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Review

Conceptual Cartography for the Systematic Study of Music Education Based on ICT or EdTech

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Abstract: Music and its study have always been present among people. Its learning is significant, as it provides benefits and helps in the acquisition of many abilities and skills. However, didactic, methodological, and pedagogical changes have begun to appear that nurture and provide new challenges to their learning. Fully adapting to the 21st century and abiding by the great demand for technologies, we have seen the rise of ICT (Information and Communication Technologies), which have also been conceived as educational technology (EdTech), when applied to education. Due to these reasons, the need to conduct a systematic literature review in four databases has arisen to find out whether the use of technology in music education helps to facilitate the teaching-learning process of students. Evidence from this research has been collected using concept mapping to organize the training process. Finally, it is relevant to comment that evidence has been found and verified that the use of Edtech helps in the learning of Music Education; given that, in various documents, it is observed that they increase motivation, musical-technological thinking, critical thinking, creativity, musical practice, and musical improvisation and that they give rise to fun, playful, enjoyable, and stimulating learning.

Keywords: didactics; music education; methodology; educational challenges; ICT

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1. Introduction

Conceptual cartography was created through numerous studies to understand the scientific terminologies or concepts that children internalized in one way or another. In fact, we could say that it was developed as an evaluation instrument applied to education, given that this tool helps teachers understand and/or plan different instructions that apply to learning organization [1].

Concepts are acquired at an early age and in a regular way, although they can also be internalized as adults. Furthermore, people tend to learn continuously, and everything learned can help keep learning and relate it with other concepts, including those related to their own language [1], as is the case with learning music and technology.

When talking about concepts and terminology, it is necessary to integrate the concept of conceptual maps. These are considered good didactic materials that help with the acquisition of learning, given that the students start to create them according to their interests to extract the maximum usefulness. In fact, its creation encourages correcting concepts that have been acquired incorrectly [1].

Nevertheless, and despite its recognition as an excellent didactic tool, conceptual maps have begun to be used as an evaluation tool to start an exhaustive study about a specific subject as they can be used to evaluate and conduct research in scientific and education fields. How do we create a conceptual map to set up learning and evaluate it? For this, we need documents that are rich in different terminology that help in the preparation of a conceptual map through key concepts that develop this subject. Afterward, these must be organized from the most general to the most specific. Then, a series of statements must be created that help send the main idea that is offered. Lastly, and if necessary, the created map should be reorganized according to the needs of the study [1].

With this, it can be determined that conceptual cartography is not only an instrument for easing learning but also an excellent pedagogic tool that helps in the achievement of goals that have been established for the acquisition of new knowledge. Therefore, it is necessary to follow a set of instructions, if justified, to establish a relationship with all key terminologies [1].

As of today, and due to the excess of existing information, it is necessary to have these types of didactic tools, which allow us to organize and manage diverse types of knowledge that exist in society to abide by the new demands for the construction of learning. In other words, different competencies that are related to the cognition and management of diverse information that can be accessed must be developed to process and define it in a manner that is more complex and critical. Therefore, and considering many studies, the recommendation is made to use conceptual cartography as a didactic strategy to help manage knowledge, to analyze it at the theoretical, conceptual, and practical levels. In addition, remember that it helps establish communication between people, verbal or non-verbal [2].

This instrument must contribute by fragmenting learning to organize it according to its disciplines and as a function of various mechanical exercises that are integrated. This must lead to the transformation of education, to the development of multiple strategies that help students acquire a global view of learning according to some specific content so that they can discuss it, and resolve some inconveniences they may find, as is the case with conceptual cartography [3].

In addition, it must help the user to receive the knowledge and apply it to a real context; as with its use, one can analyze a subject according to the dimensions that were set up to try to integrate all concepts that are related or that could be related among themselves [4]. Similarly, it must help evaluate the learning that is being conducted, for which advice is given to design the phases that are included, as well as the evaluation techniques and the competencies to develop in the acquisition of knowledge [5].

To understand concepts and be able to relate them to other areas, it is necessary to begin to organize and represent the specific topic of interest. These can be keywords as well as typical expressions related to the knowledge to be learned since their objective is none other than to take advantage of this methodology to organize the teaching-learning process. Even more so, it should be remembered that this methodology has been present for many centuries to learn basic and fundamental elements. However, its rigorous study began only in the last few years [6].

Furthermore, when talking about concept mapping as a tool for learning acquisition, we must also think about its characteristics, as it has three fundamental characteristics: multidimensionality, the integration of knowledge and its totality, and finally, the sequencing of the contents to be worked on [7].

Here, we find socioformation, a concept that, according to [8], seeks to establish a relationship between the complex thinking of people and the organizations that each can establish through various axes that can be integrated into a specific context: problem-solving; conceptual, critical, analysis of processes; and creativity.

In a few words, it can be observed that concept mapping is nothing more than a concept map that helps organize specific content that one wants to study to acquire learning. Therefore, it can be applied to any field. Therefore, due to the advances in society due to the incorporation of ICT to process information in seconds [9], as well as the technological changes that have been triggered by the use of mobile devices or smartphones [10] that have been integrated into education as a facilitator of a teaching-learning process and that, aims to develop greater intellectual capacities and skills to achieve the integral development of students through various educational approaches [11–15], the need has arisen to carry out a systematic literature review in different databases, specifically in WoS, Scopus, Dialnet, and Google Scholar to determine, through the evidence found, whether the learning of Music Education can be constructed by means of educational technology or Edtech and to

record this by means of conceptual mapping to organize the content, thanks to the battery of questions that are collected and will be shown in the following sections.

Then one could affirm what [16] posited, «Technology and music, why not join them?» (p. 13). Because of this question, does music education have to first be visualized from another perspective in which the use of technology as an essential educational tool is included in its teaching? Is there evidence that ICT or EdTech can be applied to this subject to ease the teaching-learning process? Must we start to use them to promote the learning of Music Education, or is it not necessary? These are some of the primordial questions that any educator specializing in this subject must ask in the 21st century.

To conclude, and to take all the above aspects as a reference, to which extent conceptual mapping the use of ICT applied to music education contributes does facilitate the teaching-learning process to offer new visions and opportunities to this subject?

2. Materials and Methodology

According to the purpose of the study, a systematic review of the literature of documents dealing with ICT or EdTech applied to music education was carried out to see if musical knowledge can be built through technology. For this purpose, four databases were consulted: Web Of Science (WOS), Scopus, Dialnet, and Google Scholar. In each of these databases, the following keywords were used, both in Spanish and English: Music Education and ICT, Music Education and Technology, Music and ICT, and Music and Technology. In addition, a series of selection criteria were established for the articles: that they were between 2014 and 2022; that they focused on educational practices in music education linked to educational technology; that they integrated modifications and changes in the way music is taught; and that they were freely accessible. Similarly, the following were considered: the titles of the studies, the summary, the contributions to the musical and technological educational community, the descriptors, the specific conclusions for the unification of EdTech with Music Education, and finally, the contributions that support the construction of conceptual mapping according to the axes defined by [8]. In the same way, some criteria were established to exclude documents: scientific contributions that did not contribute anything to the research; documents that did not work in ICT and music education together to establish learning; duplicated documents; final studies such as bachelor's, master's, and doctoral theses; chapters of books whose complete edition did not deal with technology applied to Music Education; literature reviews; and research that did not integrate the educational practice of the elements studied.

Similarly, it is necessary to indicate that all the selected documents were used to analyze them rigorously according to conceptual mapping, with the purpose of organizing and contrasting the evidence found, according to a series of questions posed and based on the 8 fundamental axes of this research methodology, which according to [8], help to analyze knowledge according to notion; categorization; differentiation; exemplification; characterization; subdivision; linkage; and methodology. In other words, with this approach, the progress made on a specific topic is determined, given that it builds a new theoretical concept.

In parallel to these aspects, it is necessary to mention the methodological design that has been executed as a reference frame to fulfill the objective of the research. This has served to collect the data and interpret them to provide solutions to the questions posed. As conceptual mapping focuses on providing answers to a series of questions posed according to the dimensions addressed, it was decided to present the results through qualitative research methodology. Since then, textual data on the use of Edtech in Music Education was collected and analyzed. In this way, the previously described objective was met.For data collection, the method of analysis of documents and records was used, outlined by the key questions that were established. These questions are reflected in the following section.

Categorical Axes of Conceptual Cartography

According to the guidelines established by [8] for conceptual cartography and the axes that make it up, a series of questions were defined for each axis to obtain the necessary information and organize it to achieve the proposed goal since we must not forget that this methodology systematizes and constructs new knowledge. These are found in Table 1.

Table 1. Axes of conceptual cartography with their respective questions.

Axes	Key Questions
Notion	Why must ICT or EdTech be used for learning in music education?
Categorization	Is there technological practice-based music learning?
Differentiation	Does EdTech differ from Music Education?
Exemplification	Is there evidence that EdTech applied to Music Education helps the learning process of students and changes the pedagogy that is currently used?
Characterization	What are the fundamental characteristics or aspects that must be considered to explore music learning through EdTech?
Subdivision	Are there distinctive elements of ICT and Music Education?
Linkage	Are there processes that could be linked to the learning of EdTech and Music Education?
Methodology	Are there diverse approaches to music learning centered on EdTech?

Keywords that have been asked to achieve the pre-established aim.

In fact, this set of questions listed in Table 1 is essential to be able to systematianalyzenalyse the documents found in the four databases since each of the proposed questions will be considered in the literature review since the selected documents must help answer them in a comprehensive and rigorous manner.

3. Results

After the search in the databases, a total of 31,981 documents (articles, books, conference briefings) with the descriptors were used. Of these, 8424 were repeats and therefore removed, for a total of 23,557 records. However, once the time (year) criterion was applied, this number was reduced to 17,517, with 7112 being free access. Nevertheless, after the application of the rest of the criteria defined, a total of 85 documents were finally selected, given that they were centered on the practice of educational technology applied to Music Education; and thus served for the construction of conceptual cartography, as described in the following sections.

Next, Table 2 reflects the process followed for the selection of the total sample of articles, these being the intermediate results for the analysis of the use of Edtech applied to Music Education by means of conceptual mapping.

Table 2. Intermediate results of the research.

Criteria	Total Documents in the Search	Documents Selected When Applying the Filter	Percentage
Search with the following descriptors: Music Education and ICT, Music Education and Technology, Music and ICT, and Music and technology	31,981	31,981	100%
Deleted Duplicated documents	8424	23,557	73.66%
That they were between 2014 and 2022	23,557	17,517	54.77%
That they were freely accessible	17,517	7112	22.24%
That they focused on educational practices in music education linked to educational technology	7112	4323	13.52%

Table 2. *Cont.*

Criteria	Total Documents in the Search	Documents Selected When Applying the Filter	Percentage
That they integrated modifications and changes in the way music is taught	4323	2515	7.86%
Titles of studies The summary The contributions to the musical and technological educational community The descriptors	2515	810	2.53%
The specific conclusions for the unification of edtech with music education	810	633	1.98%
The contributions that support the construction of conceptual mapping	633	516	1.61%
Deleted Scientific contributions that did not contribute anything to the research	230	286	0.89%
Documents that did not work in ICT and music education together to establish learning	82	204	0.64%
Documents that were not final studies, such as bachelor's, master's, and doctoral theses	76	128	0.40%
Documents that were not chapters of books whose complete edition did not deal with technology applied to music education	22	106	0.33%
Documents that were literature reviews	10	96	0.30%
Research that did not integrate educational practice of technology and music education	11	85	0.27%

The authors/documents that were selected as they followed the defined criteria are shown (Table 3).

Table 3. Authors and documents found.

Selected Authors					
1. Addessi (2020)	[17]	2. Addessi et al. (2017)	[18]	3. Asensio y González (2019)	[19]
4. Berbel-Gómez et al. (2019)	[20]	5. Berrón (2018)	[21]	6. Berrón et al. (2017)	[22]
7. Burton y Pearsall (2016)	[23]	8. Calderón-Garrido et al. (2019)	[24]	9. Calderón-Garrido et al. (2020)	[25]
10. Calderón-Garrido et al. (2020)	[26]	11. Calvillo (2019)	[27]	12. Casanova y Serrano (2016)	[28]
13. Castañeda y Selwyn (2018)	[29]	14. Chao-Fernández et al. (2019)	[30]	15. Colas-Bravo y Hernández-Portero (2017)	[31]
16. Countryman y Stewart (2017)	[32]	17. Cózar et al. (2015)	[33]	18. Crespo (2019)	[34]
19. Cuervo et al. (2019)	[35]	20. Czmola et al. (2019)	[36]	21. De Castro (2015)	[37]
22. De la Rosa (2019)	[38]	23. Delgado y Mederos (2019)	[39]	24. Díez-Latorre (2019)	[40]
25. Díez-Latorre y Carrera Ferran (2018)	[41]	26. Dosaiguas y Pérez-Moreno (2019)	[42]	27. Esteve y Llopis (2019)	[43]
28. Estornell (2019)	[44]	29. Eyles (2018)	[45]	30. Ferreira y Ricoy (2017)	[46]
31. Galera y Barranco (2020)	[47]	32. García (2019)	[48]	33. Gazzano (2019)	[49]
34. Gómez (2015)	[50]	35. Gorgoretti (2019)	[51]	36. Hernández-Portero (2021)	[52]
37. Hillier et al. (2015)	[53]	38. Holguín y García (2018)	[54]	39. Huertas (2021)	[55]
40. Ji (2016)	[56]	41. Kokkalia et al. (2016)	[57]	42. Kucirkova (2014)	[58]
43. Kühn (2019)	[59]	44. López (2016)	[60]	45. López et al. (2019)	[61]
46. Márquez y Sempere (2016)	[62]	47. Martín (2018)	[63]	48. Martínez (2020)	[64]
49. Muñoz (2018)	[16]	50. Nijs (2017)	[65]	51. Pagador (2020)	[66]
52. Parra (2017)	[67]	53. Pereira (2019)	[68]	54. Pike (2015)	[69]
55. Ramos et al. (2017)	[70]	56. Ramos y Botella (2017)	[71]	57. Ramos y Botella (2019)	[72]
58. Ramos y Botella (2020)	[73]	59. Riaño y Murillo (2019)	[74]	60. Rodrigues et al. (2019)	[75]
61. Roig-Vila et al. (2020)	[76]	62. Román (2017)	[77]	63. Romero (2019)	[78]
64. Sadio-Ramos et al. (2020)	[79]	65. Sánchez-Parra et al. (2020)	[80]	66. Segura (2017)	[81]

Table 3. *Cont.*

Selected Authors					
67. Senda et al. (2018)	[82]	68. Serdaroglu (2018)	[83]	69. Serrano (2017)	[84]
70. Simon (2018)	[85]	71. Souza (2019)	[86]	72. Stoeberl et al. (2019)	[87]
73. Tejada y Thayer (2019)	[88]	74. Terrazas et al. (2015)	[89]	75. Thibeault (2018)	[90]
76. Torrejón-Marín y Ventura-Campos (2019)	[91]	77. Touriñán (2018)	[92]	78. Trujillo (2015)	[93]
79. Vicente-Bújez et al. (2019)	[94]	80. Vidal y Morant (2017)	[95]	81. Wolf y Kopiez (2018)	[96]
82. Xiao et al. (2016)	[97]	83. Young (2019)	[98]	84. Zeng et al. (2019)	[99]
		85. Zhang y Suii (2017)	[100]		

3.1. Notion

EdTech has become integrated into society, even in educational models, to help teaching-learning processes achieve more fruitful knowledge. It should not be forgotten that the use of technology also helps to achieve empowerment and active participation of students, independently of the sociocultural context in which they are found [24–28]. In short, and according to many scholars on the matter, technological tools must be integrated into this artistic area of music education to supply new education and practical possibilities, aside from easing the process of knowledge acquisition or the teaching of the students. In addition, it is affirmed that these technologies have always been present in music, such as radios, sound recorders, sound mixing tables, phonographs, and synthesizers, among others [30,33,37,70,71]. However, it is necessary for music teachers to dive into the world of technology to make correct use of its tools and trigger musical-technological practice [72–74,77,80].

As of today, Music Education in the 21st century must cater to contemporary music competencies associated with technologies so that they promote new skills and abilities in this area; for example, the development of musical thinking. Similarly, through their use, new didactic, methodological, and pedagogic approaches must be created that is centered on the active participation of students so that they feel more motivated by music learning in a continuous manner [41,43,46,48,50,51]. This is possible because the use of EdTech allows one to work in a continuous manner through time and anywhere one wishes, as smartphones, among others, allow one to connect instantaneously. It can be said that the technological resources will help solidify music competence in a generalized manner and any related skill as well: singing, listening, rhythm, theory, improvisation, instrument learning, experimenting, music composition, etc. [49,90–92,97,100]. These tools also promote the use of music games to solidify and re-enforce knowledge to achieve better education practices; therefore, we must search for technological tools that help achieve the development of music knowledge to increase the motivation of the students and to promote the area of music. In fact, EdTech in Music Education implies aspects that are incredibly positive in the intellectual, cognitive, psychological, emotional, social, and physical development of the student in the school context" [60] (p. 65).

3.2. Categorization

Technological practice, although not as it is presently conceived, started to be used in the last third of the nineteenth century and the beginning of the twentieth century, in which artificial sound productions were made through digital instruments. However, it was not until 1970 that Music Education was promoted through technological means. Starting with these aspects, technologies began to make a place for themselves in the practice of music, to become entrenched in a new way to learn through EdTech [70–73]. Fascinating and unthinkable elements have been unleashed for learning music through digital tools as if in a game, in which the development of musical-technological abilities and skills are integrated [17,18,20,21,29,32,42].

Current and future music education must lead to innovative and digitized education to unleash new challenges in society. In short, Music Education professionals must take advantage of technological resources to achieve greater benefits for people and thus en-

ter into the acquisition of digital competence; therefore, technology must be integrated into their classrooms. In fact, many studies have used technology for music learning, obtaining significant experiences in students, as they feel more motivated in their learning process [19,30,31,34,35,38]. Technology has also been shown to increase concentration and deepening in music, as students are playing, but they are interiorizing content in a consistent manner. These technological practices can be seen in various educational environments: Early Childhood, Primary School, Secondary School, High School, and University, even in Conservatories, although to a lesser degree in the latter [36,39,63,84].

Nevertheless, and according to various scholars on the subject, although EdTech is used for music practice, we must not forget about the music pedagogy that nurtures its learning. Thus, technology and pedagogy must be combined. In summary, the music pedagogy of the twentieth century must be adapted to the new technological era to reach more fruitful learning starting with different software programs or applications that exist for learning music [49,56,57,63,73,74,76,93–96,99].

This musical pedagogy can be related to current technological pedagogical models such as the TPACK model (Technological Educational Content Knowledge) to identify the knowledge to be acquired through Edtech [9,88].

3.3. Differentiation

In the studies found, EdTech did not differ from Music Education. Furthermore, these wagered on learning of music with the integration of technology to offer new educational possibilities, to therefore achieve learning that is more invigorating [58,59,89]. Some of the possibilities seen are the following: editing music scores, mixing sounds, creating games based on music, publishing the material created, listening to music, communicating with other users, creating melodies and rhythmical and melodic accompaniments; learning a virtual instrument, combining the digital with the real, learning of music language and theory, and teaching listening, creative, compositional, and interpretive skills, among others [23,47,49,56,57,59,66,68,69,75,78,82,85,87]. All of this contributes to the musical-technological teaching-learning process into which new methodological and didactic concepts of music education and EdTech are integrated. Therefore, we must wager on ubiquitous learning to achieve the development of greater potential in students, such as in the case of the development of computer and musical language [44,45,49,52,60,79,83].

3.4. Exemplification

The digital culture that has appeared in society is unleashing changes in the way music education is taught since the integration of EdTech helps to facilitate the teaching-learning process; thus, it has begun to establish changes in musical, didactic, and pedagogical practice. It cannot be forgotten that this digitalized culture is not focused on anything other than performing customs using technological tools [29,35,36,61,62,67].

This digital culture can be observed with the statements made by several researchers to integrate apps in Music Education in order to facilitate the technological language, the musical, its theory, and practice; because it has contributed to improving musical compositions, thus increasing creativity, motivation, and knowledge assimilation of students, in a fun and entertaining way [66,68,69,75,78,82,85,87]. Music Education through EdTech is a reality that has arrived and will keep on being implemented to remain in education systems, given the diverse tools that could be used to reach a more innovative type of learning. Voice, instrumental, auditory, music theory, and rhythm training can be improved, among others, using these tools [17,18,22,29,49,53,58,67].

Furthermore, there are many studies on the use of mobile applications and devices for learning music. In these, an increase was seen in experiences, music knowledge, motivation, divergent, musical and technological thinking, and improvisation skills. Improvement in reading was also perceived at first sight after using technology when learning music. In practical terms, the use of these tools, since they are visual elements, encourages playing, which can result in modifying the pedagogy, didactics, and methodology of music educa-

tion. Music learning experiences through augmented reality were also observed, especially based on the pedagogy of various authors: Dalcroze, Suzuki, Orff, and Kodály, among others. However, to achieve this, teachers must be trained or learn by themselves about the possibilities offered by technologies for the development of meaningful learning. Likewise, they must develop digital skills [71–76,81,87,90,93–95,97–100].

3.5. Characterization

In some way, and according to many scholars of the subject, a fundamental aspect that must be considered for Music Education using EdTech is specialist teachers. These individuals must have training in technology, as well as its didactics, pedagogy, and methodology, which can help in the creation of music classes in an environment in which technology can be included as an essential resource to facilitate learning [25–28,33,50,80]. Other aspects that should be considered are the existing music pedagogies; given that we cannot forget about the pedagogies that are nurtured by current learning: Dalcroze, Martenot, Orff, Willems, Kodály, Suzuki, Tonic Sol-Fa, Montessori, Paynter, Maurice Chevais, Schafer, Soundcheck, and which come from the 20th century, being considered as active methodologies. Likewise, and with respect to the characteristics, the authors write that the teachers must know the essential and main characteristics that the technological tools have to be able to correctly apply them within the class group, as it is primordial to deepen into the acquisition of knowledge [40,41,54,86,90,100].

3.6. Subdivision

After reviewing many studies, we can say that no elements were found that differentiated EdTech from Music Education. Although both areas are completely different, technologies came to society to help solidify knowledge, improve and ease the process of teaching and learning, to promote education; therefore, these technological tools must be combined with music to obtain greater knowledge. In this manner, the physical and digital worlds will be combined while the content is assimilated. On the basis of this, new interactions between all the students will begin to appear, as the way to learn is promoted thanks to the many benefits obtained. There is an increase in creativity, motivation, critical and creative thinking, musical practice, and improvisations. The most important aspect is that their unification will achieve greater interdisciplinarity and better education practices [55,59,66,68,69,75,78,82,85,87,98].

3.7. Linkage

EdTech and music education can be considered cross-sectional subjects, and their unification can augment teaching and learning processes. Therefore, they can be linked to any methodology that encourages learning acquisition, as technology helps ease the user's knowledge. Collaborative, cooperative, and interdisciplinary work is one of the processes or methodologies that is being developed [54,61,64,70,75,77,82,84]. Additionally, new methodological, didactic, and pedagogical approaches are emerging that are being integrated into the music and technology learning process. In fact, audiovisual resources are used to promote learning through active participation, which increases the motivation of the student to learn music in a dynamic way [17,18,22,34,63,69,83,85]. For this, the following is recommended: choosing the content and game that is more suitable for the students; setting up diverse concepts of learning which integrate curiosity, interest, and leisure; adapting didactic approaches that help capture the attention of the student, as well as assess, appreciate, and/or reward the contents that the student has worked on and got right to increase self-esteem. All of this will contribute to the achievement of high-quality education [25,28,33,35,37,55,64,68,71,75,84].

3.8. Methodology

Given that EdTech has been integrated even more in society, even in music education, new didactic, pedagogic, and methodological approaches have appeared that are being

used to ease the learning of music through technology [44,54,63,67,70,77,88,95]. Some of the most interesting are: gamification, as it focuses on lucrative learning based on games; the SAMR model, which facilitates the use of technology in any subject based on Substitution, Augmentation, Modification, and Redefinition; the TAM (Technology Acceptance Model) model, which argues for the acceptance of technology in any area; the TPACK model, which integrates the concepts of technological, pedagogic, and content or disciplinary concepts; the UTAUT model (Unified Model of Acceptance and Use of Technology), which analyzes the academic performance of students, continuously, due to the possible influence of technological devices in any area; and PBL (Project-based Learning), which is also associated in its totality which videogames, as they are audiovisual elements, which include animated elements and sounds. Changes appear that help adapt theory and practice to obtain content in a manner that is dynamic and fun, triggering motivation and self-esteem as fundamental elements [18,25,26,34,35,38,39,49,54,55,70–73,88,89,97–100].

4. Discussion and Conclusions

Before going deeper, it is necessary to recall the question that was posed, and that served as the main objective of the research, to which extent conceptual mapping the use of ICT applied to music education contributes does facilitate the teaching-learning process to offer new visions and opportunities to this subject?

Based on the purpose of the proposed study, it is stated that the use of concept mapping has been the most appropriate tool for the research in order to know if the use of Edtech applied to Music Education contributes to facilitating the teaching-learning process of said subject; given that, this strategy is used to build verbal and non-verbal knowledge, as well as spatial knowledge based on a series of formative and cognitive competencies in which concepts, questions; among other elements, are integrated.

It is a reality that Edtech or educational technology has begun to be integrated into music education learning. In fact, the use of technology has helped consolidate new ways of establishing the teaching-learning process, especially because of COVUD-19, as all teachers have been forced to use technological resources to continue teaching their classes. Moreover, and according to all the authors analyzed in this study, there is a need to continue working and deepening in the field of technology applied to the study of music education.

To this end, music teachers must acquire fundamental skills in the use of Edtech to integrate them into their classrooms as fundamental tools that help facilitate musical learning. In short, music teachers must develop digital competence to make the most of technology during their teaching. Therefore, all teachers today must continue to be trained on an ongoing basis in the use of Edtech applied to the teaching of music.

In fact, ref. [16] already inquired about the unification of both subjects for knowledge acquisition. At present, it can be said that there are many studies that corroborate music learning using technology. Due to these aspects, it is necessary to begin to visualize other educational perspectives from didactic, methodological, and pedagogical concepts to meet this educational demand. We cannot ignore the existing evidence on EdTech applied to Music Education; thus, they must be integrated to promote the learning of students to achieve greater advances in education. The reason for this is that when technologies are unified, we achieve other important skills and abilities, as described above, such as increased motivation, development of musical-technological thinking, critical thinking, creativity, music practice, and music improvisation. In addition to these, fun, entertaining, and invigorating possibilities are unleashed, thanks to the effects of its use in class groups and individuals.

Consequently, it is affirmed and thanks to the contributions of various authors, that there are several skills and abilities that can be developed through the study of Music Education and Edtech, given that, as the student can learn music autonomously and self-taught, they also learn with technology, and most importantly of all, in an educational way; as these tools should be conceived as educational elements to facilitate their training process. Furthermore, with the integration of technology, students are experiencing new

ways of learning in education, as expressed by several authors [11,16–18,23,25,34,45,50,58], among others.

Furthermore, if we take [56] as a reference, it can be indicated that ICT in music education helps develop new educational experiences that inspire technological and musical motivation. This can be seen in the study he carried out with the use of apps for learning music in adolescents who learn music through educational games, given that he observed that the students improved their cognitive vision in music, as well as obtaining positive effects during learning.

Now, taking as a reference the questions posed in each of the dimensions, it is necessary to indicate briefly that it is necessary to begin to integrate Edtech in the learning of music thanks to the benefits that are acquired, as is the case of increased motivation, in addition to certain skills and skills. This can be verified by the various technological and musical practices that are emerging and which are increasing significantly because Edtech is no different from Music Education since technology is a means to achieve preset objectives.

In fact, technology helps the teaching-learning process of students, thus adapting music pedagogy, without the need for changes, to today's society, in which the use of ICTs predominates. Music pedagogy must be complemented by Edtech to increase learning and experiences [23,47,49,56,57,59,66,68,69,75,78,82,85,87].

However, to deepen the learning of music through Edtech, teachers must know the essential characteristics of technology to know how to integrate and use them correctly in their classrooms. However, although technology and music are two independent areas, they complement each other since their joint study helps to increase creativity, motivation, critical and creative thinking, musical practice, and improvisations, as well as interdisciplinarity and the achievement of better educational practices.

With all these aspects and, according to the results, it is affirmed that the teaching-learning processes of Music Education can be linked in its totality with Edtech; since it is possible to improve the methodology, the didactics, and the pedagogy of this subject. In fact, there are several technological approaches that can be applied to music, such as the SAMR model, TPACK, TAM, and UTAUT.

To summarize, it can be said that nowadays, thanks to the evidence found in this study, it can be stated that there is a need to change the concepts of Music Education to promote the motivation of students, to increase their cognitive and cognitive creative, compositional, and interpretative skills, through technology. However, this aspect does not mean that the existing music pedagogy must change; on the contrary, we must adapt the music pedagogy of the 20th century to that of the 21st century, in which the use of EdTech predominates, as has been done by various scholars of the subject, and which have been described above. In this way, it will be possible to deepen quality education based on digital or technological competencies associated with musical competencies. In fact, we must not forget that ICT are key and primordial tools that will change the world as it is currently conceived; therefore, we must learn to provide education on emerging technologies for the education of the future. Therefore, we must begin to train specialist Music Education teachers in the use of technologies to integrate them into their classrooms to improve education as it is conceived today and to achieve a teaching-learning process adapted to today's social environments, in which the use of ICT predominates in all areas.

5. Limitations and Future Research Lines

The following limitations have been identified during the research project:

- Rare source of information on concept mapping and its application for data collection.
- Design and definition of the project to achieve the proposed objective.
- The low sample size compared with the volume of articles found; however, they have served to address the research objective.

However, despite this, there are also lines of research:

- Study of the implementation of an app for learning music education in two diverse groups of subjects: one uses it, and the other does not, to observe academic performance.

- Study of the implementation of emerging technologies to develop music education classes.
- Evaluations of the didactics and methodology taught in music education using educational technology.

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