

## The use of ICT in Secondary Music Education and its relationship with teachers' beliefs

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### **Abstract**

One of the most notable effects that COVID 19 has engendered in education is the ICT use in teaching at all educational levels. This study provides data on the ICT usage by teachers in the teaching of Music in Secondary Education in Andalusia (Spain). It also explores the relationship between ICT practices and teachers' perceptions of the educational value of ICT for teaching and learning. The empirical results obtained indicate that Secondary Education Music teachers use ICT in their teaching in a highly heterogeneous manner, with limited use prevailing. A statistically significant relationship is also observed between ICT practices in music teaching and teachers' beliefs regarding the educational value of ICT as a tool for teaching and student learning.

### **Keywords**

Information and Communication Technologies (ICT); Music Education; Secondary Education; Teacher training; Teaching-Learning.

## I. Introduction

The incorporation of ICT into Music Education has formed the basis of analysis and research in recent years. Marín, Gabarda and Cuevas (2022) have performed a review of the research carried out on this subject and conclude that there has been a marked increase in scientific production over the last five years. Ruthmann and Mantie (2017) edited a monograph study into the use of Information and Communication Technologies (ICT) in Music Education, at the Primary and Secondary Education levels. In one of its chapters, Partti (2017) concludes that the integration of ICT in the music syllabus of teacher training remains scarce. Inadequate technological training may explain the fact that teachers have low confidence and skills in ICT, which leads to their lessened interest in incorporating ICT into teaching-learning processes. Yet there are also few diagnoses on the specific situation of countries to ascertain an overall outlook and thus be able to guide future developments. In this sense we have some contributions such as Biasutti (2012), which analyses the incorporation of ICT to Musical Education in Italy; or Stevens (2018), which describes the evolution of technology-based approaches applied to teaching and learning Music in Australia; or Gall's contribution (2017) on Technology in Musical Education in England and within the European context. With regard to Spain, we also have several contributions (Aróstegui, 2014; Authors, 2014; Authors, 2017; Sadío, Ortiz & Bernabé, 2020; Guillén and Ramos, 2021), although there are still scant studies that tackle this issue. However, the situation of COVID 19 has hastened and forced the ICT use resources to teach the Music syllabus in Spain's Secondary Education system. These practices, therefore, have become the axis of educational research in this discipline.

## II. Incorporation of ICT into Music Education

The integration of ICT in the teaching of Music is a factor aimed at improving the daily work of teachers in this discipline, since as certain research works point out, they make a heterogeneous and basic use of technologies as part of their teaching (Authors, 2014, 2017; Calderón-Garrido et al., 2019, Guillén et al., 2022). The forced incorporation of digital media as a result of the shift to on-line education during the pandemic has altered the uses of ICT in education.

Teachers were obliged to undertake a process of retraining in certain cases and self-training in others in order to be able to meet the new needs to use ICT in classroom settings. The teaching of Music has developed in a disparate way, in many cases focused on a passive musical education based on reproductive activities, justified by the lack of resources or instructions from educational administrations (Calderón et al., 2021); while in others maintaining the eminently practical and enjoyment-based nature of the subject has been sought. This application to Music Education seems to depend largely on the previous use that teachers made of ICT (Pozo et al., 2022) and on the creative and innovative way of facing the teaching of Music.

In any event, this period has made it possible to unearth the new dimensions that ICTs specifically offer for teaching in general and for music teaching. In the latter area, they unearth tools of major worth as a means of creating, producing, reproducing and disseminating music, while they also open up new educational scenarios that improve the quality and effectiveness of learning. However, for this to occur, they cannot constitute a specific way of performing certain musical activities, moreover their incorporation into the classroom must be planned and reflective. In this regard, some authors (Masdeu, 2018; Marín et al., 2022) have stressed this need to integrate ICT in music teaching in a well-thought out way, taking into account the educational potential they offer as learning tools. To implement it, commitment is required on the part of teachers.

### **a. Teacher training**

A key factor for the integration of ICT into the school curriculum is teacher training and, as numerous studies affirm (Chai, Koh & Tsai, 2013; Ruthmann & Mantie, 2017; Somekh, 2008; Wise, Greenwood & Davis, 2011) it is essential to understand and analyse the pedagogical uses that this teaching staff makes of ICT in their classrooms.

In the case of Spain, the training of Music Teachers presents a very peculiar situation, since a multiplicity of training paths are recognised (Authors, 2017, 2022; Rodríguez-Quiles, 2017). This teaching staff receives initial and in-service training. During initial training, access to teaching posts can be carried out via several Qualifications: a) Superior Conservatory Studies, b) previous bachelor's degree and current University Degree in History and Sciences of Music. In the first case, the training the onus is more on technical aspects, with the second dealing closer with history. According to Spanish studies (Authors, 2014; 2017; 2022) both pedagogical and ICT training, in this initial training, is limited.

In-service training is based on different proposals that come from public and private offerings aimed at the training of teachers in ICT, which in all cases is voluntary. This diversification in training leads to differentiated training profiles, which have an impact on the integration of ICT in the teaching of Music. Given that ICT training is a variable that directly affects the ICT use in teaching (Authors, 2014; 2017), we focus our interest on ascertaining the levels of ICT use in teaching music. Since, as numerous studies stress (Cejas, Navío and Barroso, 2016; Chai, Koh and Tsai, 2013; Kopcha et al., 2014; Zhang, Liu and Cai, 2019), in classroom practices with ICT, technological, educational and curricular knowledge are fundamental. Along these lines, Mishra and Koehler (2006) propose the TPCK (Technological Pedagogical Content Knowledge) model as an essential training reference for the application of ICT in the classroom. From these references, it is in educational practice in which these three types of knowledge converge. Hence, it is worthwhile disclosing what usage levels of ICTs occur in the teaching of Music and what educational beliefs are associated with them.

Although studies are on hand that provide data on the integration of ICT in the Spanish educational system and its autonomous communities (Author et al., 2018; De Pablos et al., 2010; Paredes, 2013; Area et al., 2014; Gros et al., 2020), there are few scientific references on applications (levels of use) of the ICT in the teaching of Music in Secondary Education in Spain. An aspect that will form the basis of this study.

### **b. Beliefs regarding educational practice**

The pandemic backdrop which has overshadowed recent years has increased this (the) need for technological training of teachers to be able to cope with virtual teaching. However, teachers must be willing to adapt their practice to this new form of teaching. Along these lines, beliefs are those that guide the action of teachers towards new ways of approaching the teaching-learning process, since they constitute the cognitive basis on which the decisions and actions of teachers are based. Thus, certain authors, namely Biesta, Priestley and Robinson (2015) or López and La Malfa (2020), argue that teachers' perceptions influence the way they organize and develop their professional activity.

The introduction of ICT as a further element in the educational system therefore represents a new differentiation factor among teachers, since the use that each teacher makes of the technological assets at their disposal in their classroom is determined by their beliefs regarding the benefits that these can contribute to the improvement of their teaching practice and student learning (Authors, 2014; Burke et al., 2018). This becomes more relevant in the case of our study area, where the motivation of the student towards learning is fundamental for the latter to develop. Numerous

studies (Stowell and Dixon, 2013; Eyles, 2017; Ruthman and Mantie 2017; Marín et al., 2022) conclude that the use of technology in Music Education boosts stimulating and motivating teaching and learning situations.

Therefore, the use of ICT in the teaching of disciplines, in our case music, depends as much on what teachers believe as on what knowledge they possess, and will determine the conformation of a certain teaching practice. Furthermore, given the close interrelation between beliefs, decision-making and actions, our aim here is to investigate the beliefs and educational ideas that are associated with the levels of ICT use in the teaching of Music.

### **III. Methodology**

This study is part of a research line carried out by the Research Group of the authors in a Spanish university. This line of research has produced publications that collect results on variables that affect the integration of ICT in schools of the Spanish Educational System (Author et al., 2018; Authors, 2014 and 2017). This study specifically focuses on the levels of instructional ICT use in the teaching of Music in Secondary Education and its relationship with the beliefs of the Music teachers. In short, it is intended to scientifically verify how educational practices are associated with certain educational beliefs.

#### **a. Objectives**

The questions that guide our research are: What levels of ICT use are found in the teaching of Music in Andalusia (Spain)? Is there a relationship between instructional ICT uses and the teaching value that teachers bestow upon them? What pedagogical beliefs support the different levels of ICT use in the teaching of Music? In short, it is intended to know if the levels of ICT use in the teaching of Music affect the beliefs of teachers about its pedagogical value in the classroom.

The following research hypothesis is to be contrasted: there are significant differences in teachers' beliefs about the value of ICT for their teaching according to their levels of use in the classroom.

#### **b. Procedure and participants**

In this research project, a descriptive methodology is applied firstly, taking the form of a survey-type design, followed then by an ex post facto design, in the second phase.

The survey method provides us with information on variables that are the object of this study: levels of ICT use in teaching Music and teachers' beliefs about the value of ICT for teaching and learning Music.

The scale applied to determine the levels of use of ICT included items referring to the didactic uses of ICT in the Music classroom. Subsequently, a cluster analysis was applied to the data obtained, in order to identify homogeneous intragroup and heterogeneous intergroup settings. The data obtained provide three use profiles: level 1 is characterised by a predominance of a less positive assessment of ICT for educational use; level 2 considers that ICTs serve to improve teaching practice and student performance and level 3 bases its teaching methodology on the use of ICTs and on the social construction of knowledge. These results serve to establish three groups representing three levels of ICT use; Group 1: Basic level, Group 2: Medium level and Group 3: High level. This classification will be treated as an independent variable.

This methodology allows us to respond to this study's goals in terms of the incidence of the independent variable, level of ICT usage, in the teachers' beliefs regarding the influence of ICT in the teaching and learning process of Music.

Regarding the scale of teachers' beliefs, it can be stated that, although there is a vast literature that addresses teachers' beliefs on hand, which began in the 1960s, most of these studies focus on aspects such as teaching and cognitive processes, teaching planning and assessment, amongst others. Nonetheless, there are scant contributions on beliefs in the uses of ICT in teaching, let alone those referring to specific disciplines, such as the teaching of music. This circumstance leads us to the need to create a data collection instrument based on previous theoretical contributions, such as the Theory of Planned Behavior (TCP) (Bañuelos, 1999) and the Technological Acceptance Model, TAM, developed by Davis (1989). Therefore, the scale created draws from the assumptions of these two approaches that we use in combination.

From the perspective of the theory of planned behaviour, beliefs are the cognitive basis on which human behaviour is based. Beliefs (Reyes and Martín, 2016) include: a) Beliefs regarding the likely consequences of the behaviour in question, b) Beliefs regarding expectations towards other people and c) beliefs on the presence of factors that can encourage or hinder the development of an activity. This model can be applied to understand and explain teaching practices. In this regard, there would be room for beliefs about the consequences, whether positive (advantages) or negative (disadvantages), of the use of ICT within the classroom; as well as expectations for student learning and, finally, beliefs on ICT's impact in facilitating or hindering teaching. According to Bañuelos (1999), items referring to the motivation generated by ICT in students, or items referring to whether they improve educational practice, or save time, amongst others, would be included as beliefs. These three types of beliefs are reflected in the scale developed ad hoc in this study.

Alongside the above, the technological acceptance model, TAM, developed by Davis (1989), serves as the grounding for this study, since in addition to being internationally disseminated, it has proved effective in its application to research on the uses of ICT. According to this model, the use of ICT is related to two aspects: 1. Utility, 2. Ease of perceived use. Perceived utility refers to the extent to which a person believes that using a particular system will improve their performance in the workplace, and perceived ease of use (PEOU) indicates the extent to which a person believes that using a particular system will make less effort to perform their tasks.

This model is based on the idea that the beliefs that subjects hold regarding the usefulness and ease of use of ICTs determine their levels of use. In this way, the items included in the scale devised take this type of belief as a reference.

The population and sample of this study is made up of Secondary Education Music teachers who carry out their teaching work in State-Run Secondary Education High-School of Andalusia (Spain). 153 teachers are those who gave their consent to participate in this study. The composition of the sample in terms of gender, age and teaching experience turned out to be somewhat balanced, with 47% of the participants being men and 53% women, with an age between 25 and 62 years and length-of-service in the teaching sector ranging from 3 and 33 years. All of them have Spanish origin and nationality. Throughout the research process, the ethical principles required in social science research have been upheld. In this sense, precise information has been provided to teachers on the characteristics of the research. It also establishes the commitment to confidentiality and protection of personal data, as well as the availability of the results obtained to the participants. To this is added the informed consent of the faculty of the sample of this study.

Both the scale applied to determine levels of ICT use and teachers' beliefs about the value of ICT for teaching and learning are recorded through Likert type scales that include 5 response options, with the score corresponding to 1 with total disagreement, up to 5 which is total agreement.

The content validation is carried out through the judgment of experts (2). Cronbach's  $\alpha$  is used to estimate the reliability or internal consistency of these scales. A Cronbach's  $\alpha$  of 0.915 is obtained in the first case and 0.925 in the second scale, meaning the reliability is very good. The data was gathered electronically.

The SPSS V. 23 programme is used to statistically analyse the data. A 95% confidence interval is established in all cases. The research hypotheses are contrasted using the Kruskal Wallis Test. Previously, the corresponding statistical tests are applied to know the adjustment of the data to the parametric principles: the Kolmogorov-Smirnov test to verify the normality of the distribution of the variables and the Levene test to ascertain the equality of variances. Bartlett's test of sphericity for cluster analysis. The Independent Variable (VI) registers three levels of ICT use by teachers in teaching Music. The Dependent Variables (DV) include items referring to teachers' beliefs about the usefulness of ICT in the teaching of Music. The estimation of the effect size of the differences between groups is carried out using Hedges 'g', taking as reference the values 0.2, 0.5 and 0.8, for small, medium and large effect sizes (Rosenthal, 1994). For the most accurate calculation, depending on the sample size, G\* Power is used.

#### IV. Results

The data submitted in this section are intended to respond to the research aims and hypotheses raised.

Regarding the levels of ICT usage by music teachers, figure 1 expresses the percentages of teachers assigned to the different levels of ICT usage.

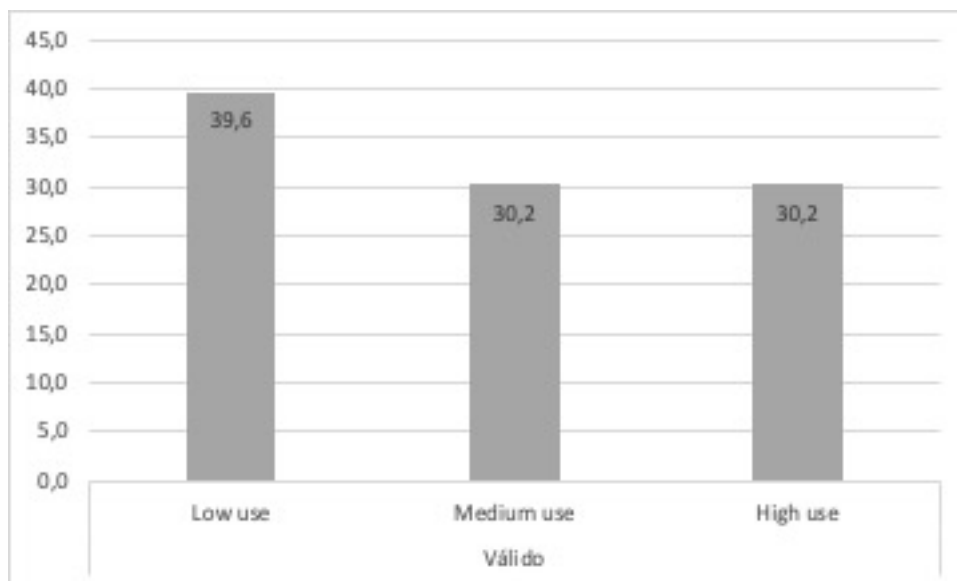


Figure 1. Percentage of Teachers that Make ICT use at Different Levels

This figure indicates that more than 39.6% of Music teachers make basic ICT use. A medium use 30.2% of the teaching staff and a high use 30.2% of the total music teachers.

**a. Teachers' beliefs about the value of ICT for teaching music, according to their level of use in the classroom**

Table 1 displays the responses of the three groups of teachers, regarding the beliefs regarding the educational value of ICT for their teaching. Different responses are appreciated, the evaluations being lower in the group of basic ICT use in the variables: "They improve my teaching practice" (Average Range 15.93); "They foster methodological didactic development" (Average Range, 14.14); "Time dedicated to ICT is rewarded" (Average Range, 17.71); "Students improve learning" (Average Range, 14.90); "Greater motivation and interest in learning" (Average Range, 18.38). However, the assessment is higher when they refer to the beliefs of: "They hinder methodological development" (Average Range, 29.38); "They mean I waste a lot of time" (Average Range, 31.88) and "Element of distraction from what is important" (Average Range, 34.52).

Ranges			
	Pedagogical Use (Grouped)	N	Range Average
They improve my teaching practice	Low usage	21	15.93
	Medium use	16	28.56
	High usage	16	39.97
They favour methodological didactic development	Low usage	21	14.14
	Medium use	16	30.38
	High usage	16	40,50
They hinder methodological development	Low usage	21	29.38
	Medium use	16	30 13
	High usage	16	20.75
They mean I waste a lot of time	Low usage	21	31.88
	Medium use	16	29.44
	High usage	16	18.16
Time spent on ICT is rewarded	Low usage	21	17.71
	Medium use	16	33.46
	High usage	16	37.78
Improve student learning	Low usage	21	14.90
	Medium use	16	30.41
	High usage	16	39.47
Greater motivation and interest in learning	Low usage	21	18.38
	Medium use	16	28.25
	High usage	16	37.06
	Low usage	21	34.52

Element of distraction from what is important	Medium use	16	25.47
	High usage	16	18.66

Table 1. Average Range of Responses According to Levels of ICT usage

With the aim of statistically contrasting our hypothesis of whether there are significant differences in teachers' beliefs about the value of ICT for their teaching according to their levels of use in the classroom, we applied the Kruskal Wallis statistic, given that the Kolmogorov normality tests -Smirnov indicate values of  $p < .001$  in all variables, rejecting the null hypothesis of normality. Table 2 displays the results obtained from the Kruskal Wallis test.

	Chi squared	gl	Sig. Asymptotic	Effect size $\eta^2$
They improve my teaching practice	24.255	2	0.000	0.8301887
They favour methodological didactic development	30.208	2	0.000	0.4891125
They hinder methodological development	4.832	2	0.089	0.2529755
They mean I waste a lot of time	8.563	2	0.014	0.4329188
Time spent on ICT is rewarded	16.902	2	0.000	0.5302353
Improve student learning	26.475	2	0.000	0.6894962
Greater motivation and interest in learning	14.928	2	0.001	0.4891125
Element of distraction from what is important	10.917	2	0.004	0.4891125

Table 2. Kruskal Wallis Test Statistics and  $\eta$  Effect Size Test  
Grouping variable: Pedagogical Use (Grouped)

The estimation of the effect size of the differences between groups is carried out using Hedges 'G', taking as reference the values 0.2, 0.5 and 0.8, for small, medium and large effect sizes (Rosenthal, 1994). For the most accurate calculation, depending on the sample size,  $G * Power$  is used. Kruskal-Wallis H 04: minimum necessary,.25: moderate,.64: strong.

The results of the Kruskal Wallis test between groups indicate that there are statistically significant differences between the three groups in the variables that comprise the scale (Table 2. Kruskal Wallis Test Statistics and  $\eta$  Effect Size Test In four of the variables analysed: "they improve my teaching practice" ( $\chi$ , = 24.25,  $p < .001$ ,  $\eta = 0.83$ ), "they favour methodological didactic development" ( $\chi$ , = 30.2,  $p < .001$ ,  $\eta = 0.489$ ), "the time devoted to ICT is rewarded" ( $\chi$ , = 16.9,  $p < .001$ ,  $\eta = 0.530$ ) and "improve student learning" ( $\chi$ , = 26.4,  $p < .001$ ,  $\eta = 0.689$ ), a rating of  $p < .001$  is obtained, with effect sizes between high and moderate, meaning the null hypothesis is rejected with the difference hypothesis thus being accepted. The variables of "greater motivation and interest in learning" ( $\chi$ , = 14.9,  $p < 0.01$ ,  $\eta = 0.48$ ), "element of distraction from what is important" ( $\chi$ , = 10.9,  $p < 0.01$ ,  $\eta = 0.48$ ), obtain significant values of  $p < 0.01$  and the variable "they mean I waste a lot of time" ( $\chi$ , = 8.56,  $p < 0.05$ ,  $\eta = 0.43$ ) of  $p < 0.05$ . In these three variables, the alternative hypothesis is also accepted, with a moderate effect size. The only variable that does not obtain significant differences is "they hinder methodological development" ( $\chi$ , = 8.56,  $p \geq 0.05$ ,  $\eta = 0.25$ ), with a small effect size. Therefore, H1 is accepted in all variables, except the latter, and it is concluded that the level of ICT use by Secondary Education teachers in teaching Music influences beliefs about the educational value of ICT (with levels of reliability of  $p \leq .001$ ;  $p \leq .01$ ;  $p \leq .05$ ; and with a power of the effect between high and moderate).



In order to more precisely identify the groups that differ, the Games-Howell and Bonferroni Post Hoc tests are applied. The results are displayed in Table 3.

Games-Howell test								
Variable and attribute			Difference of means (IJ)	Standard error	Sig.	95% confidence range		Bonferro ni from Kruskal-Wallis
						Lower limit	Upper limit	Sig.
They improve my teaching practice	Low usage	Medium use	-.923*	0.311	0.016	-1.69	-0.15	.030*
		High usage	-1.735*	0.213	0.000	-2.26	-1.21	.000
They favour methodological didactic development	Low usage	Medium use	-1.063*	0.237	0.000	-1.65	-0.48	.003
		High usage	-1.688*	0.183	0.000	-2.13	-1.24	.000
They mean I waste a lot of time	Low usage	Medium use	0.351	0.346	0.573	-0.50	1.20	
		High usage	1.039*	0.322	0.008	0.24	1.83	.015
Time spent on ICT is rewarded	Low usage	Medium use	-.705*	0.260	0.027	-1.34	-0.07	
		High usage	-1.268*	0.317	0.001	-2.05	-0.49	.000
Improve student learning	Low usage	Medium use	-1.051*	0.234	0.000	-1.62	-0.48	.005
		High usage	-1.613*	0.228	0.000	-2.17	-1.05	.000
Greater motivation and interest in learning	Low usage	Medium use	-.667*	0.270	0.048	-1.33	-0.01	
		High usage	-1.167*	0.254	0.000	-1.79	-0.54	.000
Element of distraction from what is important	Low usage	Medium use	0.682	0.289	.061	-0.03	1.39	
		High usage	1-057*	0.296	0.003	0.33	1.78	.003

\* The difference in means is significant at the 0.05 level.  
 \*\* Significant differences at the 0.01 level  
 (1) In these results, the comparisons that do not obtain significant differences have been eliminated.

Table 3. Test Games-Howell and Bonferroni Post Hoc Test Results (1)

These results indicate that in three variables the differences occur between the three groups; They improve my teaching practice, encourage methodological instructional development and improve student learning ( $p \leq 001$ ). In the rest of the variables, the differences are found exclusively

between the group with a low level of use and the high one ( $p \leq 001$ ). The significance values that are selected are the most stringent since they have been adjusted in line with the Bonferroni correction.

With a view to synthesising the results obtained, figure 2 has been devised which shows the belief profiles of the Music teachers according to the level of ICT usage. Thus, teachers who make high ICT use in their classes give high value levels to the idea that they improve teaching practice and improve student learning, in addition to encouraging the instructional-methodological development along with the students' motivation and interest. However, these beliefs are expressed in the group with low ICT use to a lesser extent and more negative beliefs prevail than in the group with greater use, such as that they distract and hinder methodological development, wasting a lot of time. The group of average use is maintained between both groups in these assessments.

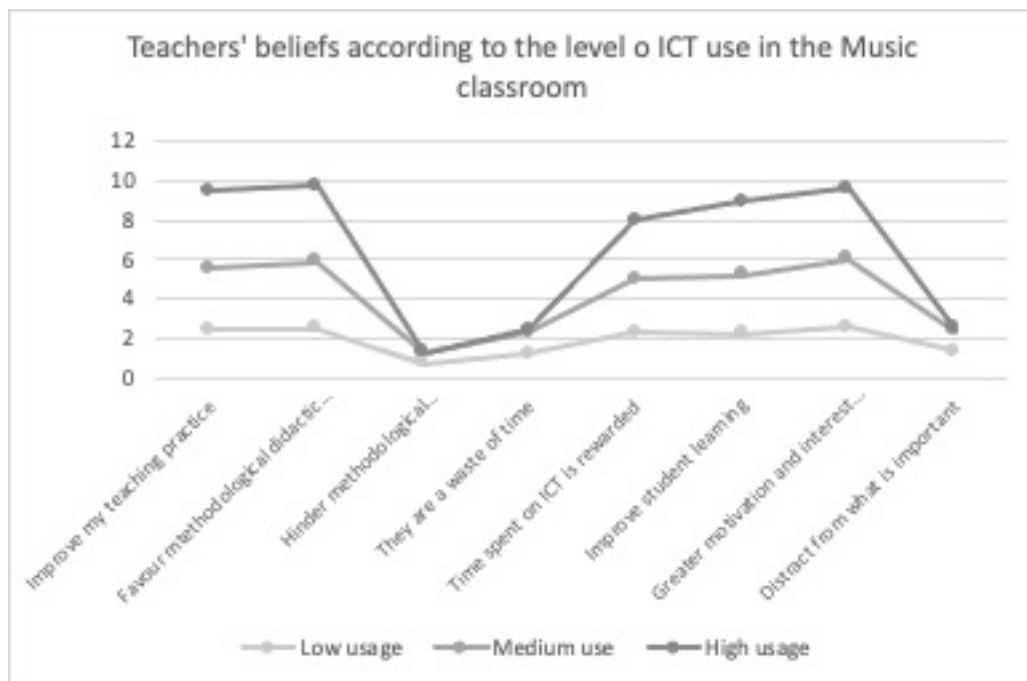


Figure 2. Average Score of Each Group of Music Teachers in Beliefs Regarding ICT in Teaching

In view of the results obtained, it can be interpreted that the level of ICT use in the classroom has significant bearing on beliefs about the value of ICT for teaching Music. In this sense, observing the averages obtained by the groups, it is found that the higher the level of ICT use in music classrooms, the better the positive assessment that teachers make of these technologies for teaching Music. In summary, the results obtained indicate that all items, except one, are significant at  $p \leq 0.05$ , so the null hypothesis of no difference between groups is rejected and the alternative hypothesis is accepted. As can be seen in the graph, the three groups give low and similar answers when dealing with negative beliefs.

## V. Discussion and conclusions

Based on the results obtained and taking as a reference the aims set forth in this study, we can conclude that the teachers of Secondary Music Education make a heterogeneous ICT use in their teaching, identifying three different groups in terms of levels of ICT use. 39.2% of these teachers make a low ICT use and 32.2% is the one that applies ICT in a more extensive instructional

manner. Levels of use is understood as meaning the variability of pedagogical applications of these technologies. High usage implies integrating ICT in multiple instructional facets. Low use refers to limited ICT use at an instructional level. Therefore, we verify that the ICT use in the teaching of Music is not yet widespread.

Regarding the hypothesis of the relationship between ICT uses and conceptions of its value for the teaching of Music, we conclude that there is a significant difference between the levels of ICT use and the beliefs of Music teachers regarding the educational value of the ICT in their teaching, the higher the positive assessment of ICT the higher the level of use. These results converge with the contributions of other studies carried out in this regard (Ertmer et al., 2015; Eyles, 2018; Shifflet and Weilbacher, 2015; Teo and Zhou, 2016) and lead us to conclude that the ICT use affects the teachers' conceptions and beliefs about their integration in the teaching of Music. Therefore, what the teacher does in the classroom is marked by their beliefs, since these affect their teaching attitudes and behavioural aspects (Cronenberg, 2019; Hedden, 2020; López and La Malfa, 2020). Although there are scientific contributions that attest to the close relationship between praxis and beliefs, as well as ICT uses in the classroom, there is scant research into the connection between ICT uses in the classroom and teachers' beliefs regarding its educational worth, particularly in music teachers.

In our study, beliefs that are statistically significant in their relationship with the ICT uses in the music classroom are identified: they improve my teaching practice, encourage methodological instructional development and improve student learning. These findings converge with studies that inquire about the effect of ICT practice on the beliefs and attitudes of teachers in training (Reyes and Martín, 2016). This research corroborates the findings of previous research, in the sense that practice is the most effective way to produce changes in attitudes and beliefs in teachers (Cronenberg, 2019; Eyles, 2018, Hedden, 2020).

Given that in the current state caused by the COVID 19 pandemic, teachers make more extensive ICT use, viewing it as an opportunity to deepen this line of research on the changes in beliefs and attitudes about ICT that teaching with ICT has generated in the music faculty, based on their own professional and personal experiences.

The results of this study are limited owing to the selection of the subjects forming the sample not being probabilistic and, therefore, the data obtained cannot be generalized to a broader population, referring to a certain cultural context, so in other contexts the results obtained could be different. The very specificity of the training of Music teachers also limits the results to this group, and it cannot be transferred to teachers of other subjects and disciplines. Therefore, the expansion to other cultural contexts and areas of professional teaching specialization could be of interest for future research.

The prospective of the research also suggests that the approach adopted in this study, based on a quantitative methodology, could be completed by including research designs with a qualitative approach. This perspective would make it possible to deepen and examine more closely numerous aspects of the incidence of ICT training in the transformation and changes in the beliefs and pedagogical conceptions of Music teachers, especially after the new demands derived from the pandemic situation that affects us and that has forced many teachers to intensive and accelerated digital literacy. Ethnographic designs, based on observations in classrooms, could also support, in practice, data obtained indirectly through questionnaires. The narrative methodology could also illustrate processes of pedagogical transformation of Music teachers, derived from this situation, with reticent teachers who have had to stop being so out of necessity and obligation.

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## **L'ús de les TIC a Educació Secundària Musical i la seva relació amb les creences del professorat**

### **Resum**

Un dels efectes més notables que ha generat el COVID 19 a l'educació és l'ús de les TIC en la docència a tots els nivells educatius. Aquest estudi proporciona dades sobre l'ús de les TIC per part del professorat a l'ensenyament de la Música en Educació Secundària a Andalusia (Espanya). També explora la relació entre les pràctiques de les TIC i les percepcions dels docents sobre el valor educatiu de les TIC per a l'ensenyament i l'aprenentatge. Els resultats empírics obtinguts indiquen que el professorat de Música d'Educació Secundària utilitza les TIC en la seva docència de forma molt heterogènia, predominant un ús limitat. També s'observa una relació estadísticament significativa entre les pràctiques de les TIC a l'ensenyament de la música i les creences dels professors sobre el valor educatiu de les TIC com a eina per a l'ensenyament i l'aprenentatge dels alumnes.

### **Paraules clau**

Tecnologies de la Informació i la Comunicació (TIC); Educació musical; Educació Secundària; Formació de professors; Ensenyament-Aprenentatge.

## **El uso de las TIC en Educación Secundaria Musical y su relación con las creencias del profesorado**

### **Resumen**

Uno de los efectos más notables que ha generado el COVID 19 en la educación es el uso de las TIC en la docencia en todos los niveles educativos. Este estudio proporciona datos sobre el uso de las TIC por parte del profesorado en la enseñanza de la Música en Educación Secundaria en Andalucía (España). También explora la relación entre las prácticas de las TIC y las percepciones de los docentes sobre el valor educativo de las TIC para la enseñanza y el aprendizaje. Los resultados empíricos obtenidos indican que el profesorado de Música de Educación Secundaria utiliza las TIC en su docencia de forma muy heterogénea, predominando un uso limitado. También se observa una relación estadísticamente significativa entre las prácticas de las TIC en la enseñanza de la música y las creencias de los profesores sobre el valor educativo de las TIC como herramienta para la enseñanza y el aprendizaje de los alumnos.

### **Palabras clave**

Tecnologías de la Información y la Comunicación (TIC); Educación musical; Educación Secundaria; Formación de profesores; Enseñanza-Aprendizaje.

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