The contribution of ICTs to inclusive choir practice[1]

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Abstract. Integrating the use of technological resources in an inclusive choir made up of people with and without functional diversity, of whom a good number have no musical knowledge, has become a reality in recent years. The objective of this study is to analyse the use of, and contributions made by ICTs to autonomous repertoire assimilation on the part of members of such choirs. Based on a case study using three tools (an ad hoc questionnaire, a discussion group, and semi-structured interviews) we carried out a thematic analysis of discourse, and we compared and triangulated the information acquired from the sources we analysed. Results regarding the use of technological resources for choirs, the objectives and benefits of their use, the evaluation of existing ICT resources, and the proposal of new tools to reinforce the learning process are presented. It is emphasized that technology as an essential resource for appropriate choir evolution and serves as a complement for face-to-face (presential) rehearsal sessions. Its potential for individual autonomous study, its adaptation to each choir member's individual needs, its ubiquity and ease of use, and the variability in the type of resources on offer and in the devices that can be employed are some of the most outstanding characteristics that allow its transfer to other educational and training contexts and realities. It is necessary to continue working in-depth on this research line for inclusion to become a reality in our society, and to offer training that adapts to everyone's characteristics and needs. Therefore, ICTs can be regarded as tools with considerable further potential for the future.
Keywords: Technology; choir; inclusion; musical education; educational innovation; functional diversity.

[es] Aportaciones de las TIC a la práctica coral inclusiva

Resumen. La integración de recursos tecnológicos en un coro inclusivo constituido por personas con y sin diversidad funcional, y en las que un grupo importante no posee conocimientos musicales, ha supuesto una realidad en estos últimos años. El objetivo del estudio es analizar el uso y aportaciones que ofrece esta tecnología en el aprendizaje autónomo del repertorio en los integrantes de dicha agrupación coral. Mediante un estudio de caso en el que se han utilizado como instrumentos un cuestionario ad hoc, el grupo de discusión y las entrevistas semi-estructuradas, se ha realizado un análisis temático del discurso y la comparación y triangulación de la información obtenida de las diferentes fuentes analizadas. Se presentan los resultados obtenidos en relación con la utilización de los recursos tecnológicos ofrecidos por el coro, los objetivos y beneficios de su uso, así como los recursos existentes y la propuesta de nuevas herramientas que favorezcan el proceso de aprendizaje. Se destaca la función de la tecnología como recurso indispensable para la correcta evolución del coro, complementando la formación presencial. Su potencial para el trabajo individual autónomo, su adaptación a las necesidades individuales de cada miembro, su ubicuidad y facilidad de uso y la variabilidad en cuanto al tipo de recursos a ofrecer y dispositivos con los que utilizarlos son algunas de las características más destacables que permiten la transferencia a otros contextos y realidades educativas y formativas. Resulta necesario seguir profundizando en esta línea de investigación para que la inclusión sea una realidad en nuestra sociedad y se pueda ofrecer una formación adaptada a las características y necesidades de cada persona; y en este sentido la tecnología se presenta como una herramienta de gran potencial.
Palabras clave: Tecnología; coro; inclusión; educación musical; innovación educativa; diversidad funcional.

Summary. 1. Introduction 2. Technology, choir education, and inclusion. 3. Objective. 4. Methodological design. 5. Results. 6. Discussion and conclusions. 7. Bibliographical references.

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1. Introduction

The task of teaching musical repertoire to an inclusive choir made up of members with and without disabilities, many of whom do not have musical knowledge, has led to a search for new alternatives and modes of learning. Information and communications technologies (ICTs) have served as an important tool to aid choir members in learning scores, particularly in the current situation in which technology pervades all areas of life including education, where it has shown considerable potential (Boza & Conde, 2015; Cózar et al., 2015; Marković et al., 2012).

Particularly in working with an inclusive choir there was a need to create and edit digital content related to online interactive scores. Audio files and scores of independent vocal parts were made available so members could listen to several parts at once). Videos with the music were translated to Spanish sign language and different versions of the selected works interpreted by other ensembles were made available. Dropbox and Google Drive were the virtual sites used to store the content and make this material available. Further communication channels were established via WhatsApp groups.

After having applied these technological resources for several years, we felt the need to research and analyse the use and contribution provided by ICTs to the autonomous assimilation of repertoire on the part of the members of this inclusive choir. The aim was to ascertain the benefits of their use, establish guidelines for improvement, and furthermore consider the possibilities of transferring these findings to other choral education contexts.

2. Technology, choir education, and inclusion

ICTs appear in many aspects of human activity in our current society, fostering new forms of communication and behaviour that affect our modes of learning and our social relations (De Castro, 2015). They are reflected in many aspects of human beings, especially the personal, social, professional, and educational levels, requiring that everyone develop a series of indispensable abilities (Ramírez, 2020). Many studies have been published on ICTs both in the general educational domain (Area, 2010; Canales & Marquès, 2007; Domingo & Marquès, 2013) and the musical domain (Cózar et al., 2015; Serrano, 2017), as well as from the perspective of educators (Guerrero, 2014) and students (Romero & Vela, 2014). Certain studies highlight the potential of ICTs to improve the teaching-learning process (Organista et al., 2017), since they include audio and video resources, sound databanks and musical accompaniment programs, presentations, simulations, and information searches (De Castro, 2015; Román, 2017). Enhanced possibilities of use can be found in additional available devices. The computer is supplemented by smartphones, tablets, and other touchscreens, along with further resources such as digital blackboards and MIDI keyboards (Aróstegui, 2005; Monteagudo, 2012). The meteoric rise in types and uses of technology require that educators constantly update their knowledge regarding the use of available tools and resources (Monteagudo et al., 2017).

In the specific area of music education, Calderón-Garrido et al. (2019) suggest that ICTs encourage learning by presenting information via multimodal and hypertextual means, merging several languages and incorporating social networks in the process. According to these authors, the development of online digital platforms and sites encourages an optimal use of lesson time, and allows the educator to reach a greater number of potential learners. Expanding that vision, authors such as Casanova and Serrano (2016), Romero and Vela (2014), and Serrano and Casanova (2018) point out that ICTs have a great potential to provide resources. Thus, educators can support student diversity by adapting to the learning rhythm of each individual and encouraging independent study. Beneficial aspects such as ease of use and the enhancement of student motivation are associated with increased personal interest and effort in the acquisition of knowledge. Rodríguez-Lozano and Vicente-Nicolás (2019) show the high degree of motivation through the use of video tutorials. They point out, however, that the key to success could lie in the combination of teacher and multimedia materials, thereby effectively coupling technology with curricular content and pedagogical methodology (Koehler and Mishra, 2008). According to Webster (2002), the benefits of music technology go even further, since the latter fosters meaningful musical experience while respecting the integrity of the artwork at all times. The integration of ICTs in the choral domain is of great interest in view of the flexible, enriched learning situations they can engender (Cabero-Almenara & Martínez-Gimeno, 2019; Ordóñez et al., 2021). As signalled by González et al. (2018), ICTs are an adequate medium for potentializing the teaching-learning process in choir practice. Due to their widespread availability, they can be adapted to new teaching contexts besides the usual rehearsals, thereby improving the procedure and results of face-to-face choir rehearsal sessions.

Research in functional diversity and the interaction thereof with ICTs is a relatively new field (Cabero, Fernández-Batanero & Barroso, 2016; Delgado et al., 2019; Fernández-Batanero & Tadeu, 2019). Although the number of studies on this subject has increased in recent years, more research will be necessary in order to explore further on a national and international scale (Delgado et al., 2019). The current literature on the subject shows that for many people with functional diversity (visual, auditive, cognitive and motor disabilities), information and communication technologies offer direct access to a series of learning contents (Orozco et al., 2017). ICTs provide an educational support medium that makes a positive contribution to the process of inclusion and empowerment (Serrano & Casanova, 2021), since they establish the bases that allow students and learners to carry out tasks that

are in proportion with their possibilities and interests (Cabero, Fernández-Batanero & Barroso, 2016; Fernández et al., 2017). They thus allow equal access, since they adapt to each individual's needs and characteristics. All of this leads to notable improvements in the quality of life of persons with functional diversity (Cabero, Fernández-Batanero & Córdoba, 2016).

ICTs can particularly serve as a tool for inclusion in the case of choral activity, since they encourage the autonomy and independence of each choir member, can be adapted to the needs of each individual and provide specifically tailored personal support. They increase the degree of communication and promote the capacities of people with disabilities by reducing their limitations (Fernández-Batanero et al., 2018). They support flexible, interactive learning environments, thus reinforcing the cognitive and motivational development of people with functional diversity (Orozco et al., 2017; Brook & Upitis, 2015), thus promoting a greater degree of equality among choir members. ICTs also give rise to multisensorial stimulation, they encourage motivation, they reinforce competencies and attention, and they help to reduce the choir member's degree of frustration in remedying errors. Undoubtedly, these tools encourage active, versatile, flexible, adaptable learning (Delgado et al., 2019). ICTs can thus serve as thoroughly useful resources to encourage learning on the part of all people, regardless of their characteristics and capacities.

3. Objective

This study's objective is to analyse the use and contribution of ICTs to the autonomous assimilation of musical repertoire in an inclusive choir made up of people with and without functional diversity, who express themselves in a variety of ways (voice, sign language, body language). This general objective is pursued in the following concrete steps:

- To analyse the use of ICTs and of the choir's available technological resources as related to its members' characteristics.
- To understand and show user perception of the benefits of the use of ICTs for the independent assimilation of choral repertoire.
- To ascertain which types of available technological resources encourage independent assimilation of choral repertoire, and which ones are the most advisable to adopt.

4. Methodological design

This study applies multi-method design with a mixed focus by complimentarily coupling qualitative and quantitative methodologies (Creswell, 2009; Johnson & Onwuegbuzie, 2004). This approach allows us to profoundly reflect on, understand and analyse complex educational innovation processes from an interpretational perspective, regarding the use of technology by an inclusive choir. The most predominant type of analysis in this study was qualitative (Díaz & Giráldez, 2013), through data gathering and analysis methods to gain a profound grasp of choir members' experiences (Bresler, 2006). This was combined with quantitative techniques (Ibarretxe, 2006), while attempting to achieve a complimentary combination of both perspectives (Blanco & Pirela, 2016). The procedure followed is represented in Table 1.

Table 1. Research phases

PHASES	APPROACHES AND TECHNIQUES
PHASE 1	Bibliographical literature review; design and validation of the questionnaire
PHASE 2	Distribution of the questionnaire for responses. Data analysis
PHASE 3	Discussion group. Data analysis thereof
PHASE 4	Semi-structured interviews. Data analysis thereof
PHASE 5	Triangulation of all previous data

4.1. Method and tools

Data was gathered using a series of different techniques and research tools in view of the ultimate triangulation of data from all phases. The tools used were questionnaire, discussion group, and interviews.

Firstly, an *ad hoc* questionnaire was drawn up *based on* information obtained from the literature review (Albert, 2007). The questionnaire consisted of 28 questions grouped into three main groups: 1) person's general characteristics; 2) their musical abilities and experience; 3) the greatest amount of questions which

explored choir members' perception of ICT usefulness and variety for the autonomous learning of choral repertoire in sign language. This last group of questions had a link to an additional section to be filled out voluntarily by those who agreed to continue helping in this research. 17 people confirmed their interest in participating.

The questionnaire was validated by a panel of three experts (Cabero & Llorente, 2013; Robles & Rojas, 2015): a professor of Educational Sciences, a professor in the area of Musical Expression Didactics with a widely recognized line of research in the methodological-technological field, and a researcher specialising in the application of ICTs to the field of education. The final version of the questionnaire was designed using the Google questionnaire tool, taking all necessary accessibility requirements for all choir members into account. This final questionnaire was transmitted online to all choir members (Fricker & Schonlau, 2002). The online version made it easy to send and fill out, while providing participants with a greater sensation of anonymity and allowing researchers to easily import their answers for data analysis.

Once analysed, the data extracted from the questionnaire served as a basis and a guide to elaborate a semi-structured script for the discussion group and for the in-depth interviews carried out thereafter. The discussion group session (Taylor & Bogdan, 1984) took place in the usual rehearsal room, a university classroom, to encourage a positive, comfortable, familiar atmosphere for all participants. The discussion group session lasted one hour and was recorded in audio and video format for subsequent transcription and in-depth analysis. To encourage the amount of interaction needed to new knowledge and content, the discussion group was carried out in a relaxed, non-directive, permissive manner, giving maximum priority to participants' observations and avoiding focalization whenever possible (Sabirón, 2007).

After having carried out an initial analysis of the group discussion data, the script for semi-structured interviews was re-elaborated (Díaz-Bravo et al., 2013) based on guidelines featuring question examples that are sufficiently flexible to allow for the introduction of other issues. The ultimate goal was to expand the overall amount of information obtained or to gather more precise details. To achieve correct theoretical saturation (Guest et al., 2017), three interviews. They took place in a relaxed atmosphere in which the interviewee could make all the comments and additions they found fitting. These interviews were recorded for subsequent transcription and analysis.

These data were analysed qualitatively in an interactive, iterative procedure, operating in a spiral of increasingly in-depth exploration during the course of the study (Strauss & Corbin, 2002). Data were studied via thematic analysis of discourse (Braun et al., 2016) and by comparing and triangulating the information obtained from the analysed sources (Flick, 2004; Maxwell, 2012), thereby allowing for the incorporation of emerging categories related with the study's objectives. It began by laying out a system of categories based on the review of scientific literature, leading to an iterative, back-and-forth procedure in six phases of thematic analysis (Braun et al., 2016). The first phase consisted of becoming familiar with the reading and rereading of answers and transcript notes related to the possible units of meaning contained in the data. Thereafter was the process of organizing, managing, and creating initial codes with significant, relevant data, giving rise to emergent categories resulting from an inductive, reflexive procedure shared among all members of the research team. To achieve this, the guidelines provided by Simons (2011) were taken into account, thereby attempting to avoid mechanic and automatic categorisation, leading to stagnation on a formalist level. Thus, while examining the data culled from the different tools and comparing them with one another, the categories were kept as open as possible to allow for eventual change as well as for the emergence of new categories.

All data obtained were subjected to a systematic triangulation procedure (Flick, 2004), which was applied to informant subject profiles (taking the different agents implied in the process into account) and to our data gathering methods (contrasting among the data obtained in the questionnaires, the discussion group, and the interviews). This triangulation allowed us to elaborate results and conclusions from a broader, more in-depth perspective.

4.2. Context and participants

This study was carried out on an inclusive university choir made up of members with and without functional diversity: students, alumni, professors, administrative personnel, service personnel, and other citizens. The choir began activities in the 2017/2018 academic year with a vision of choir singing as an activity that could potentially transform individuals in their personal and social development. Ever since its creation, members of 25 different nationalities have participated, integrating people with visual, motor, cognitive, and hearing disabilities. The choir has collaborated with a series of centres and associations implied in issues of functional diversity. On the technological scale, the choir has evolved by gradually adopting an increasing number of resources over the past three years.

When data was collected, the choir had 135 members. The questionnaire was voluntarily filled out by 89 people (out of a total of 135 who received the questionnaire), this being 68,9% of active members. In terms of age, respondents ranged from 18 to 68, although most members were ages 18 to 26. Sample distribution in terms of gender and academic/professional profile is shown in Table 2.

Table 2. Sample distribution in terms of gender and professional profile

GENDER		ACADEMIC/PROFESSIONAL PROFILE	
Female	65	Enrolled student	47
Male	23	University alumnus	16
Non-binary	1	Faculty	7
		Administrative/service	3
		Not part of the university	16

Participants' functional diversity is shown in Table 3, showing the varied spectrum of this group.

The discussion group was composed of 7 informants who were choir members; they participated on a voluntary basis. They were selected based on criteria of maximum variability (Strauss & Corbin, 2002), from data obtained in the questionnaire (details are shown in Table 4). Representativeness was taken into account for variables such as relation with the university, age, gender, the amount of time the subject had been a choir member, the type of disability, and the subject's degree of musical knowledge.

Table 3. Functional diversity of subjects in the sample

TYPE OF DIVERSITY	NUMBER OF MEMBERS
Visual impairment	7
Hearing impairment	2
Motor impairment	2
Impairment of cognitive development	1
Depression	5
Attention deficit disorder (ADD)	1
Asperger syndrome	1
Anxiety disorder	7
Obsessive-compulsive disorder	1
Specific phobia	3
Eating disorder	1
Down's syndrome	1
Immunological disease	2
Behavioural addiction	3
Performance anxiety	4
Other	6
TOTAL	47

Table 4. Participants in the discussion group

Group discussion participant	Academic/ professional profile	Musical knowledge	Amount of time as choir member	Functional diversity
I.1	Faculty	No	1 year	
I.2	Education alumnus	No	Since inception (3 years)	Asperger
I.3	Education student	Yes	Since inception (3 years)	
I.4	Student of medicine	No	1 year	Degenerative motor illness
I.5	Student of medicine	Yes	6 months	
I.6	Education student	No	6 months	
I.7	Univ. personnel	No	Since inception	

In-depth semi-structured interviews were conducted with three choir members who were selected in view of their varying characteristics and profiles: they voluntarily agreed to participate. Details of participants are shown in Table 5.

Table 5. Profile of interviewed choir members

Interviewee	Academic/ professional profile	Musical knowledge	Amount of time as choir member	Functional diversity
E.1	Faculty	No	1 year	
E.2	Graduate student in computer programming	No	6 months	Blind
E.3	Education alumnus	Yes	2 years	

All participants were informed about the study's existence from the moment when research was being planned, justifying the need of analysing the uses and benefits of technology applied in choir activities. Informed consent was obtained in all cases.

5. Results

The data were grouped into 4 categories for analysis: 1) Use of ICT resources offered by the choir; 2) objectives of the use of ICTs; 3) benefits of ICT use, and 4) existing ICT resources and proposals for new resources. These categories were organised into subcategories, and the most relevant results of the data analysis are presented below.

5.1. Use of ICT resources offered by the choir

Participants in this study use technology in their daily life for learning purposes. Practically all of them make use of the technological resources at their disposal by the choir. According to the questionnaire responses, only 10% of members do not use the ICT resources offered by the choir. The reasons that justify non-use are the fact that they have just become members and have not been able to start using those resources; others allude to lack of time for their use, and only one respondent reports a lack of means or adequate knowledge to use the resources. It was thus shown that the use of ICT resources is generally widespread across the great majority of choir members. The discussion group and the interviews yielded similar results, indicating a generally widespread use of ICT resources, which have been adopted just as naturally as any in other personal, social, and professional aspect of life, as indicated by a member of the discussion group: *ICTs have been taken a further step: they have gone from being important to being essential, in study as well as in daily life* (I.3).

5.1.1. Technological devices used by choir members

For access to the choir's ICT resources, the devices most frequently used are the mobile phone and the computer. Among all respondents, 9 subjects indicated that they require a specially adapted computer and/or mobile phone to adequately go about their daily routines. Concretely, the questionnaire indicates that the mobile phone is the most frequently used device, as shown in Table 6.

Table 6. Most used device

MOST USED DEVICE	NUMBER OF PARTICIPANTS	PERCENTAGE
Mobile phone	60	67.4%
Computer	41	46.1%
Tablet	10	11.2%

The discussion group and the interviews conducted allowed further exploration about the characteristics that led choir members to favour the use of one type of device over another, as illustrated by the following comment: *I like to see visual gestures more on the computer, and I like to hear audio examples more on the mobile phone* (I.3).

Participants highlighted the mobile's speed and immediate availability. They found computers offer better image quality (due to their larger screen), as well as better overall sound quality (enhanced volume and quality). Furthermore, the computer is easier to control and apply commands with the mouse, whereas information and menus are more compressed on the mobile. Older choir members tend to make greater use of the computer.

5.1.2. Frequency and scheduling of ICT use

In terms of frequency and scheduling of ICT use, there was a great degree of variability among choir members according to their specific individual situation.

Certain questionnaire items dealt with frequency of use. This distribution is shown in Table 7.

Table 7. Frequency of ICT use as reflected in the questionnaires

FREQUENCY	NUMBER OF PARTICIPANTS	PERCENTAGE
Less than 30 minutes	48	54%
Between 30 min. and 1 hour	23	25.8%
Between 1 1/4 hr. and 2 hrs.	7	7.9%
Over 2 hours	2	2.2%
Does not use	9	10.1%

Besides deliberate use as reflected in the questionnaire, certain members also listened to background music while going about other activities, as discussion group participants pointed out. Most of them indicated that they use these resources at home in the evening during free time when there are no more daily chores to tend to. Some members have the sensation that use of ICT resources before going to sleep encourages memorization.

The interviews likewise reflect that a member's personal self-confidence exerts a certain influence, as well as their experience in the choir. For instance, if the choir is preparing for a public performance, or on the other hand, if the choir member is new and is not yet familiar with the repertoire they are going over.

5.2. Goals of ICT use

5.2.1. Goals according to the choir members

The triangulation of data, obtained via questionnaires, the group discussion, and the interviews, yield two main perceived goals. The goal most often mentioned with the highest priority is to reinforce learning that began in the rehearsal, especially the learning of melody, text, and sign language gestures to ease memorization. The second most important goal is for new choir members to be able to learn the songs which their colleagues already know well, and to which less time is devoted during rehearsal. In both cases the ultimate goal is to avoid delaying the choir in its progress, and to encourage more positive group dynamics due to personal study.

5.2.2. Perceived goals and the *influence* of the choir director

Discussion group and interview results show that the choir director's influence upon the goals to be pursued is decisive regarding the use of ICTs. Choir members respond to the director's indications encouraging the use of ICTs, especially at the time he proposes it and according to the goals he suggests, as indicated by one of the interviewees: *For example, the other day the director said, "Listen to one another and take some time to review "Somos tu voz" before you record it." Indeed, I downloaded the audio to my computer and recorded my voice singing over it* (E.2).

5.2.3. Schedule moments when ICTs are used in view of pretended goals

In close association with the choir's goals, ICTs are specifically used right before the rehearsal to prepare with the day's songs well memorized. This is indicated not only by those members who have been in the choir for a longer time, but also by those who are new. Most choir members use ICTs to learn their part (melody, text, and gestures), and they only listen to their part. Those who possess a greater degree of musical knowledge use ICTs with a more differentiated, complex approach, by listening to other parts and singing theirs over them.

5.3. Benefits of ICT use

5.3.1. Complementarity with face-to-face rehearsals

Although face-to-face rehearsals are an indispensable element for the choir to function optimally, ICTs are just as indispensable, as discussion group participants and interviewees confirmed. All informants agree in stating that the two are complementary and fulfil different functions. In person rehearsal sessions particularly satisfy a social, psychological, emotional, and motivational need. Choir members use words such as "passion" in their descriptions. Furthermore, they point out that ICTs have a considerable potential to assist them in

individual, independent preparation, which, in turn, works in favour of the quality of face-to-face rehearsals: *Thus, you get more out of a rehearsal when you already know the piece. Things work better from the moment you arrive* (I.5).

Participants in the discussion group and the interviews expressed and showed a great degree of diversity among choir members, with different physical, psychological and cognitive characteristics and needs, beside coming from a variety of personal situations and backgrounds; and they underlined that technological resources have become great allies for each of them in the achievement of musical progress within the group. ICTs lead to improved overall rehearsal results. Without such technological support, face-to-face rehearsals could not be conducted with the same dynamics, and the choir's overall readiness to sing would be lower. ICTs thus ensure that rehearsals are more satisfactory for all choir members: *ICTs are what helps us gain more self-confidence: we can learn individually, and then they help us come to choir and enjoy the session more with the others* (I.1).

Moreover, ICTs facilitate the learning process, helping choir members learn their pieces more rapidly while strengthening the memorization process. *Any type of learning requires individual study, and this is a practical, easy way to go about it* (Response to Questionnaire Item No. 24).

5.3.2. Adaptation to the diversity of choir members

Choir members who participated in the discussion group and in the interviews agree in highlighting the benefits offered by ICT resources in this field: ICTs ensure equal opportunities by adjusting to different individual learning rates, specific needs, and differing degrees of musical knowledge, as one of the choir members explains: *ICTs provide equal access for those people who need to work a little harder. Here in our rehearsals, we truly have equality and inclusion, but ICTs allow a further degree of equality for people who need a little more, among whom I would totally include myself* (I.6).

Further, exploring the meaning they give to this term, they highlight its adaptation to choir members' needs whenever, wherever and however they arise. Face-to-face rehearsals are limited in terms of regularity, duration, and adaptation to the group's average learning rate; ICTs offer greater flexibility regarding all of these aspects. Choir members particularly point out that each one of them can use the recording as often as they want, since they are able to select the track and the fragment they need to work on most (they do not always need to listen to all the material provided). They can pause in a piece to repeat a section, and they can sing over the recording. ICTs encourage self-learning, the development of a greater degree of aural discrimination, and self-correction. Through their use, choir members learn to become more demanding of themselves, since they can arrive truly prepared for a choir rehearsal.

For those members who are shyer and more insecure, ICTs are a very useful tool that helps them reinforce their self-confidence and self-esteem, along with their knowledge of the musical content that is being worked on in the choir; otherwise, such people would not muster up the courage to ask questions in group sessions, and they would be left alone with their uncertainties. Technology helps them discover the answer to their queries on their own, and helps them learn the piece correctly. This, in turn, supports their self-esteem and reduces negative feelings they might harbour for fear of holding the group back in its progress: *[ICTs] are a complement to help me overcome my lack of self-confidence regarding music: I feel very insecure… Technology, technological tools, are essential for me […] because when you are delaying the group, it bothers you* (E.1).

Many of the choir's members have no musical knowledge or only a limited amount thereof. ICTs create equal opportunity within the group, and such people do not get lost when they are in rehearsal. Those members who are studying in other locations for a limited time (for instance abroad, going on Erasmus scholarships) can continue to work on the musical pieces, and are not dissociated from the group and its choral activity. Those choir members who possess a greater degree of musical knowledge tend to use it to explore the music further, and to improve their voice's intonation by listening to other voices interpret their part. Thus, ICTs likewise provide a greater degree of satisfaction to those members who possess more advanced musical knowledge.

5.4. Existing ICT resources and proposals for new ICT resources

5.4.1. Platform accessibility and organization of resources

One of the most salient aspects mentioned in the discussion group is accessibility to the platform on which the resources are stocked. Members point out that the choir has evolved. At the onset, resources were more difficult to access because they were on Dropbox, a cloud storage website which did not offer ease of access comparable to Google Drive, the one currently used. The latter offers rapid, simple access from computers as well as smartphones. Another topic strongly associated with the above-mentioned aspect is the way the ICT resources are presented. The fact that they are now stocked in the same virtual space makes it easier to find them rapidly without having to sort through e-mails or use non-virtual support media (such as CD recordings or external memory drives). The organization of files corresponding to the musical pieces in alphabetically sorted folders, with subfolders according to the type of resource, makes it easy to locate them rapidly.

5.4.2. Types of existing resources and new proposals

In relation with the ICT resources provided by the choir, its members all use them frequently. The questionnaires reflect that frequency of use, with the distribution shown in Table 8.

Table 8. Frequency of choir ICT resource use as reflected in the questionnaires

ICT RESOURCE	FREQUENCY OF USE ON A SCALE FROM 1 TO 10
Audio files	8.6
Sign language videos	8.3
Interactive scores	7.6

Further in-depth analysis of the questionnaires showed the use of each resources depending on each choir member and their individual needs. Certain choir members use all three types of resources, but a significant amount only use one or two types of resources on a regular basis, but not the others.

These data coincide with results obtained in the discussion group and in the interviews. Members use a certain resource more than the other ones in function of their self-perceived difficulties. They also mention the use of other ICT tools, especially WhatsApp, YouTube, and audio editing programs such as Audacity. They highlight WhatsApp's immediacy of communication. On the other hand, YouTube is easily accessible and provides many options for listening to and watching interpretations of the same pieces by other choirs. The free audio editing program Audacity allows them to add their contribution to the provided recording and listen to themselves by simultaneously listening to the two versions for comparison.

Regarding choir member proposals for additional resources to improve and expand on the existing ones, the participants' suggestions can be categorized into three groups:

–   Resources for general musical training: Specific, sequenced video tutorials featuring breathing exercises and vocal technique that assist the choir member in their prolonged individual study during intersession periods. Participants find that such resources allow each member to evolve according to their individual work rhythm, needs and knowledge.
–   Resources supporting the choir's concrete repertoire: Participants request video tutorials that contain a previous analysis of each song, pointing out the challenges it might contain, and proposing specific study suggestions for passages of greater difficulty. They also suggest the use of video tutorials that explain the meaning of each sign language gesture featured in the piece, before proceeding to record the piece in sign language in real time.
–   Resources about the use of technology. Choir members suggest the use of video tutorials on the musical use of certain applications: indicating, for instance, how to download the audio file and then, how to record one's own voice over it. Live streaming retransmission or recording of choir rehearsals is also regarded as a useful tool for people who were in lockdown due to the pandemic, or who cannot attend because they are studying or working in other locations. Thus, they can thus follow the rehearsals even if they are not present.

6. Discussion and conclusions

Data obtained from triangulating results of the three tools applied to our object of study allow us to establish a series of conclusions. It was shown that new technologies are now not only important, but have become indispensable and essential in the learning of any discipline; in the case of a broadly inclusive choir such as this one, their usefulness is beyond question. Moreover, the Covid-19 pandemic situation has expanded and accelerated their improved use in all fields including musical training, and this has had beneficial effects on the group featured in this study.

ICTs have been presented as an effective resource for autonomous individual learning because they adapt to each person's individual needs, characteristics, and learning rhythms. They permit equal access, participation, and opportunity for all members, in line with the findings of Cabero, Fernández and Barroso (2016) and Fernández et al. (2017). Consequently, this has likewise improved the results of face-to-face rehearsal sessions (Arrobas et al., 2014; Serrano & Casanova, 2018). Choir members have developed a greater sense of responsibility for their own learning, and they have improved their time management between rehearsal sessions (Perdomo, 2016; Serrano & Casanova, 2018; Sheppard, 2014). Moreover, they have developed a greater sense of reflection, self-criticism, and self-expectation regarding their own progress (Addesi et al., 2017). Their learning achievement was more significant (Boza & Conde, 2015; González et al., 2017; Monteagudo et al., 2017), which lead to a greater degree of motivation (Perkmen & Cevik, 2010; Casanova & Serrano, 2016). In line with our findings presented, the literature review carried out by

Calderón-Garrido et al. (2019) indicated an enhanced self-confidence, self-esteem, and self-regulation, while likewise reducing stress and certain states of anxiety.

The multimodal character used by the choir to express itself integrates the singing voice, Spanish sign language, and corporal expression, thereby simultaneously deploying several languages at once. It was found that digital media supported assimilation, further exploration, and integration of all of these. As affirmed by Calderón-Garrido et al. (2019), when ICTs are used in musical learning, they work in favour of the development of vocal and instrumental musical competencies, thereby reinforcing the student's command of musical language, ear training, and corporal expression. Both studies have likewise found that ICTs encourage the fusion of these different languages. The use of multimedia material and social networks has been and effective complement and provided greater flexibility and fluency in face-to-face rehearsal sessions, thereby motivating members to achieve better performance and attendance to rehearsals. On the other hand, it is undeniable that the face-to-face choir rehearsal plays an irreplaceable social, psychological, emotional, and motivational role. Results show that the choir director exerts a different influence on members, by encouraging them to use the ICT resources. According to Rodríguez-Lozano and Vicente-Nicolás (2019), student use of video tutorials leads to greater degrees of motivation, especially when the choir director proposes and is involved in proposed audio-visual materials. It should be emphasized that ICTs should always support and facilitate the process, never to be goals in themselves (Tourón et al., 2014). Thus, the selection of appropriate ICTs should help implement the training goals being sought (Cabero, 2001). The search for concrete, well-adjusted tools and the analysis thereof are an important part of the process (Perdomo, 2016). ICTs thus provide substantial benefits in education and training, according to the results of a series of studies in general education (Blasco et al., 2016, 2018; Martín & Tourón, 2017), as well as in music education specifically (Serrano & Casanova, 2018).

In conclusion, technology plays an essential role in the assimilation of musical repertoire within the context of an inclusive choir. ICTs provide many benefits are increasingly more present, even though their contribution does not have the same value without the physical, emotional and social connection provided by in person choir rehearsal sessions. Our study's results can be adapted for transferral to choirs with similar characteristics, as well as to other educational contexts oriented toward diversity and inclusion. Research about both general and specifically inclusive choral practice is still in its initial stages. It will be necessary to go on exploring this line of research for inclusion to become a reality in our society and to offer training adapted to the characteristics and needs of each person. Thus, technology is a tool with considerable potential for the future.

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