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Digital Competences in Teacher Training and Music Education via Service Learning: A Mixed-Method Research Project

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Abstract: This study investigates applied service learning (SL) methodology with the goal of analyzing digital competence in teacher training. Twenty-three preservice teachers completed validated questionnaires regarding both general and specific digital competence in music as well as a self-evaluation of SL in a case study complemented by a quasi-experimental quantitative pre-post-test comparison. The experience highlighted in this paper not only includes the application of a variety of didactic, musical, and technological knowledge and strategies but also emphasizes the aspects of reflection, analysis, and the proper use of digital media for personal, educational, and social purposes on the part of students at different educational levels. The results indicate that preservice teachers acquired the values of social and personal responsibility (82.6% of participants) and became aware of the advantages of incorporating technologies into the music classroom (87.5% of participants). Moreover, the research design provided these teachers with an in-depth perspective on the evaluation of the SL experience and its significance.

Keywords: digital competences; music education; teacher training; mixed method; service learning

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1. Introduction

In contemporary knowledge-based society, technologies are essential tools that provide essential access to information while integrating users into 21st-century professional communication channels and offering them a series of leisure opportunities [1]. University education should emphasize these changes by enabling students to develop their digital competence [2]. Its development in scenarios such as the one recently lived with COVID-19, when a rapid adaptation to teaching in social closure by means of technology was necessary, is of particular importance [3]. Reviews from the students after the closure show the importance of the use of technologies, not only to facilitate institutional and peer-to-peer communication, but also for the development of networks and permanent learning skills. Likewise, teachers stated they did not have enough abilities to face that situation [4].

Technology, however, should never be treated as an end in itself [5]. At the levels of secondary and university education, teachers and students can discuss and experiment with different devices and apps to determine whether they are worth employing to achieve certain goals. When developing digital competence, we should refrain from focusing excessively on technologies in isolation, instead taking into account the personal, social, and cultural contexts in which we use technology [5]. Media literacy and a collaborative social environment are thus equally important with respect to developing an appropriate approach to technology in the classroom.

Digital competence encompasses knowledge, skills, and attitudes, and it is associated with the following five dimensions: "(1) the location, retrieval, storage and analysis of

digital information while judging its relevance and purpose; (2) communication and sharing resources in digital environments; interaction with communities and networks; (3) the creation and edition of new content, or the re-elaboration of previous content; [. . .] the application of intellectual property rights and licenses; (4) safe and sustainable use; and (5) the identification of digital needs and resources [. . .] while solving conceptual problems related directly or indirectly with technology" [6] (p. 4). After gamification has been applied in university classes, the value of digital teaching competence tends to increase in five similar dimensions, such as digital literacy, communication, collaboration, content creation, security, and problem solving [7].

Teachers with a high degree of digital competence are well prepared to apply a series of innovative training modalities to support independent and collaborative learning [8]. Moreover, secondary education in the specific subject of music requires mastery of music-related technological skills because nowadays, there are sound sequencers editors available and applications to make recordings and sound mixing, as well as technological resources that simulate the interpretation of instrument groups, which was only possible in recording studios and can now apply to musical education [9].

Secondary education in the subject of music also requires media literacy in the area of adolescent musical subcultures. Digital sources of information regarding such musical subcultures include mass media profiles of singers or bands [10]. "Music-streaming services embed social features that enable users to connect to one another and use music as social objects" [11] (p. 643). People share their listening experiences and exchange comments on spaces such as Spotify, YouTube, and MySpace. Social groups thus emerge spontaneously as a function of these young people's shared musical tastes, thereby giving rise to a series of social and cultural values that play an essential role in their personal development [12]. Preservice teachers can thus acquire musical ICT competence if they are also trained in media literacy and familiar with informal culture. However, recent studies recommend the hybridization of training processes, integrating digital tools in the music classroom seeking to improve acoustic skills such as instrument [13], voice training [14], or composing [15].

Within the range of available methodological proposals for the music classroom, service learning (SL) projects can serve as an efficient way for students to acquire knowledge while simultaneously enabling them to discover new ways of relating to their social environment [16,17]. In the specific field of music, SL has been proven to have a considerably positive impact on the ability to learn curricular content and acquire cultural competencies while simultaneously reinforcing students' political, poststructural outlook on the society in which they live [18]. Moreover, "students gain both personal/social and academic skills. They also develop leadership and communication skills and critical awareness on the one hand and time and resources management and the ability to adapt and respond to challenges of the real world on the other" [19] (p. 259).

Owing to achieved benefits, it is necessary to conduct an in-depth investigation and programmation regarding (1) the types of tasks that must be carried out to support SL activities (acquiring, creating, and performing musical content), (2) the opportunities for students to apply their previous experience and learn from their peers within the framework of the SL activity, (3) the context in which the SL activity is applied (the connection between theory and practice), and (4) the coherence and continuity of SL projects over time, since, unlike an internship, in an SL experience, it is important for participants to feel committed to the social problem at the affective, behavioral, and cognitive levels [20]. Likewise, the role of the teacher in an SL experience is meant as support and differs from that of an internship's supervisor [21].

To ensure student engagement and critical reflection, the SL experience should feature three phases: anticipation, familiarization, and commitment. True commitment is achieved by students who have understood that the beneficiaries of the service are real people with whom they should establish personal connections. This way, the process involves a high affective charge in the relationships of the people involved and transforms the students,

since it favors awareness of his own learning and also motivates them to relate it to his personal identity [22].

Within the framework of the SL activity, the professor's role is equally essential: the faculty member is a specialist who has in-depth knowledge of the musical curriculum, who is aware of local social circumstances and realities, and who is capable of organizing initiatives that connect those two aspects with one another [23].

In music education, SL also helps students determine whether music is an appropriate profession for them. The SL activity emphasizes their competences in the area of reflective practice as well as their abilities pertaining to the skills and knowledge areas that are specifically associated with music. Regardless of the educational level at which they will be teaching, preservice teachers specializing in music discover that the SL activity improves their overall educational knowledge while simultaneously allowing them to establish work and communication networks with their peers [24].

Certain SL projects have emphasized the potential of musical activities to promote student integration and inclusion since music is viewed as a beneficial tool for ensuring equal educational opportunities [25].

A mixed-method approach is relevant in researching SL methodology because this approach allows us to obtain a better, more in-depth grasp of problems and complex phenomena than could be achieved by the use of either quantitative or qualitative methods in isolation. Data gathered using experimental and quasi-experimental designs can provide findings that facilitate the comprehension and interpretation of qualitative data [26]. This combination of quantitative and qualitative methods enables researchers to evaluate everything that occurs during an SL activity: the way in which the activity is perceived by a wide variety of participants, the significance that they ascribe to it in certain contexts, the ways in which their learning is affected by it, and the new elements that emerge in the students' perceptions. Simultaneously, a mixed-methods design can enable researchers to uncover a series of emergent, unexpected categories related to the service and to the people who participate in the activity [27].

The purpose of this study is to analyze the use of music and digital competences (including both musical and general competences) in an SL experience involving preservice teachers studying to obtain a master's degree in compulsory secondary education, as well as the evaluation of the service.

2. Methodology

2.1. Method

Applying a concurrent triangulation mixed-methods design [26], we conducted both quantitative and qualitative analyses during several different phases of the project; we emphasized the qualitative portion of the investigation due to the nature of the data we collected. Thus, this project is a case study [28] and a quasi-experimental investigation that features both pre-test and post-test appraisals without group control [29]. The project also applies a complementary approach and an integrative perspective to study qualitative and quantitative information drawn from students' evaluations of an SL experience.

2.2. Ethical Considerations

Since this research involves human subjects in the framework of an educational intervention, the team of researchers followed the rules of the Declaration of Helsinki of 1975 (https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/, accessed on 9 September 2022), revised in 2013. According to point 23 of this declaration, an approval from the local institutional review board (IRB) was obtained before undertaking the research to confirm that the study meets national and international guidelines.

Personal data have also been protected and subjected to the safeguards provided in Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016. All participants have been fully informed about why the study was conducted and

how their data will be used. Anonymity was assured. The protocol was approved by the Delegate of the Rector for Diversity and Environment of the University (ANONYMIZED).

2.3. Sample

A total of 23 trainees studying to obtain a master's degree participated in the SL activity; our selection criteria were thus nonrandom (e.g., with respect to student access to the course and the activity). The sample varied due to loss of subjects (experimental mortality). Hence, there are different sample sizes depending on the measuring instrument used (Table 1).

Table 1. Description of the sample according to the study variables.

Tool	Before the SL Activity	During the Activity	After the SL Activity
"Digital competences (INCOTIC)"	N = 23 Sex: 60.9% female and 39.1 male Age: *X* = 28.78 *DT* = 8.26		N = 22 Sex: 63.6% female and 36.4 male Age: *X* = 25.68 *DT* = 3.33
"Register of Student Reflections of master's degree" (RF-MASTER)	N = 22 63.64% female Age: $\underline{X}$ = 28.5 *DT* = 8.48	N = 23 60.86% female Age: *X*= 28	N = 16 62.50% female Age: *X*= 28.44 *DT* = 7.09
"Digital competences in the area of music" ("USMUS"; "Music and ICTs", and "Uses of Music")	N = 22 63.64% female Age: $\underline{X}$ = 28.5 *DT* = 8.48		N = 16 62.50% female Age: $\underline{X}$ = 28.44 *DT* = 7.09
Self-evaluation			N = 21 Sex: 66.7% female and 33.3 male Age: *X*= 27.95 *DT* = 6.87

Additionally, information about the same subjects before and after the service was matched in the following instruments:

(a) We were able to match 17 subjects (64.7% female, 35.3% male, mean age = 28 years; *DT* = 7.06) in the INCOTIC questionnaire.
(b) We were able to match 11 subjects (72.7% = female, mean age = 30.36 years, *DT* = 7.85) in the "Music and ICTs", "Uses of music", and "USMUS" questionnaires.

2.4. Techniques and Tools Used to Gather Data

Participating students completed several surveys regarding their digital competences (both general and music-specific), uses of music, and SL methodology. The tools used for such data collection were the following (Table 2):

Table 2. Tools.

Name of Tool/Survey	General Characteristics	Reliability
INCOTIC 2.0 [30]	Self-evaluation of digital competence. The tool is made up of 32 items on a 1–5 Likert-type scale, from 1 = "totally disagree" or "I don't know how to do it", to 5 = "totally agree" or "I know how to do it without hesitation". The items are organized along the following dimensions: international proficiency (5 items), technological proficiency (5 items), multimedia proficiency (4 items), communication proficiency (5 items), attitudes and expectations (13 items)	The tool's total reliability is α = 0.821 in the pre-test and α = 0.892 in the post-test

Table 2. *Cont.*

Name of Tool/Survey	General Characteristics	Reliability
USMUS [31]	Self-evaluation of knowledge and use of digital technologies in relation to music. The questionnaire is made up of a total of 8 items on a Likert-type scale with 4 response categories ranging from 1 (Not at All) to 4 (A Lot). The items are organized along the two following dimensions: Knowledge (4 items) and Use (4 items)	The tool's total reliability is $\alpha = 0.779$ in the pre-test and $\alpha = 0.827$ in the post-test
Adaptation of the questionnaire "Music and ICT" [32]	A questionnaire about knowledge, use, and attitudes toward digital technology in the area of music. The scale is made up of 26 items with 4 response categories (not at all, superficial, broad, and in-depth, or: never, sometimes, often, and always). It is made up of the following dimensions: Security (3 items), Improving Digital Competence (2 items), Factors that Exert an Influence on Resources (13 items), Digital Resources (8 items)	The tool's total reliability is $\alpha = 0.893$ in the pre-test and $\alpha = 0.667$ in the post-test
"Personal Identity" and "Surveillance" dimensions from the "Uses of Music" questionnaire [33]	The "Personal Identity" dimension is made up of 7 items; the "Surveillance" dimension is made up of 3 items. All of them are Likert-type with response categories ranging from 0 ("Totally disagree") to 10 ("Totally agree")	The tool's total reliability is $\alpha = 0.893$ in the pre-test and $\alpha = 0.167$ in the post-test
"Register of Student Reflections of master's degree" (RF-MASTER)	A questionnaire designed for teacher trainees made up of a total of 29 questions regarding different moments of the SL experience (before = 6, during = 7, after = 16) specifically about SL, responsible use of technologies, sustainable use regarding the protection of health, the environment, social conflicts, and interaction with other Internet users; stereotypes and musical styles; musical applications and platforms; digital material for musical learning; and training needs	
Evaluation of university SL projects [33]	The questionnaire is made up of a total of 45 items featuring Likert-type response alternatives on a scale of 1 to 5, ranging from 1 = never to 5 = always. They are organized along four dimensions: phase prior to the SL activity (2 items), planning stage (21 items), phase of conducting the activity (5 items), and closure and multiplication stage (17 items)	The questionnaire's total reliability was $\alpha = 0.951$

2.5. Procedure

The SL project featured in this study (this research belongs to the Call for Projects of Service Learning at the Complutense University of Madrid) aimed to address the needs of secondary students for digital literacy and secure use of ICTs, particularly during the COVID-19 pandemic, which accelerated the global digitalization process.

In response to this objective, an SL experience was planned, carried out by a preservice teacher of the musical course "Didactics of Secondary Music Education", which is required to obtain a master's degree in compulsory secondary education. This course was offered by a Spanish public university during the first four months of the 2020–2021 academic year. The experiential and collaborative didactic strategy (specifically associated with SL settings) was designed to apply musical curriculum to a real-life context. The featured activities included elaborating music didactic units for a secondary school using ICT tools, creating a didactic musical repertoire adapted to ICTs, and examining the possibilities of sharing these materials on social networks while exploring the strengths and drawbacks of the use of ICTs as a music learning strategy. Then, preservice teachers assisted high school students twice a month at one public school and shared their acquired knowledge about digital music activities and secure ICT use with them. Finally, we broadcast (relayed) SL results on one of the university's YouTube channels.

The following table indicates where and how the data were collected and analyzed. As shown in Table 3, some descriptive (frequencies) and inferential (Wilcoxon) analyses were made for the evaluation of the data collection quantitative tools, as well as a thematic qualitative analysis for the reflexive records.

Table 3. The SL activity: a concurrent triangulation mixed-method design.

Case Study—Data Collection			
Pre-Test	**SL Activity**	**Post-Test**	
Quantitative Techniques	- INCOTIC 2.0 [30] - USMUS [31] - "Music and ICTs" questionnaire [32] - "Uses of Music" questionnaire [33] - Self-evaluation [34]	- High school (secondary) students and university students acquired competences in the areas of citizenship and social responsibility, specifically regarding the responsible use of ICTs in the area of music.	- INCOTIC 2.0 [30] - USMUS [31] - "Music and ICTs" questionnaire [32] - "Uses of Music" questionnaire [33] - Self-evaluation [34]
Qualitative Techniques	- "Register of Student Reflections of master's degree" (RF-MASTER)	- "Register of Student Reflections of master's degree" (RF-MASTER)	- "Register of Student Reflections of master's degree" (RF-MASTER) - Focus groups
Data Analysis			
Quantitative analysis, emergent categories (Atlas.ti software) through thematic analysis + descriptive, inferential statistics (SPSS software)			

2.6. Data Analysis Techniques

Using qualitative analysis, we identified similarities among ideas, concepts, and themes. Relationships were subsequently established, and information in line with this study's theoretical framework was integrated into the procedure [35]. On the basis of the thematic analysis, emergent categories were the result of bottom-up inductive criteria [36]. The triangulation process allowed us to dialectically link all the information pertaining to the object of research by using the tools and data collection techniques applied in this project [37]. Analysis was conducted using Atlas.ti software, Version 8 (Scientific Software Development, ATLAS.ti GmbH, Germany).

In view of the small sample size and the absence of normality in some variables, we used the Wilcoxon signed rank test to compare the pre- and post-test results of the questionnaires "USMUS", "Music and ICTs", "Uses of Music", and "INCOTIC". We similarly calculated effect size using the r coefficient [38], interpreting effects below 0.1 as irrelevant, effects between 0.1 and 0.29 as small, effects between 0.3 and 0.5 as medium, and effects greater than 0.5 as large [39]. For this purpose, we used SPSS Statistics 21.0 (IBM Corp, Armonk, Nueva York), applying a 95% confidence interval.

3. Results

Results are organized according to three moments in time: before, during, and after the service. Additionally, in the latter, findings obtained in self-evaluation of SL together with the rest of the instruments are specified.

The qualitative results drawn from the student responses contained in the "Register of Student Reflections of master's degree" tool (RF-MASTER) yielded 539 emergent categories (based on responses provided at the onset, during the course of the SL activity, and after the activity had concluded (see Table A1 in Appendix A)).

We now present the process by which we integrated these qualitative categories derived from the utterances collected from the "Register of Student Reflections of master's degree" (RF-MASTER) with the information collected via the questionnaires USMUS [31], INCOTIC [30], Music and ICTs [32], and Uses of Music [33], as well as self-evaluation of the SL [33].

3.1. Prior to the SL Experience

3.1.1. Knowledge of and Competence in the Use of ICTs in Music

The preservice teachers included in our sample had previously acquired knowledge and competences related to the use of ICTs in music either (1) autodidactically, (2) by taking

general or specific classes or courses, (3) from colleagues and peers, (4) by participating in tutorials, (5) by watching YouTube, or (6) using software such as Sibelius and LOGIC (source: RF-MASTER).

Additionally, certain respondents had professional experience and training in a non-university environment, such as taking computer courses, attending conservatories, or studying musicology (source: RF-MASTER).

On a scale ranging from "a great deal" to "none at all", familiarity with blogs, wikis, and/or forums featuring comments on music (59.09%), interactive multimedia apps (45.45%), and ways of sharing music (40.91%) were evaluated as "moderate", whereas online music video portals were evaluated as "a fair amount" (40.91%) (source: USMUS).

Regarding the frequency with which online music video portals were used, the most common response was "a great deal" (50%), whereas the responses regarding sound reproduction were "a great deal" and "a fair amount" (43.75% and 43.75%, respectively), as was also the case for interactive multimedia apps (37.50% and 43.75%, respectively). Regarding the use of virtual musical encyclopedias, the most frequent response was "a fair amount" (50%) (source: USMUS).

According to our respondents, additional activities used to improve competences in the use of musical ICTs are (1) the creation and maintenance of relevant websites, which was evaluated as "occasionally" (54.54%) and (2) the use of sound editors and generators such as Garage Band (Apple, Inc., Cupertino, CA, USA), LMMS, etc., which was evaluated as "occasionally" or "never" in 36.36% and 31.81% of cases, respectively. Over half of the students included in the sample had "never" used the following apps: 68.18% had "never" used ear training programs (such as Lemus or Ear Master); 63.64% had "never" used software or digital resources aimed at learning to play an instrument (such as Yousician, or Coachguitar); 68.18% had "never" used software for vocal improvement (such as Winkaraoke Creator or Vanabasco); and 50% had "never" used audiovisual editors (such as Imonie or Finalcut) or sound sequencers (such as Cubase or Logic) (source: M-ICTs/knowledge subscale). In response to another question regarding which apps they had used most frequently, 34% of participants mentioned score editing software such as MuseScore (Licencia Pública General de GNU, Germany), Finale, and Sibelius (Sibelius Sibelius Software, Finland) (source: M-ICTs/use subscale).

3.1.2. Previous Experience with SL

A total of 70.83% of the students included in the sample did not have previous experience with SL. Students who did have previous experience had acquired it by using Audacity, Sibelius, and MuseScore either at conservatory or while studying to obtain a master's degree in musicology (source: RF-MASTER).

3.1.3. General Expectations Regarding the SL Project

The students' expectations regarding the SL project focused on three subjects: their own training, the service beneficiaries, and their own experiences (source: RF-MASTER).

SL is a significant learning experience that involves a high degree of social commitment, which allows students to acquire knowledge about music and ICTs. The service was administered in a real-life context featuring high school (ESO) students, a situation that was not only highly motivating but also, as an intergenerational experience, invited participants to reflect on their own futures in the teaching profession. The university students who participated in the activity desired to allow secondary school (ESO) students to engage more closely with music as well as to develop knowledge regarding ICTs and their responsible use by developing of their competences (source: RF-MASTER).

3.1.4. Expectations Regarding the Service Beneficiaries (High School Students)

The preservice teachers included in our sample believed that the service would create an awareness in adolescents of music-related prejudices and stereotypes by providing more in-depth knowledge and inspiring them to adopt a new and different vision of

music. This shift, in turn, would foster critical reflection and a more critical attitude while simultaneously familiarizing preservice teachers with the adolescents' lifestyles by creating specific content aimed at fostering the construction of identity (source: RF-MASTER).

3.1.5. Problematic Use of Technology with Respect to Adolescents

The preservice teachers included in our sample find that the secure, critical, sustainable use of ICTs is a complex and controversial subject that plays a key role in education and is essential to the ongoing development of a democratic society. Reasons in favor of the use of ICTs include increased motivation to learn. Potentially detrimental aspects include a lack of control with regard to privacy/security and excessive amounts of screentime. Our respondents highlight the needs to adapt the course content to students of these ages and to familiarize these adolescents with the potential repercussions of their actions. To achieve the latter goal, the role of the family is fundamental (source: RF-MASTER).

Regarding their views of themselves, the preservice teachers included in our sample note that they behave in an educated manner when they interact with others via the Internet ("entirely agree": 95.7%). Simultaneously, they are worried about their own security and privacy (65.2%), and they tend to respect the intellectual property rights associated with the resources (documents, images, videos) that they encounter online (43.5%). When they witness nonethical behavior, they denounce it (52.2%) (source: INCOTIC-Pre-test). A total of 63.64% of respondents indicated that they have "superficial" knowledge of suitable educational practices related to ICT resources in the context of music education. A total of 68.18% of respondents affirmed that they "always" use some kind of system for password/user protection, and 59.09% "always" use additional tools, such as antivirus software or firewalls, to guarantee and ensure the privacy of the computer system. A total of 45.45% of the respondents added that they "often" know how to solve technical problems when they arise (source: M-ICTs/security subscale).

As preservice teachers, our respondents would take the following factors into account when choosing an ICT resource for the music classroom. A total of 81.82% of respondents claimed that it is "very important" for the resource to be accessible to all students, including those with disabilities, and that it is important for the resource to be motivating. A total of 72.73% of respondents reported that ease of access for all students, independent of their socioeconomic background, is "very important", while 40.91% of respondents indicated that student familiarity with the tool or resource is "very important". A total of 59.09% of respondents believed that it is "important" for the tool to support certain specific types of learning, while 54.54% of respondents noted that it is "important" for the tool to have the potential for use in a secondary music classroom as well as scientific and professional relevance. A total of 54.54% of respondents claimed that the time that teachers must dedicate to the resource is "very important", whereas 36.36% found this factor to be "important" (source: M-ICTs/resource subscale).

In the opinion of our respondents, the most significant limitations of ICTs in the teaching–learning process in the classroom are technical mishaps (68.18%), a lack of teacher preparation/training (50%), and problems with the equipment in the classroom (45.45%) (source: M-ICTs/digital resources subscale).

3.1.6. Prejudices and Stereotypes Regarding Musical Styles

Regarding the music styles to which our trainee respondents listen as well as the prejudices and stereotypes associated with those styles, classical music is viewed as boring, monotonous, old-fashioned, classist, elitist, bland, offering little variety, and intended only for specialists, intellectuals, and senior citizens who have purchasing power. Contemporary music is limited to people who have studied music; Latino music is associated with lower classes; ska or singer-songwriter music is associated with politics and protest; some respondents are in favor of reggaeton, whereas others believe that it does not count as music at all and should not be referenced in the classroom due to the dubious content of its

lyrics. Other respondents listen to additional styles, such as power metal, punk, commercial genres, or music genres that tell stories (source: RF-MASTER).

Moreover, 31.82% of participants "totally agree" (on a scale ranging from 0 to 10) that they use music to express their identity, whereas 31.82% "entirely disagree" with this statement, affirming that music does not allow them to express a sense of belonging to social groups or subcultures (source: UM/Subscale 2).

3.2. During the SL Experience

3.2.1. The Contribution of SL to the Development of Competences Related to Citizenship and Social Responsibility

With respect to the training of high school (ESO) students, the SL experience helps foster greater social awareness and responsibility, respect for copyright law, responsible management of social networks, and privacy of content while simultaneously encouraging a strong critical position regarding the advantages and disadvantages of the use of ICTs. All these factors boost young people's motivation to learn (source: RF-MASTER).

Our respondents added that the experience is fun, gratifying, and enriching; it provides them with new knowledge and learning in the areas of music and ICTs. Simultaneously, it allows them to come into direct contact with high school (ESO) students, and the associated personal growth aroused their curiosity. Our respondents noted that SL requires a great degree of planning; the service has positive repercussions not only on the classroom but also on the entire school (source: RF-MASTER).

Simultaneously, 61.9% of our respondents found that the service "always" establishes goals related to values such as participation, cooperation, solidarity, and respect; furthermore, 33.3% of respondents found that the service "always" establishes goals related to social justice and sustainable development, whereas 38.1% noted that these objectives "sometimes" respond to the community's needs (source: SELF-EV).

3.2.2. The Contribution of SL to the Acquisition of Academic Curricular Knowledge Associated with the Course Subject

The SL experience serves as an appropriate complement to the practicum and to the theoretical course content; 28.6% of our respondents found that the service is "almost always" well-integrated into the course syllabus, and a further 28.6% indicated that it is "always" well-integrated therein. SL is valued as a methodology that promotes the development of competences that are necessary for life and can be combined with other active methodologies. SL offers an opportunity for students to put what they have learned into practice, for instance, by presenting a theme to the high school class, which supposes that the content is adapted to the cognitive requirements of that age group (source: RF-MASTER).

3.2.3. The Contribution of SL to Sustainable Development via ITCs

Our trainee respondents found that a person can contribute to sustainable development via ICTs when the person has access to interdisciplinary content, when ICTs are used to care for the environment, when there is a greater awareness of energy expenditure, when screentime is excessive, when families are involved in the process, when new apps are discovered and shared, when the purchase of e-books is encouraged, and when ICTs are put to pedagogical use. A greater level of awareness and responsible use encourages the creation of blogs and social networks, promotes respect for data protection and intellectual property, and leads to the adoption of a critical stance toward information and fake news (source: RF-MASTER).

3.2.4. Incorporating Digital Apps and Devices into the Process of Music Education

Our respondents regard the incorporation of digital apps and devices into the process of music education as interesting but also controversial since these tools should serve as a complementary approach that should never take the place of live instrumental or vocal music-making; moreover, they can distract the students. Digital apps and devices are highly versatile tools that can be employed in the teaching–learning process to promote ear

training and improve knowledge of musical scores. These tools can allow teachers to come into closer contact with digital natives, and they thereby require teachers to have adequate training and in-depth familiarity with the curriculum. For our student participants, training with these devices and apps helped demystify them (source: RF-MASTER).

3.2.5. Preferences for Learning Course Content and Listening to Music

To study course content, our student participants preferred to use apps such as Tuner, Audacity, Garage Band, learning apps, and Metronome. All these apps are accessed using a variety of devices, such as iPads, computers, and smartphones. The students also resort to a great variety of web pages and blogs written by music education teachers as well as posts on social networks. For writing scores and composing music, students prefer to use Finale, Sibelius, and MuseScore (source: RF-MASTER).

For listening to music, the platforms used by students are Apple Music, Adagio, Prime phonic, Soundcloud, Spotify, and YouTube; apparently, none of these platforms are associated with a particular musical style (source: RF-MASTER).

3.2.6. Stereotypes and Music Styles (or Apps) in the Teaching Process

In the teaching process, if we want to take the stereotypes associated with certain styles or with certain music apps into account, we must develop respect for multiculturality as well as a perspective that is critical, constructive, inclusive, and devoted to equal access for all, alongside the formation of a cultural/collective identity and the reinforcement of bonds among generations. Knowledge of these different music styles should be a fundamental priority in teacher training (source: RF-MASTER).

3.3. After the SL Experience

3.3.1. Efficient and Secure Use of Digital Material for Learning Music

Provided that face-to-face learning is not precluded and that a balance is maintained between traditional and digital material, the latter can be used to promote efficient and secure musical learning by highlighting sources of reference (images, videos, podcasts), gamification, creation tools (for recording, audio, and video), and the knowledge of the relevant apps and the curriculum to be taught (source: RF-MASTER).

To achieve this goal, preservice teachers must have knowledge of apps and devices used to record and share music (in this context, 37.50% of respondents indicated "a great deal" and 43.75% reported "a fair amount"), online music portals (56.25% indicated "a great deal"), and interactive multimedia apps and devices (37.50% reported "a great deal", while 50% responded "a fair amount") (source: USMUS/knowledge subscale).

Within the framework of an appropriate pedagogical orientation, digital material can serve as a means of support and point of departure for school subjects in which secure content is created and shared to conduct contests, interactive games, and analyses of listening experiences. This approach is an innovative and highly motivating methodology that uses a language that is accessible to both teachers and students, offering boundless possibilities for promoting musical learning. Student follow-up and parental supervision can help develop a greater awareness of users' right to privacy while simultaneously facilitating the prevention of inappropriate use (source: RF-MASTER).

Among the types of activities that might be useful for improving their competences in ICTs, 75% of our teacher trainee respondents answered "always" with regard to score editors (Sibelius, Finale, etc.), and 43.75% of respondents responded "always" with respect to sound synthesizing and sampling software (Garage Band, LMMS, etc.). A total of 62.50% of respondents indicated "often" with regard to accessing Internet platforms and digital resource archives, and 50% of respondents responded "often" with respect to the creation and maintenance of a list of relevant websites. Audio editing software (Audacity, Sound Forge, etc.) received responses of "always" and "often" from 37.50% and 37.50% of respondents, respectively. Lower scores, such as "sometimes", were associated with ear training software (Lemus, Ear Master) according to 68.75% of respondents. Half or

nearly half of these students have "never" worked with software or resources that teach the user to play an instrument (Yousician, Coachguitar, etc.) or with software or resources that are designed to develop a user's vocal expression and capacity (Winkaraoke Creator, Vanabasco, etc.) (43.75%) (source: M-ICTs/digital competence subscale).

3.3.2. Training Needs and Requirements for Virtual Activities in the Music Classroom

The requirements of conducting virtual activities in the music classroom can be organized into the following categories: knowledge of apps, content creation, elaboration of presentations (images, audio, video), score editing, mastery of ICTs and software, and access to web resources and platforms. These needs should be met continually and specifically and should be given appropriate institutional support. Moreover, our preservice teacher respondents highlight the need for an obligatory university course with an emphasis on evaluation. Among the characteristics required of a teacher, the respondents mention interest in the subject, commitment, personal responsibility, problem-solving capacity, and the development of competences (source: RF-MASTER).

As future teachers, the respondents are asked to choose one ICT resource to use in the music classroom and to evaluate the level of importance that they would ascribe to the following factors. In response to this question, 87.50% of participants ascribed a score of "very important" to ease of access for all students (independent of their socioeconomic situation). The other factors mentioned, in descending order, are as follows: the ICT resource should be motivating for all students (75%), it should be accessible (including for students with disabilities) (68.75%), technological innovation (68.75%), support for certain types of learning (50.00%), didactic innovation (50.00%), specific potential for use in a secondary-level music classroom (50%), and the amount of time that must be devoted by the teachers to the ICT resource (43.75%). Moreover, 62.50% of our respondents rated high school students' familiarity with the use of the tool or resource as "important", whereas 56.25% of respondents regard its scientific and professional relevance as important (source: M-ICTs/resource factors subscale).

3.3.3. SL and Changes in the Perception of Stereotypes and Personal Values: Motives

Half of our student respondents affirmed that the SL experience changed their perceptions of stereotypes and personal values as a result of three factors: (1) knowledge of SL methodology, (2) direct contact with secondary-level students, and (3) the fact that the service provided serves as a complement to traditional teaching and can help establish a learning community (source: RF-MASTER). These qualitative data are confirmed by the questionnaire results regarding the SL experience: 47.6% of respondents approved of the change, responding with a rating of "always" (source: SELF-EV) and 43.75% "totally agree" that the use of music has enabled them to remain well informed regarding current events (source: UM/Subscale 2).

Respondents who did not report experiencing a change (13.63%) justified their response by claiming that the experience was brief, noting that it closely resembled volunteer work, or by reference to the fact that the high school students had better knowledge of the subject than the teacher trainees themselves (source: RF-MASTER).

3.3.4. SL and Collaboration with Fellow Students

In their responses in the "Register of Student Reflections of Master's Degree" (RF-MASTER), 82.6% of respondents reported that the SL experience had a positive influence on their collaboration with fellow students; when asked to explain the reasons underlying such collaboration, their answer was that it was based on mutual respect, a suitable working atmosphere, the sharing of tasks with different people, a positive attitude among the team members, feedback within the group, individual efforts and contributions, and the shared endeavor to achieve a common goal (source: RF-MASTER).

Teamwork in the context of the SL experience was characterized by a suitable working atmosphere and harmonious coexistence within the group; with the aim of achieving a

common goal, tasks were equitably distributed. This collaboration allowed the group to adapt to the pandemic situation and respond to the obligation to resort to distance learning (e-learning). The students in the course maintained a positive attitude and a high degree of engagement due to their peers' contributions and group feedback. However, a lower number of respondents indicated that since the SL experience was conducted at the beginning of the semester, they did not yet know one another very well; it thus took some time for an atmosphere of teamwork to emerge (source: RF-MASTER).

When collaboration among students ranges beyond the walls of the university classroom, 42.9% of respondents affirmed that the participants "always" work together when planning the service (including students, community collaborators, and university faculty members), and 52.4% of respondents affirmed that joint decisions were made during the course of the implementation of the service. However, the service's intrinsic difficulties reduced the percentage of "always" responses to 38.1% with respect to the question of whether the SL experience fomented collaboration among participants (i.e., students, community collaborators, and university faculty members); moreover, only 38.1% of respondents indicated that the SL experience "always" includes the voices of all participants (including the collective beneficiaries). Moreover, 38.1% of respondents indicated that the roles and functions of participants were "always" well defined (including students, community collaborators, and university faculty members). Responses of "always", "almost always", and "sometimes" were given to the question of whether the goals of the SL experience were agreed upon among participants (including students, community collaborators, and university faculty members) (28.6%) (source: SELF-EV).

The majority of respondents believed that the degree of satisfaction of the beneficiary collective and the community with the offered service was "always" high (52.4%) and that the experience was handled in a truly collective manner (among beneficiaries, trainees, faculty, and community collaborators) (57.1%) (source: SELF-EV). As expressed by one respondent, "particularly in the moment when we were facing the high school kids in class, this bonded us together a lot" (source: RF-MASTER).

3.3.5. Satisfaction with the Use of the SL Methodology

The greatest degree of satisfaction with the use of SL methodology was noted with respect to knowledge of the methodology and its efficacy, having direct contact with the reality of the classroom, the fusion between music and technology, intergenerational interaction, planning the class sessions, putting one's acquired theoretical knowledge into practice, and working among peers. Furthermore, the students highlight their personal satisfaction due to having learned something that is beneficial for society by sharing, presenting, and transmitting knowledge to high school students (source: RF-MASTER).

Moreover, this experience could motivate other groups to participate in SL projects (66.7% of respondents answer "always" to this question) and promote teacher reflection on the assignment of roles and responsibilities (42.9% of respondents indicated "always" in this context) (source: SELF-EV).

The knowledge that students acquired in terms of suitable educational practices that take advantage of ICT resources in the context of music education was "broad" (62.50%). Moreover, 93.75% of respondents "always" use some sort of privacy protection system, such as a user password, and 62.50% of respondents use antivirus software or a firewall (source: M-ICTs/security subscale).

3.3.6. SL and the Acquisition of Academic Knowledge Regarding the Course Curriculum and Digital App Preference

The SL experience enabled trainees to acquire academic knowledge regarding technology, music, and applications; they were able to put their theoretical knowledge into practice and reinforce it; and they were able to search for information and integrate content. Master's degree students need to prepare, with dedication and effort, the matter they will present to secondary students, who are the recipients of the service (source: FR-MASTER).

Group teamwork was also reinforced, as was student training in SL methodology. Only two respondents indicated that they experienced no changes from an approach using the traditional methodology and indicated that their experience amounted to no more than merely another type of activity or approach (source: RF-MASTER).

Regarding the acquisition of knowledge, 38.1% of respondents appreciated the activities associated with reflecting upon their learning and the service provided, providing ratings of "almost always" and "always" in this context. A rating of "always" is indicated by 61.9% of respondents in response to the fact that the evaluation was conducted at three points in time: at the onset of the experience, during the experience, and after the experience. A total of 42.9% of respondents "always" appreciated the feedback provided by faculty to trainees regarding their progress, and 38.1% "always" appreciated the fact that the trainees self-evaluated themselves with regard to the procedure and its results (source: SELF-EV).

Similarly, 36.4% of the trainees "agree" that they use digital tools to a great extent in their personal lives, and 40.9% use such tools to a great extent when studying. A total of 27.3% of respondents "totally agree" that they could not live without an Internet connection; remarkably, similar percentages are reported regarding the use of smartphones. Among respondents, 22.7% "totally agree" and 27.3% "disagree" that they could not live without a mobile telephone (source: INCOTIC, post-test).

3.3.7. SL Personal Identity, Musical Styles, Personal Changes, and Academic Changes

Among the trainees, 76.19% found that participating in this project helped them come to value the identity-building role of musical styles and/or certain apps: 37.50% of respondents reported a maximum score of 10 ("totally agree") in response to the statement that they use music to express their identity. A total of 37.50% of respondents rated the statement that they use music to explore possible identities at a level of 9–10 points; 37.50% of respondents agreed with the statement that music helps them transmit a certain image of themselves to others at a level of 8–10 points; and 43.75% of respondents responded to the statement that music helps them develop their own identity with a value of 7–10. The lowest evaluation was 2–3 points (by 37.50% of respondents) in response to the statement that music helps them affirm their sense of belonging to social groups or subcultures (source: UM/personal identity subscale). This finding is due to probable increases in these students' critical capacity, self-confidence, creativity, and curiosity; simultaneously, they listen to new musical genres, acquire an awareness of values education, become familiar with new apps, and learn to manage those apps while increasing their consumption of both such apps and certain webpages. Additional manifestations of these personal and academic changes are associated with knowledge regarding SL, participation in planning didactic activities and units, and having obtained an understanding that ICTs can be used to pedagogy and the achievement of its goals (source: RF-MASTER).

Other equally interesting items are associated with three major limitations of ICTs: a lack of teacher training (81.25%), a lack of classroom equipment (68.75%), and technical difficulties (68.75%) (source: M-ICTs/digital resources subscale).

3.3.8. Better Apps and Platforms for the Music Classroom: Frequent Use

In response to an item featured in the questionnaire developed by Calderón et al. [32], i.e., "If you know or use score editing software, audio editors, sound sequencers, sound generators, ear training apps, audio-visual editors or software/resources to learn to play an instrument and/or MIDI instruments, please indicate which ones you use most frequently", 58.06% of the trainees reported that they most frequently use musical score editors (MuseScore, Finale, and Sibelius). Regarding the information collected via the USMUS questionnaire, the results do not vary from those obtained via the pre-test (source: M-ICTs/digital resources subscale).

Among all respondents, 50% affirmed that digital tools facilitate their communication with their peers and professors (INCOTIC post-test). The three most significant advantages of ICTs in the teaching–learning process in the music classroom are access to information

(87.50%), content creation (68.75%), and a diversity of methodologies (56.25%) (source: M-ICTs/digital resources subscale).

After their SL experience, participants regarded the following as the best apps and platforms: Anchor, Audacity, Canvas, Garage Band, Google Docs, Incredibox, Kahoot, Learning Apps, Madlipz, Menti, Mentimeter, MuseScore (Licencia Pública General de GNU, Germany, TikTok (TikTok ByteDance, Beijing, China), score editors, audio recording software, music creation software, YouTube (Google, Mountain View, CA, USA), Pinterest, and Facebook. Among these apps and platforms, they particularly highlight Audacity, Canva, Kahoot, and MuseScore because these tools provide enrichment to the educational community (source: RF-MASTER).

It is likewise interesting to note that more than 50% of respondents know how to do the following "without hesitation" (source: INCOTIC post-test): conduct a videoconference with more than three friends (72.7%), work collaboratively on a document shared via the cloud (72.7%), note when presentations by colleagues are too colloquial (68.2%), send a video file with a size of 2 GB to friends via the Internet (63.6%), convert a PDF file into a spreadsheet document (59.1%), determine when a multimedia message is a scam (54.5%), connect their smartphone to the EDUROAM Wi-Fi network when at the university (50%), send an e-mail to a recipient using blind carbon copy (50%), and design a personalized platform for a presentation (50%).

3.3.9. Improved Apps and Platforms for the Classroom: Educational Value for High School Students

Although 36.4% of our university student respondents report themselves to be "indifferent" regarding whether mastery of digital platforms and apps should be incorporated more heavily in high school curricula or not (INCOTIC post-test), the apps and platforms that they consider to be most attractive for youngsters are as follows (Table 4):

According to participants' judgments regarding the presumed interests of high school (ESO) students, the most attractive aspects of these apps and platforms are their proximity to the ICT environment and the fact that they are motivating, dynamic, creative, interactive, and easy to access. These tools thus encourage learning, attention, and project development; moreover, the results of using such tools can be shared on social networks. Work on apps or platforms can be performed using a variety of different devices: tablets, smartphones, or computers (source: RF-MASTER).

Lastly, the three moments of SL share common elements present in the reflexive records of master's degree students. Learning requires skills and specific content to acquire before, to prepare the service, during, to learn by doing, and after, to provide a sense to the service. Service by itself is the action that is performed to meet a real need. Intentionality between the connection of contents learned and tasks or activities developed during the experience. The participation of all the agents is involved in the service. Moreover, reflection and critical thought in the different phases of the project in order to achieve meaningful learning and reflexivity are key throughout the process.

Table 4. Opinions regarding apps and platforms.

Access to Content	Anchor/Score Editors and Apps Related to Audiovisual Content
Makes suitable use of technologies in the school environment	Menti/Kahoot/YouTube
Proximity and easy access	YouTube
Flipped classroom	YouTube
Playful activities	TikTok
Sharing documents/ Follow-up on written assignments	GoogleDocs
The competence of learning to learn Enhances creativity Encourages responsible use	Score transcription apps, music recording apps, music creation apps

Table 4. *Cont.*

Access to Content	Anchor/Score Editors and Apps Related to Audiovisual Content
A complement that enables content to be learned more playfully and visually without precluding rigor	Smartphone
Content is well-received and appreciated by students	Musescore/Mentimeter/YouTube
Poster creation	Canva
Creating and editing scores and rhythms	Incredibox
Creating content	TikTok
Creating musical patterns	Garage Band
Creativity	YouTube/MadLips/TikTok
Fun and entertainment	YouTube/MadLips/TikTok
Listening to music	Facebook
Easy to use	Audacity/Canva/Kahoot/MuseScore
Gamification	MadLips/Learning Apps
Youth are actively engaged and participate in social action	Spanish national SL network/ Musescore
Improvising	TikTok
Enhances motivation	Audacity/Canva/Kahoot/Musescore/Kahoot
Creative, attractive presentations	Canva
Suitable for homework	Pinterest
Enables students to work in a practical way with music and its elements	Musescore
Free software	Audacity/Canva/Kahoot/MuseScore
Work in groups (teamwork)	Youtube/TikTok/MadLips

Own elaboration.

3.3.10. Digital Competences: Pre-Test and Post-Test

Table 5 shows the results of a comparison between the pre-test and post-test results for the responses to different questionnaires. Significant differences were observed in the two subscales of the USMUS questionnaire as well as in the subscales "security" and "digital resources" of the Music and ICTs questionnaire. We also observed differences in the INCOTIC questionnaire regarding the dimensions of computer proficiency, communication proficiency, and the total scale, which always indicated better results on the post-test and featured large size effects [39].

Table 5. Differences before and after the SL activity.

Variables	Pre (before) [1]	Post (after) [1]	*Z* (*p*)	*r*
USMUS N = 11				
Knowledge	5 (3.8)	9 (8.11)	2.64 (0.008)	0.80
Uses	5 (2.7)	9 (7.10)	2.97 (0.003)	0.90
Music and ICTs N = 11				
Security	11 (7.14)	14 (12.14)	2.38 (0.018)	0.72
Improving digital competence	2 (1.4)	3 (3.5)	0.718 (0.472)	
Resource factors	27 (23.30)	28 (24.30)	0.297 (0.766)	
Digital resources	4 (3.13)	12 (10.16)	2.18 (0.029)	0.66
Uses of Music N = 11				
Personal identity	39 (31.48)	43 (34.53)	0.67 (0.505)	
Surveillance	16 (8.23)	21 (18.25)	1.74 (0.082)	

Table 5. *Cont.*

Variables	Pre (before) [1]	Post (after) [1]	Z (p)	r
INCOTIC N = 17				
Computer proficiency	3 (0.806)	3.80 (0.55)	−2.588 (0.010)	0.62
Technological proficiency	3.20 (0.85)	4.20 (0.77)	−1.856 (0.063)	
Multimedia proficiency	4.250 (0.42)	4.50 (0.64)	−0.278 (0.781)	
Communicative proficiency	3.60 (0.62)	4.00 (0.54)	−2.280 (0.023)	0.55
Attitudes and expectations	3.69 (0.61)	3.85 (0.51)	−1.708 (0.088)	
Total scale	3.47 (0.46)	4.12 (0.44)	−2.391 (0.017)	0.58

[1] The values displayed are the mean, with the standard deviation in parentheses.

An increase in pre-test and post-test results is shown in all three instruments in favor of the latter, being the effect size between moderate and high.

4. Discussion

4.1. Authors' Development of Digital Competence

Digital involvement is a given in all areas of society, the economy, and entertainment; therefore, the sphere of education cannot remain on the margins of these developments. Education must ensure that all students, regardless of their level of education, are equipped to acquire tools, capacities, and abilities that allow them to become proficient within a digital society, in which they should be able to participate securely, respectfully, and profitably, both as individuals and as a collective [7]. The study presented agrees with previous investigations about the benefit of using technology in SL, drawing particular attention to the enrichment involved in the use of technology in the development of different creative processes, as well as various technological abilities, such as asynchronous or remote teamwork [40–42]. At the same time, it is to be noted that the findings presented coincide with those obtained by Littlefield [43] since, in both cases, it is determined that the use of technology in the classroom, regardless of the subject, increases learning, as well as the digital skills necessary for both personal and academic life. Despite a number of advances in this direction, the literature reports that the potential of technologies for learning and communication has not yet been fully exploited. The teaching-learning process continues to focus on a certain multimedia learning context that does not allow students to fully develop their digital competence. Furthermore, researchers have observed, according to what was presented, a gap between the need to increase students' digital competence and the theoretical and methodological treatment of these subjects in certain fields of knowledge [44]. That is to say, there should be a balance between both aspects; consequently, investigation in this field must be carried out from different models, such as the one presented through SL. This way, the benefit could be reversed both to teachers in-service or training, despite the role they hold (executor or recipient of the service). In any case, Escofet [42] points out that knowledge about the technology selected (benefits and limitations) and its possible uses should be taken into account. As been explicit in previous sections, these aspects have been valued in a particular way in the design of the present SL.

Regarding the need for improvement concerning teachers that this current study has found, it may be noted the lack of the necessary capacity to incorporate technological media or skills into their subjects; some teachers may be poorly motivated to develop their own digital resources or even to use professional means of digital communication (which would nevertheless be helpful with respect to promoting nonlinear, collaborative forms of knowledge sharing among educators). Although this situation could be justified in part by the institutional context in question (organization, programs, etc.) or the type of curricular content being taught, these factors do not justify teachers' overall lack of technological involvement [8].

The development of students' digital competence is intimately related to lifelong learning, which increasingly plays a fundamental role in all facets of human life and, thus, in the acquisition of technical and cognitive skills that can enable students to address learning challenges not only in the classroom but, more importantly, outside of it. For that matter, the results obtained make us position ourselves with the postulates of González-Martínez et al. [30] when they indicate that the development of digital competence thus includes a "multimedia, informational, and communicative" (p. 135) understanding of the subjects who require it: in this case, university students.

4.2. Impact of SL on Students

In terms of the results achieved in the areas of social responsibility and personal values, student expectations at the onset of the SL activity did not refer to the aspect of social commitment. However, during the SL activity, they related the service that they were providing to the acquisition of personal values such as solidarity, cooperation, and respect. After the SL activity, the results indicate considerable impacts on the personal transformation of certain students in terms of their emotional ties with others and the critical thinking they applied in their search for profound meaning and solutions to the issue that was addressed by the activity, namely, the secure, sustainable use of ICTs for adolescents. Similarly to the results obtained, García-Romero and Lalueza [22] affirm that SL helps establish personal connections among emotional, intellectual, and behavioral contexts, thereby producing a learning experience that is more profound, continual, and holistic. Moreover, as a result of the relation SL between real-life experience and reflection provided by SL, the SL experience promotes conscious learning, which, according to Deeley [45], is preferable to other forms of learning (which can lead to alienation or to a limitation of the learner's personality).

The SL experience discussed in this project also activated values related to educational practice, such as mutual respect, autonomy, collaboration, and a positive attitude. Such values were likewise observed in the study conducted by Gillanders and Tojeiro [25] on teacher training in music education. In student reflections gathered during and after our SL project, collaboration emerged as a salient aspect of SL. Our respondents highlighted values such as trust in others, the equal distribution of tasks, the endeavor to achieve common goals through activities, and joint decision making during the service.

In line with previous research, our results highlight the personal satisfaction experienced by students, which was achieved (1) through their engagement with a social problem by adopting shared goals with the beneficiaries [24], (2) by extending teaching activities outside the classroom, thereby connecting with a variety of different formal education spaces [46], and (3) by develop harmonious coexistence in class through the cultivation of mutual respect, a positive attitude, and a collaborative spirit among students, who thereby felt understood and welcomed [20].

Regarding changes in identity, "service-learning offers preservice teachers increased opportunities to develop their teaching practice and teacher identities" [20] (p. 18), as has been evidenced in this current study. Our post-test results reflect a change in our participants' attitudes toward musical practice. They became more aware of the need to incorporate technology efficiently and responsibly into the secondary-level music classroom. Moreover, since their critical capacity increased after undergoing the SL experience, they became more aware of the importance of avoiding the transmission of stereotypes in the classroom by reference to a certain choice of music styles, websites, blogs, or apps. The preservice teachers who participated in this SL activity also came to realize that they also use music to express their own identities, and this realization can likewise have an impact on the transmission of such stereotypes.

As indicated by García-Romero and Lalueza [22], this process of becoming aware of identity-building and self-perception leads to a new type of transformative learning that emerges when preservice teachers are required to adapt their mental schemata to a reality that is different from their own, while learning to regard others as fundamental referents

in the construction of meaning. Personal identity is thus expanded, as is one's vision of oneself and one's social environment.

The preservice teachers who participated in this SL experience also became aware of the need to address a series of biases that adolescents associate with certain music styles (for instance, classical music is often considered to be "boring and elitist"). Over the course of the SL experience, our teacher trainees increasingly shared and adopted a series of goals that they shared with others, which embodied a variety of different cultural and social worldviews. In so doing, they started to acquire a more profoundly anchored civic identity. As indicated by García-Romero and Lalueza [22], such a process is achieved by engaging in experiential learning in a variety of social contexts outside the classroom, which is supported by individual and/or collective reflection.

4.3. Acquisition of Musical Knowledge and Abilities

Results obtained underline that digital devices help increase musical skills and knowledge, especially related to musical score editing and the creation or recording of musical proposals. This may be because usually a music classroom of any educational level does not have all the material needed in the matter, and moreover could be unmanageable in a regular classroom [47]. In this sense, some parallelisms are found with the results from Crawford [48], who points out that ICTs have usually been left out of artistic classrooms such as music. Its use would serve to enhance the position of this discipline in the study plan while simulating real learning contexts that could motivate an interesting pedagogical change.

Some other results related to musical knowledge and skills transmitted through SL are the considerations that students who have the information available in electronic media are more motivated toward them while different methodologies concur, which they find interesting and beneficial for their learning [49].

SL initiatives in the field of music tend to promote the acquisition of additional musical knowledge and abilities: the trainees begin by planning the service in their role as "specialists" but must later adapt their intervention during the service to apply it to a group of no specialists. In so doing, they must master knowledge, competences, procedures, and abilities more adroitly than would be necessary in a traditional classroom setting [20].

Such initiatives can thus be said to promote learning both in music and through music since the student is presented with clear content associated with the service provided. This approach is beneficial with respect to the achievement of curricular objectives in the field of music. One should also bear in mind the fact that the integration of SL experiences in the high school music education syllabus is conditioned by students' previous learning, the context to which SL is applied, the social and community needs to which the service attempts to respond, and the characteristics of the participating educational institutions. The proposed model should thus be selected based on the musical knowledge and abilities that the educators intend to transmit. Therefore, we place ourselves with Chiva-Bartoll et al. [18] in that the degree to which that content is applicable should be weighed and evaluated before this approach is implemented [18].

More concretely, Feen-Calligan and Matthews [24] suggest that SL in the context of music education can help foster sight-reading skills, rhythmic dexterity, creation/composition abilities, instrumental skills, and even the acquisition of the basic techniques associated with a new instrument. These skills are developed both by the beneficiaries and by those who provide the service. Simultaneously, these authors note that this pedagogical teaching-learning model provides knowledge of certain tools, such as musical and nonmusical digital platforms, that can facilitate learning to play an instrument. At the same time, it draws attention to the fact that among the least-used software and applications—despite the willingness shown by students—are simulators of musical instruments. These have been scarcely used by both students who executed and who received the service. It has already been argued the fact that musical interpretation cannot (should not) be replaced by digital applications because there are certain skills that can only be achieved with the direct

use of the instrument. In this matter, a study by Chan et al. [50] on the learning of piano showed that secondary education students improved their reading and rhythmic skills (including auditory development or comprehension level, among others), although not as much their technical skills. As can be seen at this point, there is still some controversy among investigators because abilities and knowledge related to instrumental performance have often been featured in previous SL projects since instrumental ensembles facilitate the "democratization of artistic-musical practice in spaces where not all people could otherwise acquire this knowledge and experience" [46] (p. 558), thereby resulting in a shared musical practice.

This research project faces certain limitations. The sample was not selected at random; thus, it is difficult to generalize the results of this project (external validity). From a quantitative perspective, the sample size of the study is small and not mixed, which implies an interchange of possibilities for external generalization and transference; the sample purports to achieve a balance between the saturation of categories and representativeness [36]. However, Parra [51] indicates that such conditions cannot always be ensured since the sample referenced by this type of social impact project must be realistic. Thus, "it is not the number of cases which is important; instead, the research proves its worth in the interpretation and explanation [of the research question]" [49] (p. 160). In a future project, we intend to investigate a larger random sample. Since the reliability of some tools used in this project is insufficient, the results of this study should be interpreted with a certain degree of caution.

5. Conclusions

To conclude, the learning facilitated by the SL experience has been transformative: it has led to a change in the personal visions of the preservice teachers and the ways in which they apprehend their social environment.

Two major challenges are inherent in such musical SL initiatives involving technology. On the one hand, the experience should be designed and planned by educators who truly have in-depth knowledge of digital technologies (this approach simultaneously serves to improve their students' digital competence). On the other hand, those specialists must also have in-depth knowledge of music as an educational subject on a conceptual and procedural level if they are to be able to adjust the featured musical content to the didactic model that they have selected.

The experience highlighted in this paper not only included the application of a variety of didactic, musical, and technological knowledge and strategies but also emphasized the aspects of reflection, analysis, and the proper use of digital media for personal, educational, and social purposes on the part of students at different educational levels. Thus, preservice teachers must be aware of the curricular and psychological challenges associated with teaching adolescents. Adolescent students, in turn, must understand that digital tools are used not only for play but also for academic purposes and can prove to be useful in a variety of different areas, e.g., music, as shown in the project featured in this paper.

Simultaneously, the interaction between quantitative and qualitative analyses in the later phases of a project such as this one, which was designed as a case study, provided our research team with more in-depth knowledge of emergent variables such as identity, personal values, and values related to the teaching profession.

From future perspectives, it is necessary to increase SL initiatives focused on practicing music teachers in order to improve their digital skills in their continuous training. Furthermore, additional studies on SL with ICT are needed that take into account underprivileged children's sectors who lack access to these types of resources. Even though, in this case, improvement of their digital skills may not further develop after the experience, socialization, and critical ability can be promoted, being those useful tools in their individual or group development throughout their lives. With time, it would be interesting that parents could be the authors of the service in order to help their own children in the acquisition of

content and musical skills through technology, as well as in the necessary reflection about the selection and use of electronic devices.

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Appendix A

Table A1. Categories and codes.

Categories and Codes		N	%	Textual Utterances Contained in "Register of Student Reflections of Master's Degree" (RF-MASTER) (Textual Quotes Have Been Separated from One Another by Slashes (/))
				Pre-Test
Knowledge and competences regarding the use of ICTs in music		18	3.34	I learned to use Audacity intuitively, without any external help/The tool I most use is Sibelius; I learned to use it in a brief course, then in practice/Because I needed to, and by consulting the tutorials I found on the Internet/At school we had music computing as a subject: there I learned to use score editors and video editing programs/More recently, I've learned to use audio creation and editing programs, since I needed them in order to continue to give classes during lockdown/I learned to use them in music school assignments such as "music computing".
SL	SL Previous experience(s)	8	1.48	Staging of an urban popular music story for an audience of secondary-level students, carried out with my colleagues studying toward a Master's Degree in Musicology, each one of us playing their instrument and explaining in a theatrical mode/I don't recall any concrete experiences with SL, but I find it quite interesting and important/In our conservatory we carried out a musical therapy project in which I participated. Thus, in the group, we experienced SL ourselves, acquiring the necessary knowledge to apply it in a hospital setting.
	General expectations regarding the SL project	20	3.71	To bring music closer to high school (secondary-level) students by adapting musical content to the technological reality we live with on a daily basis, managing to present it from a more attractive angle for them/Integrating "2.0 level technologies" to classroom learning from a critical perspective/Including technology in the classroom in an efficient manner, and not as a last resort/Providing a practical, real-life experience for students who are going to teach students/That is what perhaps generates the greatest degree of commitment to the project.
	Expectations regarding the service beneficiaries (high school students)	14	2.60	If adolescents are able to grasp the fact that music's significant influence is affected by a number of external factors, then they will be able to question a series of stereotypes associated with different music styles, or with other aspects of their musical preferences (fashion, social behavior, etc.)/I find that the fact of presenting a more personal, close-up project will have undoubted benefits for these adolescents, fostering their critical attitude toward aspects of which they are not yet aware, as well as from other perspectives that will doubtlessly enrich their personality/Thanks to the principle of reflection, SL should help students to reconsider their concepts and attitudes regarding music, so that they can acquire new perspectives they did not previously have.
Problematic use of technology in adolescence		14	2.60	It's somewhat dangerous: adolescents often do not think of the possible repercussions of their acts/Special attention needs to be paid to these issues; adolescents, however, tend to lend more importance to social aspects than to secure use of the Internet/It is necessary to create an awareness regarding new digital and technological media so that we can use them to foster learning and education/I find that new technologies can be very beneficial, but they can also be highly harmful if [adolescents] do not know how to use them correctly.

Table A1. *Cont.*

Categories and Codes		N	%	Textual Utterances Contained in "Register of Student Reflections of Master's Degree" (RF-MASTER) (Textual Quotes Have Been Separated from One Another by Slashes (/))
Prejudices and stereotypes regarding musical styles		28	5.19	Classical music [is] more for an elite social class/When people think of Latino music, they associate it with people from lower classes.
During the Service-Learning Project				
The contribution provided by SL	Developing competences related to citizenship and social responsibility	40	7.42	Moreover, relating it with competences related to citizenship and social responsibility, SL helps to improve them: on the one hand, it favors the inclusion of students who are using the same technology; on the other hand, the students help each other if someone has difficulties in using ICTs in class/I had never had the courage to use or even get near ICT resources or apps; this course has achieved that I now not only regard them as something totally viable, but it has even awakened my curiosity to the point of now envisioning to devote in-depth study to some of the tools we were presented with during the course, perusing the Web for information so that I can already start to read something about them/This is an enriching experience that helps us, on the one hand, thanks to what we learn; then, on the other hand, we are providing a service to the high school students who receive the service/It also opens a door, and it will continue to open more doors toward good collaboration between families, while providing a first contact and a collective action in the high school's social environment/And the fact of being able to provide them with some of our knowledge is something very satisfactory for us/Helping to build communities that are stronger from a civic and social point of view.
	Acquisition of academic curricular knowledge associated with the course subject	25	4.64	The SL methodology provided us with a direct, interesting experience: we were able to enter in contact with the professional environment in which we will be working after finishing our Masters degree/It helps us acquire a more realistic vision of what we are studying: in other words, we go directly into a classroom with all its social and resource problems/It is being integrally applied along with the other methodologies we are working on/First we carry out a theoretical study that provides us with the knowledge we need to communicate to the high school students.
	Sustainable development through ICTs	27	5.01	If we want to be more ecological, I would propose that we use e-books for reading, or read on recycled paper/Fostering an awareness in the students in our classes/I think it is very necessary, on a general level, to develop a greater awareness of energy consumption/Getting to know and use the apps that have been designed for these purposes, helping students in the classroom get to know them, and even designing new initiatives with the students.
Apps, programs, and digital platforms	Incorporating them into the music education process	14	2.60	But I have to acknowledge that I have discovered a vast range of useful tools for teachers to prepare and adapt classes according to the type of group; for the students, they nourish their learning; moreover, the teaching experience can be more variegated, more fun, and perhaps even more efficient/I find that this is one tool more, but we shouldn't obsess over its use. It can serve as an incentive, and we need to know how to manage it, but educational activity should not be based on digital applications/I find it positive as a complement to certain activities, or in order to carry out activities related to electronic music or composition; still, this should only be a complement, without substituting the possibility of performing music live with real instruments or the human voice/I find that this is just one more tool; although we should not succumb to the illusion of believing it is the only one, our obligation as teachers is to be aware of our reality and that of our students, in order to position ourselves within it/I am in favor, as long as such digital tools do not become the only option for music education. There are activities that the ICTs cannot carry out for us in our place.
	Preferences for learning the course content and for listening to music	50	9.28	I tend to use Spotify and SoundCloud. In terms of music styles, I listen to everything except for commercial pop and reggaeton/Spotify and YouTube for all types of music (classical, rock, trap, pop...).
Stereotypes and music styles in the teaching process		12	2.23	Prior to teaching the class, we should always inform ourselves in-depth about the subject or genre we're going to be dealing with, so that we always have an idea about how to answer their questions and how to provide them with adequate information. A teacher should always be informed, mastering the subject they are going to teach in the classroom, and knowing how to manage the app that they're going to use or teach their students to use/I'm against stereotypes, even more so regarding musical styles. Just like ICTs, they are one more tool for music education; the variety of styles provide us with different approaches and visions of musical reality.
Post-Test				
Efficient and secure use of digital material for learning music		28	5.19	These apps and social networks can always be put into practice, provided that the students know how to use them safely/With didactic applications that gamify the content that is being treated/They can be used under condition that they don't preclude important and enriching activities such as singing or instrumental practice/Digital material can be used with much success to promote musical learning in the classroom. Currently there is lots of information on websites and music archives where the student can have access to the specific content they are interested in. Moreover, there are many applications that encourage and promote musical learning.

Table A1. *Cont.*

Categories and Codes		N	%	Textual Utterances Contained in "Register of Student Reflections of Master's Degree" (RF-MASTER) (Textual Quotes Have Been Separated from One Another by Slashes (/))
Teacher training	Training needs and requirements for virtual activities in the music classroom	20	3.71	I think it's essential to have good mastery of ICTs, since they are the students' true vocabulary. Nevertheless, the way of using them should be something very personal/As a minimum, I think [a teacher] should know how to use a score editor with ease/Ongoing training is necessary, as well as institutional support for the teacher in terms of freeing them from certain duties so that they can devote more time to elaborating and studying the ICT subjects they're going to feature in class/I find that it would be a good thing if there were an obligatory [university] course that would train future teachers in this area/A teacher needs to be well-trained in terms of digital competences in order to be able to carry out worthwhile virtual activities in the music classroom.
SL	Changes in the perception of stereotypes and personal values: motives	19	3.53	Of course, this activity has helped me increase the visibility of many aspects related to styles and personality related to each one of them, and to the their inclusion in the classroom/[This activity has helped me] adopt another viewpoint to regard a methodology [SL] that is very interesting: for students as well as for teachers/Yes, because it is the application of my ideas on a real-life terrain, with real people/The practical application of the activity is enriching, but I think I was already aware of the value of working toward developing communities/Yes, I think I've become more aware of the real situation, in terms of how students interact with new technologies outside the classroom/I wouldn't say that my attitude has changed, but [the activity] has reconnected me with the more social portion of my values.
	Collaborating with fellow students	25	4.64	The fact that a group of university students or experts in different areas manage to reach an agreement to use their experience to help younger students proves the value of collaboration among people and, precisely, can foment such values in those who have received the service/Yes, although we already had good rapport with one another previously; after this experience, it has intensified/I think the project was carried out in a moment when we, the students, did not know one another as well as we do now, and did not have the same level of trust and familiarity with one another.
	Satisfaction with the use of the methodology	20	3.71	[We were able to] ascertain the real way new technologies are used in the class environment/To have survived the task of presenting a theme in front of a group of youngsters of that age/To have been able to see how they asked questions and to note that what we were transmitting was of use to them/The interaction between people of different ages and levels, learning from one another/[The importance of] the social service [we] provided.
	Acquisition of academic knowledge of the course curriculum and digital preferences	30	5.57	I think we learned the course content in a better way, since it was something we had to teach ourselves. Thus the assimilation of the course content has been more efficient than if we had passed an exam or written a term paper/I'm convinced that whatever we truly experience in real life always leaves profound traces, because it provokes many different emotions in us; that is why the SL experience involves an entirely significant learning of the course content/I think [our] emotional implication leads to an improved assimilation of the content/It has helped us try out our skills in a real-life work environment, with situations that can occur in our day to day experience and that we will have to solve by using the best didactic resources/A total awareness of the learning method [was achieved], since we have put it into practice/I have not noted a significant change compared to a more traditional methodology.
	Identity and musical styles: personal and academic changes	22	4.08	Anything that helps us become better teachers is good/I am no longer afraid of discovering new apps.
Added value	Frequent and/or improved use of applications or platforms for the music classroom	90	16.70	Audacity: easy to use, free software, it boosts motivation/Canva: easy to use, free software, boosts motivation for creating posters, [resulting in] creative and attractive presentations/Kahoot: easy to use, free software, boosts motivation, makes use of technologies in a school environment/Musescore: easy to use, free software, boosts motivation, the students appreciate the content; it is not indispensable but it can be a useful tool; one can work in a practical way with music and its diverse elements. Involvement and encouragement of social action involving youth.
	Improved apps and platforms for the classroom: educational value for high school (ESO) students	15	2.78	Versatility for working in different contexts and with different tools/As it turns out, they are very intuitive and easy to use/Those that have a graphic presentation are ingenious and attractive for high school students/It is a way of collecting opinions and surveying the level of a group's general comprehension of a subject/The app's overall design and intuitive interface make it more attractive and easier to understand for students.
	Total	539	100	

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