectives of early childhood education teachers in Spain regarding the integration and use of digital technologies at this stage, highlighting their evolution over the last decade, especially driven by the COVID-19 pandemic. The study focuses on the use of digital educational resources (DERs), analysing the frequency of use, the combination with printed materials and the moments of application, among other aspects. The methodology is quantitative and is based on the implementation of an ad hoc questionnaire. The results show a dichotomy in the perception of DERs in early childhood education, since their unlimited potential is recognised, but the importance of deepening the selection, application and use, as well as the purposes and interests, is emphasised. At the same time, challenges are detected regarding the quality of free resources and concerns about possible health effects and addiction at an early age. It is necessary to deepen teacher training to contribute to a better selection and use of resources, and to continue moving towards a paradigm shift in the role of teachers as guides, facilitators of experiences and collaborators in the school of the 21st century.

Palabras clave: Educación Infantil, Tecnología Educativa, Profesorado, Recursos Didácticos.

Abstract: Today's generation of children is immersed in the digital environment from the moment they are born, and a reality devoid of technology is alien to them. These tools make up a significant part of their leisure time, and their consumption occupies a prominent place in their routines. However, in the educational environment, they occupy a less predominant position. In this research, we analyse the perspectives of early childhood education teachers in Spain regarding the integration and use of digital technologies at this stage, highlighting their evolution over the last decade, especially driven by the COVID-19 pandemic. The study focuses on the use of digital educational resources (DERs), analysing the frequency of use, the combination with printed materials and the moments of application, among other aspects. The methodology is quantitative and is based on the implementation of an ad hoc questionnaire. The results show a dichotomy in the perception of DERs in early childhood education, since their unlimited potential is recognised, but the importance of deepening the selection, application and use, as well as the purposes and interests, is emphasised. At the same time, challenges are detected regarding the quality of free resources and concerns about possible health effects and addiction at an early age. It is necessary to deepen teacher training to contribute to a better selection and use of resources, and to continue moving towards a paradigm shift in the role of teachers as guides, facilitators of experiences and collaborators in the school of the 21st century.

Keywords: Preschool Education, Educational Technology, Teachers, Educational Resources

1. Introduction

The omnipresence of digital technologies, devices and services has transformed not only the ways of socialising and consuming culture but also educational paradigms (Cobo, 2019). Early childhood education finds itself inevitably involved in this technological progress. The convergence of digital technology and children's lives is one of the major lines of study that many researchers have been pursuing for the last decade, especially after the experiences of the pandemic event due to COVID-19 and the many classroom 'digitalisation' processes (Rodríguez Rodríguez and Area-Moreira, 2022). Recent research on how technology is used in the early childhood education stage reveals an evident dichotomy, where technology is presented as a tool with unlimited potential but whose value is linked to its application, purposes and interests (Martín-Gómez, 2023).

This technological ambivalence reflects educational challenges that have existed since long before the arrival of the most recent innovations. Postman and Weingartner (1973) put forward an educational analogy: school as an entity that preserves fundamental values when society advances rapidly, and as a driver of change when society so demands. The dilemma becomes more acute when considering the incorporation of electronic devices and digital educational resources into early childhood education (Zabalza, 2020). Although technology is an integral part of children's daily lives in their family environment, many teachers opt for an approach that advocates a balance between digitalisation and more tangible and direct experiences (Martínez-Roig et al., 2023).

1.1. Challenges and limitations of the use of digital resources in early childhood education

Studies intended to explore in greater depth the integration of digital technologies into this educational stage show that, in spite of the abundance of digital resources available to teachers, it is seen that, in general, free resources tend to be of low quality, promoting a traditional methodology that is lacking in interaction and based on behavioural pedagogy (Garcés-Delgado et al., 2023; Albert-Monrós et al., 2023). Simultaneously with the rise in the number of studies on the use of digital resources in education, there has been an increase in the number of publications that examine the possible effects of technology in early childhood as well as the concerns expressed by families, health and education professionals and other sectors of society (González Ruiz et al., 2023). Even as early as in 2017, UNICEF tackled these problems in the report Children in a Digital World (UNICEF, 2019). These research studies focus on educators' concerns and doubts regarding the growing use of digital resources at an early age, tackling issues such as potential addiction to technologies and their impact on health (Álvarez-Herrero et al., 2021). This scenario highlights the need for a balanced approach to the integration of technology into early childhood education, considering both its potential benefits and the legitimate concerns of educators, families and health professionals (Rodríguez and Estrada, 2021). Adapting to this new digital era requires a careful assessment of practices and policies to ensure healthy, enriching development in early childhood (Halpern et al., 2021; Grané, 2021; Grané et al., 2023).

1.2. Teachers in the face of the digitalisation of educational resources

Today's society demands a redefinition of teachers' role, freeing them from conventionalities and rigidities imposed by obsolete paradigms (García-Sampedro et al., 2024). In the face of the irruption of digital educational resources (DERs), teachers are required to assume renewed roles, becoming involved in the creation of digital learning objects with defined educational objectives and adopting a competence-based approach. Interprofessional collaboration and the design of proposals that promote students' digital skills are crucial in this paradigm shift (Sánchez Vera, 2021). This integration is tailored to students' specific needs at this critical stage of development (Vidal Esteve et al., 2023). Teachers highlight the motivational capacity of DERs, as shown in the improvement in children's attention span and academic results, in line with previous studies (Vidal-Esteve and Martín-Gómez, 2023). Although the need to introduce technology in early childhood education is recognised, some concerns persist regarding its potential long-term effects, which has currently generated a debate on its incorporation into the initial stages of learning.

In this new scenario, teachers' role is redefined, with the teacher now acting as an agent with the following necessary functions (García Contador and Gutiérrez-Esteban, 2020):

- Guide and companion: orienting children in the responsible, safe, ethical use of technologies from an early age as a measure intended to prevent future problems stemming from the use and abuse of digital means.

- Designer of learning experiences: integrating ICTs into the early childhood education curriculum in a creative, pedagogic manner is essential for the creation of appealing, motivational, significant learning experiences.

- Collaborator and communicator: collaborating with other professionals, families and the community is essential with a view to creating a safe, enriching digital ecosystem for learning at these initial stages.

With this approach, this study joins others that explore teachers' view of the use of digital technologies in the classroom in greater depth. Some questions arise in relation to the curricular integration of DERs in the early childhood education stage: what is the frequency of use of these means in teaching practice? Do teachers combine digital and printed resources? Does the introduction of digital materials necessarily imply a change in methodology? Do teachers create their own digital educational resources in response to students' needs? These questions are aligned with the primary objective of this quantitative study, focused on an analysis of early childhood education teachers' perceptions of the assessment and use of digital educational resources in different Spanish autonomous communities.

2. Method

The methodological procedure followed to conduct this study is described below. This is a quantitative research study based on a questionnaire designed ad hoc. Specific information is given about the context, methodology, tool, data collection, analysis and study participants.

2.1. Context

This research is framed within the project entitled «Infanci@ Digit@l: Los materiales digitales en la Educación Infantil. Análisis y propuestas para su uso en la escuela y el hogar [Digital Childhood: Digital materials in early childhood education. Analysis and proposals for their use at school and at home]» (Ref.: RTI2018-093397-B-100). The project was structured in four phases and was carried out by three research teams from the autonomous communities of the Canaries, Galicia and the Valencian Community. In the first phase, the digital resources aimed at this stage of education were analysed. The second phase focused on identifying the views and opinions of teachers and families. In the third phase, usage practices were analysed, and in the fourth phase the results were translated into a best practice guide aimed at teachers and families (Vidal Esteve et al., 2022). This study discusses the results of the second phase and, specifically, intends to analyse early childhood education teachers' perceptions of the assessment and use of digital educational resources in different autonomous communities of Spain.

2.2. Methodological design

The project has a parallel-convergent mixed methodological design and implements both semi-structured interviews and questionnaires, seeking an eclectic approach to school using different methods and techniques (Digón-Regueiro et al., 2024).

However, the study on which this research is focused is quantitative and analyses the results of a questionnaire completed by early childhood education teachers (Area-Moreira et al., 2023). The questionnaire was developed ad hoc by the research team of the project, taking previous research (Area Moreira, 2020) as reference. It was subjected to cross-validation by a team of experts, as well as to a pretest, with valid results in the formulated dimensions. High reliability was obtained in each dimension, with results above 0.800 in Cronbach's alpha, supported in turn by values of the KMO statistic that also exceeded 0.800, as well as by Bartlett's test of sphericity with statistical significance ($p < 0.01$).

Specifically, the results of this study focus on Section IV thereof: 'DERs and teaching practice in the classroom', and the analysis performed, as noted by Garcés-Delgado et al. (2023), is descriptive and inferential.

2.3. Instrument

The data were collected using the CASI (computer-assisted self-interviewing) technique, a type that, according to Fairweather et al. (2012), does not require the presence of an interviewer and is accessible to respondents, as it can be completed from home. A total of 2,242 valid responses were obtained.

The questionnaire consists of four sections. The first one is the identification section and is aimed at collecting demographic and education-related information (age, sex, autonomous community, education level, characteristics of the school, position and years of experience). The second section focuses on teachers' assessment of DERs, exploring their degree of knowledge of these resources, their effects and teachers' expectations in greater depth. The focus of the third section is on students, assessing the degree and frequency of use of DERs by students, their digital

competence and the positive and negative impact of these resources on children. Lastly, the fourth section is the longest, and is the section this research focuses on. It deals with teaching practice in the classroom and the use of DERs, and presents an in-depth study of the frequency and time points of use of the different resources in the classroom, the criteria used to select them, the accompanying methodologies or their combination with printed material, among others.

In general, the questionnaire contains qualitative variables (ranges), responses on ordinal scales (agree–disagree scales), nominal scales and some binary scales. It also includes both multiple- and single-choice questions and open-ended questions, which were recategorised to be included in the intended categories or to create new ones if relevant.

2.4. Data collection

The questionnaire was disseminated through INTEF (Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado [National Institute of Educational Technologies and Teacher Training]) to the different autonomous communities, which shared it with schools.

To complete the questionnaire, the following characteristics needed to be met: to be of legal age and be working as a teacher at an early childhood education school in any Spanish autonomous community. Also, the instructions guaranteed the participants' anonymity and the confidentiality of the study data.

2.5. Data analysis

For the analysis of the data, the statistical program SPSS (Statistical Package for the Social Sciences) in its version no. 25 was used (Bryman and Cramer, 2011).

Multivariate statistical analysis techniques were applied to try to differentiate various teacher profiles in terms of attitudes, practices and knowledge in relation to digital educational resources. A hierarchical clustering classification was employed to this end, using Ward's method to group the clusters resulting from the counts for the chi-square test.

2.6. Participants

Taking the variables that define the sample into consideration, we obtain, in the first place, that the sex distribution is totally out of proportion. The percentage of women is 94.8% versus 5.1% of men, with 0.1% of respondents who marked 'Other' as answer. With regard to age, as shown in Figure 1, the prevailing population is 35–44 years old (34.7%), followed by those aged 45–54 years (31.1%).

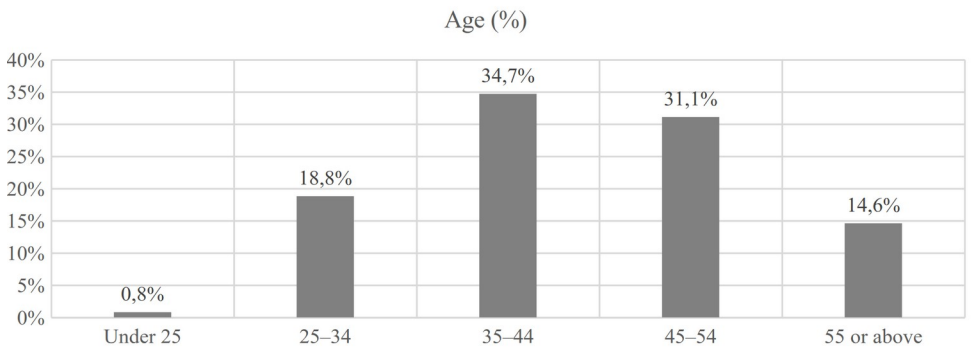

Figure 1. Age of participants

In terms of location, the teachers interviewed are distributed among 15 of the 17 autonomous communities in Spain, with no data from the Basque Country or Navarre. The Community of Madrid prevails (30.8%), followed by Castilla–La Mancha (21%) and Galicia (13.2%), as presented in Table 1.

Table 1. Autonomous communities where the interviewed teachers work.

	Frequency	Percentage
Community of Madrid	691	30.8 %
Castilla–La Mancha	470	21.0 %
Galicia	296	13.2 %
Extremadura	249	11.1 %
Canary Islands	152	6.8 %
Valencian Community	107	4.8 %
Catalonia	93	4.1 %
Principality of Asturias	84	3.7 %
Aragon	45	2.0 %
La Rioja	42	1.9 %
Balearic Islands	5	0.2 %
Andalusia	4	0.2 %
Castile and León	2	0.1 %
Region of Murcia	1	0.0 %
Cantabria	1	0.0 %
Total	2.242	100.0 %

The distribution by level of education taught is comparable between the three years of early childhood education. Also, teachers are characterised by having a certain degree of experience: over 70% of them have more than 10 years' teaching experience.

Lastly, with regard to the schools where they perform their duties, the prevailing types are public (93.9%), urban (53.4%) and early childhood and primary education schools (85.8%).

3. Results

The primary results that stem from the implementation of the questionnaire are presented below. This section is organised according to the main areas of research explored.

3.1. Frequency of use of DERs in teaching practice

The proportion of teachers who use DERs daily has increased from 24.2% to 52.8%, while the number of those who use them at least once a week has risen from 57.5% to 84.5%.

3.2. Level of use of the different types of DERs

The resources whose use has seen the greatest increase are infographics, charts and presentations, digital documents and mobile apps. A significant post-COVID-19 difference should be noted, especially in the Canaries, where only 14.5% of the people surveyed declared that they had never used this type of material, compared with 57.3% of people who use them at least several days per week (28.9% in the Valencian Community and 36.9% in Galicia). However, their frequency of daily use is relatively lower than in Extremadura. These differences between autonomous communities have a weak association, as indicated by the V value (0.084). With regard to the change experienced, the use of apps shows an increase of great magnitude following the pandemic. After applying the Wilcoxon signed-rank sum test to compare both time points in the different autonomous communities, statistically significant results were obtained for all the communities ($p < 0.001$), with size effects (r) between 0.680 and 0.803 (Valencian Community: $Z = -4.511$, $N = 44$; Galicia: $Z = -8.288$, $N = 118$; Canary Islands: $Z = -6.705$, $N = 76$; rest of autonomous communities: $Z = -21.716$, $N = 731$).

Table 2. Level of use of different types of DERs by autonomous community (%).

		Valencia	Galicia	Canarias	Resto de España	χ^2	V de Cramer	Sig.
Apps (Antes COVID 19)	Nada	46.1	41.2	30.4	41.6	21.469	0.063	.044
	Poco	23.7	29.8	28.0	24.1			
	Algo	17.1	12.9	13.6	12.6			
	Bastante	13.2	9.8	17.6	15.1			
	Mucho	0.0	6.3	10.4	6.6			
Apps (Después COVID 19)	Nada	30.3	29.4	14.5	26.4	38.619	0.084	.000
	Poco	21.1	20.4	10.5	14.2			
	Algo	19.7	13.3	17.7	12.3			
	Bastante	14.5	20.8	29.8	22.0			
	Mucho	14.5	16.1	27.4	25.1			
Contenidos para pizarras digitales (Después COVID 19)	Nada	36.8	26.7	27.4	34.2	23.701	0.066	.022
	Poco	6.6	9.4	10.5	8.7			
	Algo	13.2	18.0	12.1	12.8			
	Bastante	25.0	24.7	17.7	25.4			
	Mucho	18.4	21.2	32.3	19.0			
Blogs (Antes COVID 19)	Nada	34.2	27.8	46.0	42.1	32.835	0.077	.001
	Poco	22.4	23.1	23.4	23.8			
	Algo	21.1	22.0	18.5	17.3			
	Bastante	15.8	18.0	8.1	12.2			
	Mucho	6.6	9.0	4.0	4.6			

3.3. Degree of combination of digital and printed resources

The combination of digital materials and printed materials shows variations depending on the autonomous community where the teacher is based, although there is no clear tendency. Predominant use of digital resources is higher, in percentage terms, in the autonomous communities of Galicia, the Canary Islands and Valencia than in other regions, while the predominant use of printed materials shows an opposite trend, with a higher incidence in communities such as Extremadura, Castilla–La Mancha and Madrid. The transition from printed to digital materials still seems distant. Although almost all teachers (98.8%) combine these two types of educational resources in some way, only 22.1% of them mostly prefer digital resources, while 76.7% of them give priority to printed resources. The differences between communities are statistically significant, although of weak magnitude.

Tabla 3. Degree of combination of digital and printed resources by autonomous community (%)

	Valencian Community	Galicia	Canary Islands	Rest of Spain	χ2	Cramer's V	Sig.
I only use printed resources	3.9	0.4	0.8	0.9			
I combine both types of materials in exceptional cases, but I mostly use printed resources	24.7	22.7	16.8	20.6			
I sometimes combine both types of resources, but I mostly use textbooks or printed resources	40.3	51.0	52.8	57.9			
I sometimes combine both types of resources, but I mostly use digital educational resources	13.0	9.8	12.8	7.4	29.957	0.012	0.012
I usually combine both types of resources, but I mostly use digital educational resources	16.9	15.7	16.8	13.0			
I only use digital educational resources	1.3	0.4	0.0	0.1			

3.4. Time points in teaching/learning at which DERs are used

The time points at which teachers use digital educational resources the most seem to be linked to content presentation, either when explaining such content, to expand or reinforce it, or when starting a learning sequence. By contrast, assessment methods, tests or exercises are the teaching areas where digital materials are used the least.

Table 4. Time points in teaching/learning at which DERs are used.

	Frequency	Percentage	IC95 (lower limit)	IC95 (upper limit)
When planning the teaching–learning process	1056	57.5	0.552	0.597
At the start of learning sequence or a task/activity sequence	1347	73.3	0.713	0.753
When presenting contents	1347	73.3	0.713	0.753
During the development of guided practice	787	42.8	0.406	0.451
During problem solving and exercises	451	24.5	0.226	0.265
When reinforcing or expanding contents	1246	67.8	0.657	0.699
At the time of an assessment	424	23.1	0.211	0.250

3.5. DER selection criteria

Teachers' choice of digital materials is mainly governed by usefulness and relevance criteria. The fundamental priority is that these materials should meet the needs of both students and teachers, ensuring that the former will find the material motivating. User-friendliness and free availability are the second criteria that teachers consider. Other aspects related to teaching, such as the incorporation of curricular adaptations or the inclusion of specific contents, are not as important to the users of these resources.

3.6. Methodologies used with DERs

In relation to the methodologies applied through DERs, over 50% of teachers point that they use project-based learning with ICTs, while almost a third indicate that they use gamification methodologies (31.1%).

With regard to differences by autonomous community, the methodology used varies notably and these differences are statistically significant (χ^2 between 11.8 and 20.6; $p < 0.01$; Cramér's V between 0.08 and 0.11, indicating weak associations). In Galicia, the Canaries and Valencia, project-based learning is used significantly more than in the rest of Spain; the flipped classroom is more common in the Canaries, while gamification stands out in Galicia and the Canaries. Also, these three regions show a lower proportion of teachers who declare that they are not familiar with any of the methodologies mentioned, while in Extremadura, Castilla–La Mancha and Madrid this percentage oscillates between 14% and 16.5%.

Table 5. Methodologies used with DERs by autonomous community (%)

	Valencian Community	Galicia	Canary Islands	Rest of Spain	χ2	Cramer's V	Sig.
Project-based learning with ICTs	62.3	65.5	60.0	51.8	19.751	0.104	0.000
Flipped classroom	5.2	3.5	12.8	6.9	11.809	0.080	0.008
Gamification and/or ludification of learning	26.0	40.0	36.0	29.3	13.974	0.087	0.003
1:1 model (one device per student)	6.5	1.6	8.0	3.4	12.046	0.081	0.007
I do not know any of these methodologies	7.8	5.1	7.2	14.0	20.588	0.106	0.454

3.7. Assessment of the influence of the use of DERs on teaching and school life

The influence of the introduction of digital resources in education is perceived in a rather similar manner by teachers in the different autonomous communities. However, with regard to changes in the grouping of students, these are notably more evident among the teachers of the Valencian Community and the Canaries. Also, the way of assessing students' tasks and family involvement are other effects that teachers in the Canaries and Galicia appraise as being the most important. In general, teachers in the Community of Madrid declare a lower impact on their school life, while this impact is more significant for teachers in the Canaries.

Table 6. Assessment of the influence of the use of DERs on teaching and school life by age (%).

		Valencian Community	Galicia	Canary Islands	Rest of Spain	χ2	Cramer's V	Sig.
It has led me to change my way of grouping my students	Not at all	16.9	36.0	24.2	31.1	27.265	0.071	.007
	Not much	31.2	23.7	30.6	30.3			
	A little	32.5	22.5	31.5	27.3			
	Quite a lot	18.2	15.0	12.1	9.5			
	A lot	1.3	2.8	1.6	1.8			
It has led me to change my way of assessing my students' tasks	Not at all	11.7	20.6	12.9	24.3	28.179	0.072	.005
	Not much	39.0	27.4	21.0	26.5			
	A little	35.1	32.1	41.1	33.3			
	Quite a lot	13.0	16.3	21.8	13.0			
	A lot	1.3	3.6	3.2	2.9			
It has helped to increase family engagement	Not at all	10.4	7.9	4.0	7.5	27.047	0.070	.008
	Not much	15.6	19.8	12.1	21.1			
	A little	39.0	29.2	29.8	34.7			
	Quite a lot	27.3	27.7	41.9	26.4			
	A lot	7.8	15.4	12.1	10.4			

3.8. Teachers' own criteria for DERs

In addition to using the available digital resources, sometimes teachers resort to the creation of their own material. Both before ($\chi^2 = 22.514$; $p < 0.001$; $V = 0.111$) and after the arrival of the pandemic ($\chi^2 = 11.939$; $p = 0.008$; $V = 0.081$), we should highlight the percentage of teachers in Galicia (64.17% and 76.68%, respectively) who prepare their own materials, surpassing the Canaries (48.39% and 62.10%) and the Valencian Community (52.63% and 76.32%). These figures are also above those of other communities, such as Madrid or Extremadura. The latter autonomous community has the lowest proportion of teachers who state that they use this type of materials, which was especially the case before the pandemic. Regarding the specific types of materials created, differences are seen only in the case of infographics, produced less often by Valencian teachers, and blogs, produced much more often by Galician teachers.

3.9. Types of DERs created by teachers

The distribution of each type of material produced is closely similar to the general frequency of use during the teaching process. The resources most frequently created by teachers are audiovisual materials and text documents, followed by infographics, charts and presentations. However, it seems that these professionals are less qualified to produce applications, which logically makes sense. On the other hand, the creation of games, blogs and other interactive resources is mentioned by less of a half of the teachers who produce their own audiovisual material.

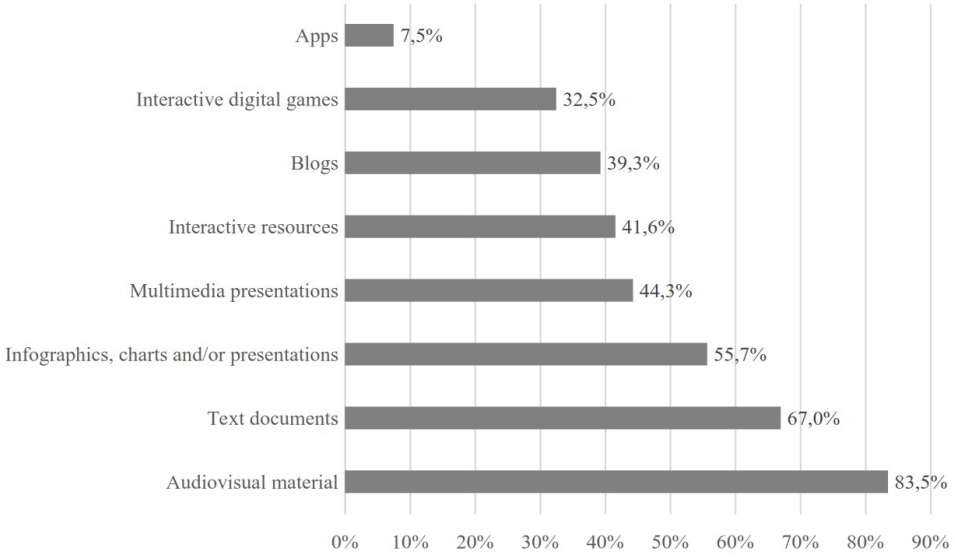

Figure 2. Types of DERs created by teachers (%).

3.10. Motivations to produce one's own material for DERs

The reasons adduced by teaching staff to create their own content in digital materials are diverse, and all of these reasons show very similar frequencies among the autonomous communities when their level of content creation is similar. However, there is a significant difference in the item «Because I consider it necessary to innovate

in my teaching practice». This motivation is chosen by only 41.8% of the Galician population of the study, while in the Valencian Community this percentage increases to 50%, to 52% in the rest of Spain and up to 58.8% in the Canaries.

This and «To develop my digital competence and that of my students» are the reasons that stand out the most among teachers in the autonomous communities with the lowest percentage of creation of their own material. On the other hand, among the communities with the highest percentage of creation of materials, the main motivations are related mostly to dissatisfaction with the suitability of the existing materials.

Table 7. Motivations to produce one's own material for DERs (%).

	Frequency	Percentage	IC95 (lower limit)	IC95 (upper limit)
Porque me gusta crear mis propios materiales	794	61.2	0.586	0.639
Porque considero necesario innovar en mi práctica docente	668	51.5	0.488	0.542
Para desarrollar mi competencia digital y la de mi alumnado	541	41.7	0.390	0.444
Porque los que encuentro no se adaptan a las necesidades de mi alumnado	530	40.9	0.382	0.435
Porque los que encuentro no se adaptan a mis necesidades docentes	517	39.9	0.372	0.425
Por encargo de un organismo público	21	1.6	0.00931	0.0231
Por encargo de una empresa privada	2	0.2	0,00059	0.0036

3.11. Considerations on intellectual property rights related to one's own materials

Teachers' concern about intellectual property rights does not seem to be very widespread, as up to 36.8% of them indicate that they do not take such rights into consideration when creating their own materials. Only 14.6% request authorisation from third parties during the creative process, and an even lower percentage seek to have intellectual property rights to their creations recognised.

Among the autonomous communities studied, these concerns about intellectual property and the methods used to share DERs produced by teachers themselves do not show significant differences. However, significant variations are seen with regard to school blogs and web pages: 47.8% of Galician teachers tend to share resources by these means, in contrast with 23.3% in the Valencian Community and 30% in the Canaries. Also, Extremadura stands out as the autonomous community with proportionally the fewest teachers who usually share their materials, while in Galicia, the Canaries and the Community of Madrid this practice seems to be more common.

3.12. Places where one's own resources are shared

When teachers decide to share their own resources, the school environment becomes the main means to disseminate this type of material, often through internal networks

of the school or via its website or blog. However, 32% of teachers state that they do not usually share these types of creations. In this sense, educational repositories, both regional and national, are the methods teachers use the least, with this being a very rare practice among the sample of this research study (2.9% and 4.5%, respectively).

3.13. Permanent changes in the teaching approach with regard to DERs

Regardless of whether these are teachers' own materials or those of others, the irruption of digital resources in the field of education as a result of the lockdown due to the COVID-19 pandemic has had a significant impact. The aspect teachers highlight the most is an improvement in communication, especially with families, which has led to greater family involvement in the school education of their children. In the second place, teachers attach significant value to the change in the methodologies and teaching practices implemented in the classroom. Lastly, it seems that their relationship with students and assessment methods are the aspects least affected by the incorporation of digital materials.

Table 8. Permanent changes in the teaching approach in relation to DERs as a result of the lockdown due to COVID-19 by autonomous community (%)

		Valencia	Galicia	Canary Islands	Rest of Spain	X^2	Cramer's V	Sig.
It has led me to change the way the classroom is arranged	Not at all	19.7	32.1	21.8	30.1	46.850	0.093	.000
	Not much	22.4	16.3	29.0	20.7			
	A little	28.9	20.6	28.2	24.2			
	Quite a lot	25.0	14.7	15.3	18.3			
	A lot	3.9	16.3	5.6	6.7			
It has led me to change my way of grouping my students	Not at all	21.1	32.0	25.8	34.4	53.566	0.099	.000
	Not much	31.6	18.6	30.6	22.7			
	A little	26.3	15.8	23.4	22.6			
	Quite a lot	14.5	15.8	14.5	13.6			
	A lot	6.6	17.8	5.6	6.7			
It has led me to change the types of activities I implement in the classroom	Not at all	10.5	19.8	6.5	17.7	30.794	0.075	.002
	Not much	21.1	14.2	17.7	19.4			
	A little	36.8	32.8	41.9	36.4			
	Quite a lot	28.9	22.5	28.2	20.5			
	A lot	2.6	10.7	5.6	6.2			
It has led me to change my way of communicating with my students' families	Not at all	6.6	11.9	2.4	7.3	29.682	0.074	.003
	Not much	3.9	10.7	8.1	9.1			
	A little	32.9	24.5	19.4	23.0			
	Quite a lot	34.2	28.5	50.0	38.2			
	A lot	22.4	24.5	20.2	22.5			
It has helped to increase family engagement	Not at all	15.8	16.2	7.3	13.0	26.026	0.069	.011
	Not much	26.3	27.7	20.2	23.6			
	A little	25.0	26.1	33.1	31.1			
	Quite a lot	26.3	17.0	33.1	23.3			
	A lot	6.6	13.0	6.5	9.0			

In sum, the experience during the lockdown due to the COVID-19 pandemic has prompted changes in the educational approach and the school dynamic, some of which have become permanent. Galicia and Madrid are the autonomous communities where teachers report the fewest changes experienced, while in the Canaries or

Extremadura the lockdown seems to have had a deeper impact on educational practices.

4. Conclusions

Digital technologies, as Cepeda et al. (2017) stated, are becoming increasingly present in our country's schools, thanks to, among other aspects, the boost given by national and autonomous community policies. The results obtained in this study reveal some trends in teachers' perceptions in Spain regarding the use of technology in the field of early childhood education, which undoubtedly have an impact on both teaching practice and teacher training.

First, it is evident, as pointed out by authors such as Sanz et al. (2020) or Becerra Brito et al. (2021), that the health crisis caused by COVID-19 led to a notable increase in the use of digital educational resources, with figures almost doubling. This change reflected teachers' quick adaptation to those exceptional circumstances and the effective integration of digital tools into teaching.

With regard to the use of DERs and their combination with printed materials, although most teachers combine both types, a preference for printed formats still predominates. This fact has been established by Cavazos Salazar and Torres Flores (2016) and is also reflected in students' preferences (Rego-Agraso and Marín Suelves, 2019; Marín-Suelves et al., 2022), indicating that a full transition to digital materials still seems distant. Usage preferences vary by region, with the most used materials being, in general, infographics, charts, presentations, digital documents and mobile applications. Stemming from their use, most autonomous communities agree that DERs impact, most evidently, the manner in which students are grouped, the way of assessing tasks and family involvement. With regard to time points, the use of DERs is mainly linked to content presentation, whereas they are less used for assessment purposes, which suggests that, in line with the results obtained by García-Ruiz et al. (2023), teachers see technology as an efficient means to present and reinforce contents.

For the selection of materials, usefulness and relevance are the main criteria adopted by teachers, which coincides with the proposals of Cabero-Almenara and Palacios-Rodríguez (2021). Some key factors include adaptation to the individual needs and differences of students and teachers, user-friendliness or being free of charge.

The most common methodologies associated with the use of digital resources include notably, according to Arabit García and Prendes Espinosa (2020), project-based learning and gamification. The differences between autonomous communities indicate variability in pedagogical practices and the adoption of innovative approaches.

It should be highlighted that, as pointed out by Reyes Valderrabano et al. (2017), concerns about intellectual property rights when teachers design their own materials are not generalised, so it would be necessary to explore these aspects in depth from the time when future teachers are being trained. Also, most teachers share resources mainly in the environment of their schools, with educational repositories being the least used space.

It should be noted that digital teaching competence (DTC) is important for the effective, diverse use of DERs by practicing and trainee teachers. Recent studies point that the DTC level and profile condition the type of use, the production and the utilization of digital educational resources, influencing directly the pedagogical quality of their integration into the teaching process (Romero-Tena et al., 2024, 2025; Barragán-Sánchez et al., 2023). For this reason, it is fundamental to promote training programmes that help to develop this competence, paying particular attention to technical, didactic and ethical aspects. To tackle the shortcomings detected in this study, such as the need to improve the selection of free resources and the appropriate management of intellectual property rights, it would be indispensable to train teachers including criteria to assess the quality and relevance of digital resources, as well as legal and ethical aspects related to the creation and use of digital educational materials. Also, it is fundamental to promote teachers' critical, reflective thinking to encourage responsible, effective practices when integrating technologies into the classroom.

Lastly, it has been shown that the irruption of digital resources has had, in line with the conclusions reached by Bernate and Fonseca (2023), a significant impact, especially in terms of improving communication with families and on teaching methodologies. The experience of the lockdown has left permanent changes in all the autonomous communities, which are less evident in Galicia and Madrid.

By way of conclusion, it can be stated that this research provides an overall vision of the integration of technology into early childhood education in the Spanish context and highlights the need to further explore in particular, in the field of teacher training, the selection and use of digital resources in the classroom. This will undoubtedly give teachers knowledge and discernment to suitably adapt their pedagogical strategies to an increasingly digitalised society.

Notwithstanding, the study has certain limitations, such as its possible dependence on teachers' self-reports and a marked gender bias and regional focus that limit the generalisation of the results, as well as a lack of analysis of the impact of digital resources on students' actual learning and on equal participation. Therefore, future research could focus on the strengthening of digital teaching competence at different time points of the training, assess the actual effect of digital resources on students' learning and wellbeing and promote studies that explore the efficacy of training programmes and the ethical, innovative use of technologies in the classroom.

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