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ARTICLE / ARTÍCULO

Digital Music Resources in Early Childhood Education: A Study of Spanish Repositories

Recursos digitales musicales en la educación infantil: estudio de repositorios españoles

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Abstract: Digital technologies have transformed educational environments, yet Early Childhood Education (ECE) remains an under-researched period regarding the use of technological resources, particularly in music. This study is part of an inter-university Research, Development, and Innovation (R&D&I) project and aims to analyse digital music resources targeting the second cycle of ECE available in Spanish institutional repositories: espazoAbalar (Galicia), Mestre@Casa and ReDi (Comunitat Valenciana), and EcoEscuela2.0 (Canary Islands). A descriptive methodology was employed based on the analysis of 643 digital resources. Of these, 37 were directly related to music education and examined according to five variables: prevalence, language, type, curriculum area, and target grade level. The results indicate that music resources account for only 5.75% of the total resources. Most resources are developed in Spanish or co-official languages, with Digital Learning Objects and online applications, tools, or platforms being the most common types. Nearly all are associated with the curriculum area of Communication and Representation of Reality and primarily target the entire second cycle of ECE. The study concludes that, despite institutional efforts, the digital music offer in ECE is limited, it lacks diversity and is unevenly distributed both linguistically and pedagogically. It is recommended to develop more multilingual resources, improve their classification, and promote their pedagogical evaluation to enhance their educational usefulness.

Keywords: Early childhood education, Music education, Instructional materials, Educational technology, Instructional design.

Resumen: Las tecnologías digitales han transformado los entornos educativos, pero la Educación Infantil (EI) continúa siendo una etapa poco investigada en relación con el uso de recursos tecnológicos, particularmente en música. Este estudio se enmarca en un proyecto de I+D+i interuniversitario y tiene como objetivo analizar los recursos digitales musicales destinados al segundo ciclo de EI disponibles en repositorios institucionales españoles: espazoAbalar (Galicia), Mestre@Casa y ReDi (Comunitat Valenciana), y EcoEscuela2.0 (Canarias). Se empleó una metodología descriptiva basada en el análisis de 643 recursos digitales. De estos, se identificaron 37 vinculados directamente a la educación musical, los cuales fueron examinados en función de cinco variables: presencia, lengua, tipo, área curricular y curso. Los resultados indican que los recursos musicales representan solo el 5.75% del total. La mayoría están elaborados en castellano o lenguas cooficiales, siendo predominantes los Objetos Digitales de Aprendizaje y las aplicaciones, herramientas o plataformas en línea. Casi todos se relacionan con el área de Comunicación y Representación de la Realidad y se dirigen principalmente al segundo ciclo completo de EI. Se concluye que, a pesar del esfuerzo institucional, la oferta musical digital en EI es escasa, poco diversificada y desigualmente distribuida lingüística y pedagógicamente. Se recomienda desarrollar más recursos multilingües, mejorar su clasificación y promover su evaluación pedagógica para fortalecer su utilidad didáctica.

Palabras-clave: Educación preescolar, Educación musical, Medios de enseñanza, Tecnología de la educación, Elaboración de medios de enseñanza.

1. Introduction

Digital technologies have transformed our world (Freitas de Torres, 2023; Saura and Caballero, 2021) across work, education, and even art itself. But in the education system, digitalisation has brought about a radical shift (Area-Moreira et al., 2020; Erwin and Mohammed, 2022; Navaridas-Nalda et al., 2020; Purnomo et al., 2024; Sosa and Valverde, 2020), leading teaching towards a distinctly hybrid scenario (Pardo et al., 2019).

The recent academic literature on this phenomenon is extensive. Still, the focus of observation tends to be on higher education, with little attention to Early Childhood Education (ECE), due to the controversies surrounding the issue. There is concern regarding the effects of overexposure to screens (Garavito-Sanabria et al., 2022; Gavoto et al., 2020; Priftis and Panagiotakos, 2023), and the underlying so-called 'digital dummy' (Ancajima, 2021). Conversely, other voices advocate for its introduction into nursery classrooms to counteract their adverse effects, enabling children to develop critical awareness through their didactic use (González, 2019). Thus, the educational process is aligned with current reality and childhood (Sevillano and Rodríguez, 2013), the 'digital native' generation (Prensky, 2011), although they lack the necessary skills to use them responsibly (Acosta, 2022).

Against this backdrop, this work stems from an inter-university Research, Development, and Innovation (R&D&I) project, focused on analysing the digitisation of the curriculum in the second cycle of ECE. Although ECE is not compulsory, it is the norm in Spain, with a net enrolment rate from age 3 of 97.2% (Ministry of Education and Vocational Training, 2022a). Specifically, this article examines the characteristics of digital music resources for this stage in three Spanish institutional repositories. Given that digital environments for music education present both advantages and obstacles (Freitas de Torres, 2023), their characteristics will lead to conclusions that can enhance their quality and guide their development.

Digital technology in children's music education has been scarcely explored in the academic literature (Cuervo et al., 2022). There are general studies on digital repositories, teaching practice, and the creation of Open Educational Resources (OER), such as that of Cohen, Kalimi, and Nachmias (2013). However, very few studies focus on music education (Allen, 2023), and even fewer examine music OERs created by students (Sliger et al., 2018). A review of three databases (Web of Science, Scopus and Google Scholar) using the keywords 'resources', 'repositories', 'early years' and 'music' in Spanish and English, yielded very few results. This contrasts with the growing interest in research on the creation and use of digital teaching resources (Area et al., 2022; Fernández et al., 2021; Marín et al., 2022). Regarding the specific topic at hand, digital music resources for ECE on repositories, only one study on repositories and music (see Pereira, 2019) and two on music and children were found. Firstly, although the digital ecosystem has undergone a metamorphosis (Area, 2017), the work of Vicente and Rodríguez (2014) lays the foundations for approaching the subject of this study. This work explores the educational provision and teachers' assessments of music teaching materials for ECE from a decade ago. Economic interests and publishers' proposals are the most influential factors in selecting and using these teaching materials, and the results highlight the need to improve teacher training in their selection. Secondly, Casal (2023) describes the digital teaching resources in the Galician repository *espazoAblar*

for the second cycle of ECE. This study concludes that not even one-tenth address musical content, and of these, only 22.3% are offered in Galician, with practically all being Digital Learning Objects (DLOs). As for the musical content, all resources focus on visual and auditory discrimination of instruments, except for one, which focuses on sound parameters.

Despite the scant coverage of digital music resources for ECE on repositories in recent literature, it warrants specific attention given the inherent particularities of music education in ECE. Unlike in later stages, music education is not recognised as a subject area (or sub-area) of the ECE curriculum but rather constitutes a basic skill: musical language and expression¹. Added to this is the globalising nature of ECE, which is why music should be approached holistically. Consequently, its implementation in the classroom is largely carried out by generalists (Ivanova & Siebenaler, 2018) rather than specialists, which poses significant teaching challenges (Zamorano et al., 2022) in selecting and implementing resources.

To facilitate teaching, it is essential to have digital educational resources that present the content, skills, abilities, and attitudes of music education dynamically and straightforwardly, tailored to children's psycho-developmental characteristics. There are various ways to organise and present digital educational resources. Following Area (2017), we identify resources that are not specifically educational but are used in the classroom, such as digital objects (videos, presentations, etc.), applications, tools, and online platforms, as well as other resources with a clear educational purpose. These include digital textbooks, teaching didactic materials (created for teaching), digital learning objects (multimedia content for educational purposes), tangible teaching materials (online spaces designed to facilitate learning), and intelligent adaptive learning environments (linked to the use of Big Data in education). Studies such as the one by Becerra, Martín, and Bethencourt (2021) highlight the predominance of DLOs in ECE.

Amidst this variety, repositories have gained great importance as online spaces for storing, organising, and retrieving digital educational resources (Fernández-Pampillón et al., 2013; Sanabria et al., 2017; Santana et al., 2017). Public education authorities have devoted considerable effort to repositories (Gabarda et al., 2021), and there is currently a wide range of public repositories for digital educational resources. Offered by the Spanish autonomous regions, these include materials and sections specifically designed for the different educational stages. Regarding music education in ECE, these repositories can serve as an excellent resource for teachers. However, they also raise questions about how to ensure their proper implementation in the classroom and their suitability for supporting learning, given the scarcity of appropriate software for music education (Liao, 2022). Among these questions are: (1) What presence do the digital musical resources offered for the second cycle of ECE have in Spanish institutional repositories? (2) Given that ECE itself and multilingualism are policy priorities for the European Union (Birch, 2023; Council of Europe, 2019), in what language(s) are these resources designed?; (3) What types of resources are available?; (4) Which curriculum area are these resources in the repositories associated with?; and (5) Which school years do they target?

¹ Ministry of Education and Vocational Training (2022). Royal Decree 95/2022, of 1 February, establishing the organisation and minimum teaching requirements for Early Childhood Education. Official State Gazette, 28, 14561–14595. <https://www.boe.es/buscar/act.php?id=BOE-A-2022-1654>

Given the lack of specific studies, it is necessary to start with a preliminary descriptive analysis of their characteristics. In this paper, we will answer these questions.

2. Methodology

To address these questions, we have reviewed resources hosted in three institutional repositories, considering five nominal variables (Russell, 2018): presence, language, resource type, learning area, and school year. For the selection of the repositories, an intentional or deliberate selection (Patton, 2002) was made based on criteria previously defined for the research, established within the project in which this study is framed. Accordingly, the institutional repositories of digital educational resources from the three autonomous regions participating in the aforementioned project are available on the official websites of their respective regional governments: the Autonomous Community of Galicia, the Valencian Community, and the Autonomous Community of the Canary Islands.

2.1. Institutional digital repositories

Institutional digital educational resource repositories emerged in Spain in the early 2000s. Among the first was that of the National Centre for Information and Educational Communication (CNICE), which later became the Agrega Platform and marked the beginning of the platformization of the education system (Decuypere et al., 2021). Following the trail of this state impulse, the autonomous regions begin to offer their repositories.

Hosted by the Regional Department of Culture, Education and University espazoAbalar, the 'Repository of Educational Content' (Galician Regional Government) was born in 2010. Since its creation, it has amassed over 3,500 resources, although it has recently undergone a process of renewal and streamlining. Prior to this change, the platform allowed filtering by educational stage, but the current interface only offers three search options: language, resource type and licence. For the past few years, DIXIT, a parallel repository of innovative resources designed collaboratively by teachers that, in principle, puts students at the centre, has existed (Barreiro et al., 2023).

In the Valencian Community, the first institutional digital platform for educational functionality was Mestre@Casa, which comprised various sections, including an archive organised by educational stages. At each stage, the resources were classified by cycles, educational levels and learning areas or fields. Subsequently, in response to the need arising from the COVID-19 pandemic and the temporary transition to digital teaching, the Valencian Regional Government created a new repository: Rebot Digital (ReDi), which follows the same organisational structure as Mestre@Casa but with more up-to-date materials.

Under the Directorate-General for Planning, Innovation and Quality of the Government of the Canary Islands, EcoEscuela2.0 is the portal of the Autonomous Community of the Canary Islands. It offers various educational resources, classified into four categories: digital educational resources (with a variety of resources and interactive digital objects); media library (a space with images, videos, etc., mainly

relating to the geography of the Canary Islands); CanariWiki (a collaborative website); and BioCan, the Canary Islands' natural inventory database.

2.2. Research phases

In accordance with the protocol of the Bioethics Committee of the lead university of the project, in an initial phase, a team of 12 people (4 per region) examined the preliminary characteristics of each institutional repository: *espazoAbalar* (Galicia), *Mestre@Casa* and *ReDi-Rebost Digital* (Valencia) and *EcoEscuela2.0* (Canary Islands).

Subsequently, the resources targeting the second cycle of ECE (3-6 years) were classified and reviewed in each repository, using a matrix designed specifically for the research and validated by an expert group comprising four Spanish universities, an Ibero-American research group in didactics and school organisation, ECE teachers, and staff from the International Association for Research on Textbooks and Educational Media. The matrix included data on all digital resources available for the second cycle of ECE in each regional repository, yielding the following initial sample: 81 for Galicia; 284 for the Valencian Community (100 in *Mestre@Casa* and 184 in *ReDi-Rebost Digital*); and 278 for the Canary Islands, making a total of 643 initial resources reviewed.

In the second phase, the filters 'teaching' and subsequently 'early years education' of the Galician platform *espazoAbalar* were applied, which led to 81 resources. In line with the platform's data for each resource, these were all suitable for use across the entire stage (0-6 years), the second cycle (3-6 years), or specific years within the educational stage. Hence, all 81 were considered for the research. For the Valencian Community, the filters 'early years', and subsequently 'Second Cycle' of the platform *Mestre@Casa* were applied, yielding 100 educational resources. In *ReDi*, the stage (ECE) was selected, and the second cycle was subsequently manually chosen, resulting in a total of 184 resources. The Canary Islands portal *EcoEscuela2.0* has three filtering sections: a search box (by keywords), a main menu (by educational stage and learning area), and a resource type (e.g., applications, videos, images, infographics). To identify resources for ECE, the simple search box was used with the keywords 'early childhood education' and 'early years', yielding 278 resources. Filtering by cycle was performed after identifying the resources linked to music education, as noted below.

As a result of the matrix, three tables were produced in the third phase of the research, containing the resources' data. Each resource was assigned a number and listed with its title, a direct link to the repository where it was hosted, and information such as the following:

- Language: Spanish, Galician and/or English for Galicia; Spanish, Valencian and/or English for the Valencian Community; and Spanish and/or English for the Canary Islands. These categories were not pre-established but emerged during the research. The research team also included the option 'various languages', which included resources that allow the user to choose the language from the options offered by the resource. This is the case of R3, which is in Galician and Spanish, or R25, which is in Spanish and Valencian (see Results and Table 2).
- Type: Digital Object (DO), Digital Learning Object (DLO), Digital Teaching Material (DTM), Professional Teaching Material (PTM), Applications, Tools or

Online Platforms (ATOPs), categories inspired by the classification established by Area (2017). These categories were included in the analysis matrix; that is, they did not emerge from the research but were pre-established before the resources were studied.

- Most relevant curriculum area: Growing up in Harmony, Discovery and Exploration of the Environment, and Communication and Representation of Reality (Ministerio de Educación y Formación Profesional, 2022b).
- Topic: key concepts regarding the content or topic of each resource (e.g., string instruments, auditory discrimination, etc.).
- School years/ages: the school years, ages, or cycles, as appropriate, for which the resource can be used were noted, based on the data or labels on the repositories.
- Other features: blank space to indicate, at the discretion of each researcher, notable characteristics of the resource (navigation, interactivity, type of tasks, inclusion or absence of feedback, interface design, etc.).

Finally, the fourth phase of the research involved collecting specific music education resources using data from the preliminary general matrices and the filtering options offered by each platform (see Table 1).

One person per region checked each resource to ensure that each one was directly related to the characteristics of basic knowledge F of Royal Decree 95/2022 (Ministerio de Educación y Formación Profesional, 2022b), called 'musical language and expression', particularly for repositories that did not offer the option to filter by 'music'. For Galicia, the preliminary matrix was used, which contained information on all available resources for ECE (n = 81), from which 9 were directly linked to music and extracted. As regards the Valencian context, to identify those addressing music education, each resource was accessed individually on Mestre@Casa, yielding 4 music education resources for ECE. For ReDi, music resources were found using the 'music' filter for ECE, yielding 13 resources from the 184 available at this stage. As this platform does not specify the cycle, the suitability for the second cycle was assessed individually, resulting in a total of 17 resources. For the Canary Islands, the search box on EcoEscuela2.0 was used with the following keywords and phrases: 'education' and 'music' and 'early years', 'Early years education music' and 'Music in early years education'. The largest number of resources was returned by the phrase 'Early years education music', so we chose this option. Furthermore, the results provided by the other phrases and keywords duplicated those previously filtered. To ensure that the portal did not offer any further resources relevant to this research, a search using the section on the portal titled 'Languages, Communication and Representation» was also carried out, which led to the same results. This screening yielded 35 resources, which were reviewed individually using their tags to choose only those resources for the second cycle of ECE. Although these tags cannot be used as filters, they help distinguish the cycle; as a result, we obtained 11 music resources for the second cycle of ECE. Based on the overall filtering process for each region, the music resource data for ECE were compiled in a table (see Table 2), enhancing the data's readability and clarity (Russell, 2018).

Table 1. Steps followed to access the sample of digital music resources on the repositories.

Repositories	Sorted by cycle	Filter by music
<i>espazoAbalar</i> (Galicia)	N=81	(n=9): 9 resources out of 81 met the criteria for basic knowledge F of Royal Decree 95/2022.
<i>Mestre@casa</i> (Comunitat Valenciana)	N=100	(n=4): 4 out of 100 resources met the criteria for basic knowledge F of Royal Decree 95/2022.
<i>ReDi</i> (Comunitat Valenciana)	N=184	(n=13): 13 resources out of 184 met the criteria for basic knowledge F of Royal Decree 95/2022, and were listed in the repository under the tag «music».
<i>EcoEscuela2.0</i> (Canarias)	N=35 35 resources out of 278 (all resources for the whole ECE) met the criteria for Basic Knowledge F of Royal Decree 95/2022, as identified through filtering with the phrase «Early Years Education music».	(n=11): 11 resources out of 278 met the criteria of basic knowledge F of Royal Decree 95/2022, the tag «Early Years Education music», and were indicated for the second cycle.

2.3. Description of the sample

As a result of the process described, a final sample of 37 digital music resources for the second cycle of ECE across the three regions was obtained: Galicia (n = 9), the Valencian Community (n = 17), and the Canary Islands (n = 11), as shown in Table 2. For each resource, the following details are included: a code (e.g., R1 = Resource 1), the language in which it is designed, the type of the resource (Digital Object -DO-, Digital Learning Object -DLO-, Digital Teaching Material -DTM-, Professional Teaching Material -PTM-, Applications, Tools or Online Platforms -ATOPs-), the most relevant curriculum area (CRR: Communication and Representation of Reality; and DEE: Discovery and Exploration of the Environment), and the school year/s in which each resource could be used. For the educational stages, we used ECE (Early Childhood Education), PE (Primary Education), CSE (Compulsory Secondary Education), and BAC (Baccalaureate).

For R26 (see Table 2), ‘several languages’ is indicated in the ‘language’ column and ‘all ages’ in the ‘school years’ column, as it can be used in English, Spanish, French, Portuguese, Russian and Chinese, and because the repository indicates that it targets «all ages». Despite its complexity, we decided to place it in the second cycle of ECE, as it holds IARC certification for early years and a PEGI Europe 3 rating (for ages 3 and older).

Table 2. Study sample: digital music resources for ECE children on espazoAbalar (Galicia), Mestre@casa and ReDi-Rebost Digital (Valencia), and EcoEscuela2.0 (Canary Islands).

Repository	Nº	Title	Language	Type	Area	School year
espazoAbalar (Galicia)	R1	O artista na aula e os nenos e nenas ao museo: Xaime Quessada (Workbook for the pupil)	Galician	DLO	CRR	6 th ECE
	R2	O artista na aula e os nenos e nenas ao museo: Xaime Quessada (Workbook for the teacher)	Galician	PTM	CRR	6 th ECE

Repository	Nº	Title	Language	Type	Area	School year
Mestre@casa (R10-R13) y ReDi (R14-R26) (Comunitat Valenciana)	R3	Vermes musicais	Galician & Spanish	DLO	CRR	6 th ECE
	R4	El mundo de Fantasmín	Spanish	DLO	CRR	4 th ECE
	R5	Así suenan los instrumentos	Spanish	DLO	CRR	1 st - 6 th ECE
	R6	Coloreamos instrumentos	Spanish	DLO	CRR	4 th - 6 th ECE
	R7	Construimos nuestros propios instrumentos	Spanish	DLO	CRR	4 th - 6 th ECE
	R8	Formemos una orquesta	Spanish	DLO	CRR	4 th - 6 th ECE
	R9	Puzles de instrumentos	Spanish	DLO	CRR	1 ^o -6 ^o EI
	R10	Juega con los instrumentos musicales	Spanish	DLO	CRR	4 th - 6 th ECE
	R11	Somos artistas	Spanish	DLO	CRR	4 th - 6 th ECE
	R12	Cuento de los artistas	Spanish	DLO	CRR	4 th - 6 th ECE
	R13	Acudiu amb les guitarres	Valencian	DLO	CRR	4 th - 6 th ECE
	R14	La Factoria de Sons	Valencian	ATOP	CRR	1 st - 6 th ECE
	R15	Trobadores	Valencian	ATOP	CRR	1 st - 6 th ECE
	R16	Correllengua 2020	Valencian	DLO	CRR	4 th - 6 th ECE
	R17	La Caixeta musical	Valencian	ATOP	CRR	1 st - 6 th ECE & 1 st - 6 th PE
	R18	Recursos AE Música i Arts Escèniques	Valencian	DLO	CRR	1 st - 6 th ECE & 1 st - 6 th PE
	R19	Mainasons	Valencian	DLO	CRR	1 st - 6 th ECE
	R20	Rodamons teatre	Valencian	ATOP	DEE	1 st - 6 th ECE & 1 st - 6 th PE
	R21	Canal de Dani Miquel	Valencian	ATOP	CRR	1 st - 6 th ECE & 1 st - 6 th PE
	R22	La música del Super3	Valencian	ATOP	CRR	1 st - 6 th ECE
	R23	Les cançons de les feretes	Valencian		CRR	1 st - 6 th ECE
	R24	Els Bítors	Valencian	ATOP	CRR	1 st - 6 th ECE
	R25	La Colla i Acció	Valencian & Spanish	ATOP	CRR	1 st - 6 th ECE
	R26	Incredibox	Various languages	ATOP	CRR	All ages
EcoEscuela2.0 (Canarias)	R27	Güicho con las notas musicales	Spanish	DO	CRR	4 th - 6 th ECE & 1 st - 6 th PE
	R28	Actividades de música para EI	Valencian	DLO	CRR	4 th - 6 th ECE & 1 st - 6 th PE
	R29	Aprendomúsica	Spanish, German, English & Catalan	ATOP	CRR	4 th - 6 th ECE & 1 st - 6 th PE
	R30	Sube y baja la marea	Spanish	DO	CRR	4 th - 6 th ECE & 1 st - 6 th PE
	R31	Toy Theater-Music	English	ATOP	CRR	4 th - 6 th ECE & 1 st - 6 th PE

Repository	Nº	Title	Language	Type	Area	School year
	R32	Tonematrix	English	DO	CRR	4 th - 6 th ECE, 1 st - 6 th PE, CSE & BAC
	R33	Mi primer xilófono y piano – hecho para niños	Spanish	ATOP	CRR	4 th - 6 th ECE & 1 st - 6 th PE
	R34	Chrome Music Lab	English	ATOP	CRR	4 th - 6 th ECE, 1 st - 6 th PE, CSE & BAC
	R35	Pito herreño	Spanish	DTM	CRR	4 th - 6 th ECE & 1 st - 6 th PE
	R36	Biblioteca de actividades JClic	English, Spanish & Catalan	ATOP	All	4 th - 6 th ECE & 1 st - 6 th PE
	R37	Cuentos y canciones con pictogramas	Spanish	ATOP	CRR	4 th - 6 th ECE & 1 st - 6 th PE

To ensure the replicability and validity of the study, the research team has faithfully adhered to the information in each resource on its platform when compiling Table 2. All data for the variables were extracted from the platforms, except for the type of resource and the learning area, which were determined by the research team for *espazoAbalar* and *Mestre@Casa*, as *EcoEscuela2.0* and *ReDi-Rebost* Digital filter by learning area.

Data extraction took place between 2020 and 2025. As previously mentioned, during this period, the repositories underwent updates and remodelling, which explains why some resources are currently inactive. However, it is important to clarify that they were part of the repositories during the data collection period and may have been used by teachers. Therefore, all resources (those still available today and those no longer active but active in 2020) have been included in the sample. This provides a more accurate picture of the digital music resources available on the repositories over the last 5 years.

2.4. Analysis procedure

To describe the characteristics of the resources in terms of their presence (in relation to the total of resources from the three regions: N = 643), language, type, learning area and the school year they target, a quantitative-descriptive analysis was carried out on the 37 resources comprising the sample of the data shown in Table 2. The research team used Microsoft Excel to process the data and generate figures illustrating the results.

3. Results

The results outline the main characteristics of the digital resources based on five variables: a) the presence of digital music resources for the second cycle of ECE, b) languages, c) type, d) curriculum/learning areas, and e) the school years they target. They are presented in sections following the research questions.

3.1. What presence do the digital musical resources offered for the second cycle of ECE have in Spanish institutional repositories?

Thirty-seven out of 643 digital music resources for the second cycle of ECE in the institutional repositories of the autonomous regions were analysed, accounting for 5.75% of all resources targeting this cycle.

3.2. In what language(s) are they designed?

As shown in Figure 1, digital music resources targeting the second cycle of ECE are mainly produced solely in Spanish (37.84%), in a similar proportion to those designed in the co-official languages covered by the study (Valencian and Galician, 40.55%), or exclusively in foreign languages (English, 8.11%). Very few (13.51%) offer a multilingual option, and those that do always include Spanish. Regarding resources published entirely in co-official languages, the reach is much greater in Valencian (13 out of 17) than in Galician (2 out of 9), representing 76.47% and 22.22%, respectively.

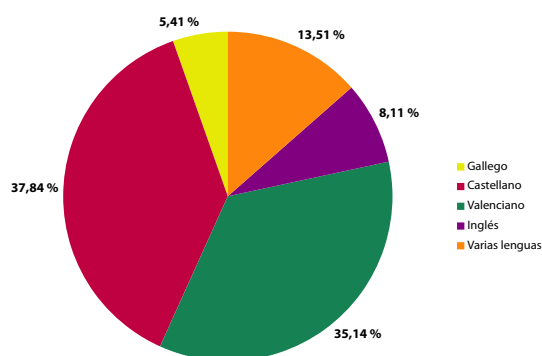


Figure 1. Languages of digital music resources for the second cycle of ECE in the Galician, Valencian and Canarian institutional repositories.

3.3. What types of resources are available?

Almost half (45.95%) of the available resources are ATOPs, closely followed by DLOs (40.54%). In much smaller proportions, DOs (8.11%), DTMs and PTMs (both 2.70%) can be found.

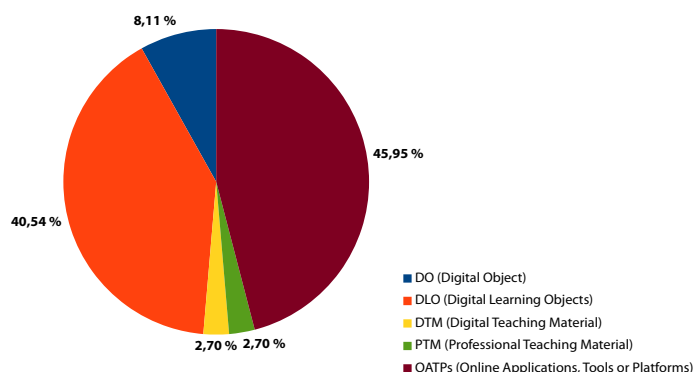


Figure 2. Types of digital music resources for the second cycle of ECE on the Galician, Valencian and Canarian institutional repositories.

3.4. Which curriculum area are these resources on the repositories associated with?

According to Table 2, all music educational resources for the second cycle of ECE are mainly linked to the curriculum area Communication and Representation of Reality. The uniqueness of the two resources is worth noting. R36 is a library encompassing various resources, which has led us to identify the three curriculum areas as linked to this resource, with no clear preference among them. Secondly, the researcher who analysed R20 indicates that it is a «workshop» for making musical instruments from recycled materials, which is why she decided to classify it as more directly linked to the area of Discovery and Exploration of the Environment.

3.5. Which school years do they target?

Figure 3 shows that more than half (54.05%) are aimed entirely at the second cycle of ECE, that is, from 4th to 6th grade of ECE (3-6 years). The resources indicated as suitable for use throughout the ECE stage, from 1st to 6th grade, account for 35.14% of the total. Very low percentages are indicated exclusively for the 6th grade (8.11%) and the 4th grade (2.70%).

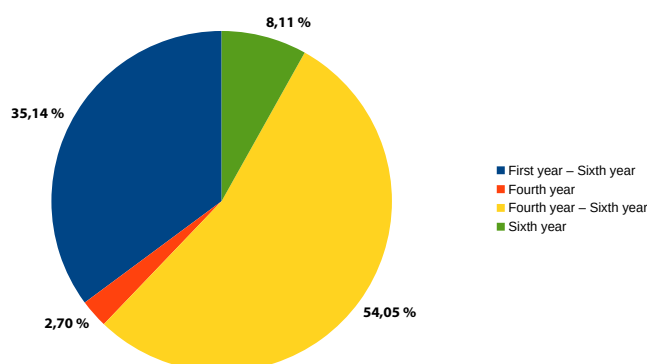


Figure 3. School years targeted by digital music resources for the second cycle of ECE on the Galician, Valencian and Canarian institutional repositories

4. Discussion

We have observed that the educational portals of the Spanish autonomous regions studied in this research offer a variety of digital resources. This implies considerable effort to maintain an active space, consistent with the work of Gabarda et al. (2021) on public investment by administrations in these resources. However, we note the low representation of digital music resources, which account for only 5.75% of the total resources allocated to the second cycle of ECE.

This could be linked to the scarcity of academic literature on this subject, as mentioned in the introduction to this text, given the lack of studies on this topic and this educational stage, the least researched in the national context. As noted, this could be due to the harmful effects of screens in early childhood, particularly overexposure

(Garavito-Sanabria et al., 2022; Gavoto et al., 2020). Hence, experts nowadays even refer to zero screens in early childhood. An example of this claim is the report of the committee of experts for the development of a safe digital environment for youth and childhood². This report recommends no exposure to digital devices between ages 0 and 3, warns against their use until age 6, and limits their use to specific instances to maintain social contact, always under parental supervision. The report even suggests restricting adults' device use when children under 6 are present. In line with these arguments, the Spanish Paediatric Association (Asociación Española de Pediatría, 2024) advocates no screen time until age 6 and only 1 hour per day between ages 6 and 12. These concerns have recently been endorsed by law with the emergence of a new draft bill on the protection of minors in the digital environment in Spain³, which also recommends avoiding screen use until age 6.

Although the use of technology in music education appears to be effective, with positive results in both musical and non-musical learning (Cuervo et al., 2022), the fact that music as a discipline is undervalued in schools «ultimately results in a scarce presence of digital educational resources for the field of music education» (Pereira, 2019, p. 81) on repositories. In addition, given the limited number of hours generally devoted to music in schools, we need to assess the appropriateness of using digital music resources.

This study concludes that there is practically the same representation of resources produced solely in the official language as of those designed in co-official languages, with a higher proportion of the latter in the Valencian Community than in Galicia. This could be linked to the language policies implemented or to the political instrumentalisation of co-official languages. The Valencian context highlights the promotion of the co-official language over the last decade carried out by teaching staff and the Botànic Education Authority, as reflected in the range of resources available on this region's repositories. In the Galician context, the prevalence of resources in the co-official language is more modest. Malheiro (2022) describes the de-Galicianization currently affecting Galicia and proposes following the models applied in other regions to «halt and even reverse the decline of a marginalised, slowly agonising heritage, as can be seen at present in Galician language» (pp. 129–130). Whilst European policies highlight multilingualism and ECE itself as priorities (Cortina-Pérez, 2022), we have also found that very few resources are designed directly in foreign languages or offered as multilingual options. Hence, the creation of more multilingual resources is necessary.

Concerning the types of resources, a high percentage (86%) are Applications, Tools or Online Platforms (ATOPs) and Digital Learning Objects (DLOs). This is in line with the preeminence of DLOs highlighted in Casal's (2023) research on music resources and with the generalist study by Becerra, Martín and Bethencourt (2021). However, the latter points to an evolution towards the proliferation of online platforms, which may be a consequence of the considerable supply and impact of entities that design and create digital educational materials, thereby favouring platforms.

² Spanish Ministry of Youth and Children. (2024). *Report of the committee of experts for the development of a safe digital environment for youth and children*. <https://bit.ly/435syhE>

³ Government of Spain. (2024). Preliminary Draft Organic Law for the Protection of Minors in Digital Environments. Ministry of the Presidency, Justice and Relations with the Cortes; Ministry of Youth and Children; Ministry for Digital Transformation and the Civil Service; Ministry of Social Rights, Consumer Affairs and 2030 Agenda. <https://bit.ly/4vnTghB>

About the curriculum areas, there is a wide range of resources linked to the area of Communication and Representation of Reality. This is consistent with the analysis by Casal (2023) and with the provisions of Royal Decree 95/2022 on musical language, which facilitates intercommunication and active listening (Ministerio de Educación y Formación Profesional, 2022b).

More than half of the resources studied target the entire second cycle (3-6 years), without specifying a school year, and almost 36% target the entire stage (0-6 years). Still, very few resources are designed exclusively for a specific school year. The speed that characterises educational digitalisation (Erwin & Mohammed, 2022; Purnomo et al., 2024) is unmanageable in real time for teachers, so repositories should facilitate their work. For this purpose, it is advisable to have a more balanced classification by school year to facilitate their selection. In line with the needs identified by Vicente and Rodríguez (2014), teachers intuitively select resources without reference points (such as assessment guides), which is related to a lack of both initial and continuous training. Both are highly influential in teaching practice with Information and Communication Technology (ICT) because they involve the internalisation of attitudes and habits that determine how technology is used. In addition, the provision of ICT training for teachers by the education authorities is scarce and highly instrumentalist (Sosa & Valverde, 2022). Particularly striking is the information in the 'grades' (school year/s) column in some of the resources (see Table 2: as stated in the platform's own information, R17 can be used during all the stages of ECE and Primary Education, while R26 can be used at all ages). This points to two aspects of interest. Firstly, it is necessary to highlight the generic nature of some resources: whilst they are clearly musical, some are videos or links to musical artists' channels and are therefore suitable for implementation at any educational level or stage. This leads to the second aspect: the prioritisation of quantity (Gabarda et al., 2021) over selection rigour, causing the entertainment factor to take precedence over educational and musical values. Whilst playfulness facilitates learning and appeals to digitally native generations (Paule-Ruiz et al., 2016), these resources should not neglect the educational and musical aspect that defines them. Without questioning the quality, this highlights the lack of evaluation and of specific, comprehensive criteria focused on the musical potential of the resources. The inclusion of guidelines for their didactic use beyond mere viewing or entertainment would reinforce this aspect.

5. Conclusions

Despite public investment in the creation and maintenance of institutional repositories containing digital educational content, music education resources for the second cycle of ECE hosted on these repositories are scarce, accounting for less than 6% of the total resources for that stage. These are offered in both Spanish and the co-official languages in roughly the same proportions, with the co-official figure considerably higher in the Valencian Community than in Galicia. Almost 90% are apps, platforms, or digital learning objects, and they cover content in the Communication and Representation of Reality curriculum area. More than half target equally pupils in 4th grade to 6th grade of ECE (3-6 years), and almost 40% target the entire stage (0-6 years), while those designed exclusively for a given grade are insignificant.

Among the weaknesses of this work, we highlight the continuous evolution of repositories, which means the available resources are constantly changing due to

updates. Another area for improvement is the expansion of the autonomous communities analysed. Although the chosen communities were defined by the R&D&I project within which this article is framed, a possible future line of research could be to replicate this study in other regions to obtain a more comprehensive overview of the issue. Given the rapid pace of curriculum digitisation, it would be advisable to repeat the study over five years to examine the evolution of both the resources and the platforms that host them, as well as other variables such as their efficiency, quality, practical use, or even to carry out comparative analyses between different countries. Therefore, it is necessary to continue developing analyses such as the one presented here to optimise the pedagogical characteristics of the resources and to provide guidelines for their proper selection based on critical assessments of their potential.

6. Contribution of the authors

All authors contributed to the research and writing – draft, review and editing. Specifically: Conceptualisation (LCF, MIPB, CJGR); Methodology (LCF, MIPB, CJGR), Validation and Formal Analysis (LCF and MCPG), Visualisation (LCF).

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