A study on the use of ICT as a tool in music education of students with visual impairment

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Abstract: Information and Communication Technologies (ICTs) are part of the contemporary world and permeate all areas of action and social interaction. This paper presents a theoretical study on the use of ICTs in aid to the musical education of students with visual impairment. They will be described here some of the most used tools to promote accessibility to music, such as screen readers and software methodologies touch approach, using miniature musical instruments (handmade or 3D printers). This study aims to help bridge the gap of social inclusion of music students with visual disabilities through alternative technologies that promote their digital inclusion.

Keywords: Accessibility. Digital inclusion. Musical education, ICT.

1. Introduction

Vision is one of the most fundamental human senses to acquire information of the reality that surrounds us. Louro tells us that approximately 75% of our perception is through this sense (LOURO, 2012: 247). A failure in the visual system can compromise the quality of life and consequently the learning disabled individuals, different and unexpected ways. For musicians Visually Impaired (VI), there are a number of barriers that hinder their development. While common sense is the the blind musicians have more acute hearing, Louro (2012) tells us that, although the VI people use more the sense of hearing and so naturally develop more this perception, this does not necessarily mean that VI musical ear is automatically developed, ie the acute hearing of the VI for acoustically understand the reality that surrounds it is a distinct cognitive process that used by your musical ear (LOURO, 2012: 263). At the same time, it can be seen that contemporary society has, in large part their daily actions established in processes involving the use of information technology and digital communication - ICT calls - for conducting day-to-task day. According to Ramos (2008), are

in this context included devices such as the computer, smartphones (mobile phones with internet access and running applications), tablets (similar to smartphones, but with larger screens, touch sensitive; the touchscreens) and cybespace own, made possible by the internet. The use of these devices has significantly influenced social behavior by changing the way of interaction between individuals, and their shapes and their working hours of entertainment. According to Braga (2013), "people who do not have contact with these technologies are already suffering social pressures to be identified as individuals who delay processes." In this scenario, the VI have another challenge: in addition to the existing obstacles to their social inclusion, now they also need to be digitally included.

One of the major obstacles to the digital inclusion of VI is that ICT is usually not built for people with visual impairment. Being the view perhaps the most significant direction for the acquisition of information, ICT has been naturally developed making use of visual information (imagine using a computer, smartphone or tablet closed eyes). Alternatively, what (and when) occurs is an adaptation of technologies designed to sighted individuals (with normal vision) that are used with some modifications to become accessible to VI.

Louro (2012) reminds us that the United Nations (UN) established the year 1981 as the "International Year of Disabled Persons". This led the company to a series of reflections, observations and research related to the social inclusion of people VI, creating a new concept called Support Paradigm. This is based on the assumption that "the person with any kind of disability is entitled to non-segregated living and immediate and continuous access to the rights available to other citizens" (LOURO, 2012: 27). From this idea the author says that "society must adapt to the needs of all people" (LOURO, 2012: 28). In this context, this research aims to contribute to the process of digital and social inclusion of people VI, particularly those who are musicians and music students.

This theoretical study will also provide methodological approaches to the discussion currently present in education, which deals with the inclusion of students with a disability in the regular classroom, since currently, the laws implemented in Brazil in order to provide the socialization of the disabled, seek to place students with any kind of limitation, physical or cognitive in regular classrooms, in order to foster both their accessibility to educational resources as their social inclusion.

2. Computational Propositions

Computational technological developments of the last decades has had significant influence in music, through the popularization of computers and their interconnection through the internet, and the development of hardware and specific software for musical applications. Currently, the musician or music student who has access to information, have the possibility to use editors software scores, audio editors, multitrack recorders, instructional software used for perception of intervals, chords and scales, as well as access to virtual libraries audio and video (remembering that for the musician enjoy these resources, it is necessary that it has proficiency, even if basic in computer science). Therefore, it is appropriate that these possibilities also become accessible to musicians and VI students. However, it is undeniable that there is great dependence of people with visual impairment, both the software operation, such as for access to library materials (in digital format) for the realization of musical studies. These factors undoubtedly cause a mismatch in the learning process and the issue of equality in learning environments or professional.

The technologies used as aid to VI tools are called Assistive Technologies. These are software and hardware tools that allow the overcoming of the gap between what a disabled person wants to do and what is the technology infrastructure that allows you to perform this task. According Hasher, assistive technology "consists of equipment, devices and systems that can be used to overcome the social barriers related to infrastructure and other obstacles faced by persons with disabilities and that prevent their full and equal participation in all aspects of society " (HARSHER, 2008: 4).

It can be said that even with the technological breakthrough that reflected in numerous contributions to the study of music to VI people, the technologies available, for the most part, have some difficulties handling for this public, due to the fact that music software having their interfaces almost exclusively graphic (visual) and that are not accessible to screen reader software. These are software able to transform into speech (via a synthesizer voice module) text file sections, so that the VI user can have audible access (in the form of spoken language) to the text content (in the form of written language).

For the fact assistive technologies represent a possibility of inclusion for musicians and VI students to the resources offered by computer should be created specific methodologies for the use of ICT in musical education to VI people, taking into account the possibilities of possible adaptations. Thus one should examine how existing ICT, especially in the music area, can be adapted or designed to assist the VI in their musical studies. Among the desired objectives is the development of strategies to access the VI to computer tools, such

as software that interact with the music business, such as audio editors (eg Audacity), music publishers (including software that edit scores for the musicografia Braille or offer paths to the same (eg Musibraile, Sibelius, musescore, Goodfell, Braille Music Editor and Sibelius Speaking) and sequencers (eg Anvil Studio, Sonar and Caketalking), as well as the technological resources area of existing music for the study and development of musical theory and perception (eg Ear Master and sites music Theory.net and Teoria.com).

3. Methodological Developments

This theoretical research aims to have its empirical part developed in the Central Library Accessibility Lab Cesar Lattes UNICAMP. They will be presented, discussed and mapped the experiences with the proposed software and hardware. From the data collected and analyzed will be developed possible solutions to the problems studied. Subsequent to this step, a pilot project will be proposed that may be offered and developed free in call centers to people VI Campinas and Limeira, SP Remember that, if necessary, will be an update on information technology and accessibility for participating students because, as stated earlier, access to information by VI is still heavily dependent on visual information and therefore a major challenge.

The software to be used in the project will be open-source tools, which not only fail to generate costs for its acquisition, as permit be modified and extended for more advanced users. For now, they are in the study, experiments with Sonic Pi software (www.sonicpi.net), Audacity (www.audacity.org) and Anvil Studio (www.anvilstudio.com).

Sonic Pi is a free software and was developed by Dr. Sam Aaron, the University of Crambridge. This software was designed specifically for the classroom, and also can be used in live performances. The input information in the program is done through text lines and the programming environment you can change the program parameters in real time. Runs on Windows, Mac and Linux. Audacity is also a free and open source software. It is a multitrack audio recorder and editor. Works on Windows, Linux and Mac OS X. It Anvil Studio is Freeware, ie is free, but does not open source, moreover if you want you can have access to additional resources through payment of fees. However, its free version is sufficient to meet the proposal of this research.

The criterion for selection of these software, besides the fact that they are operating and open manipulation are also relate to the possibility that some of them allow manipulation by lines of text – which is advantageous for the VI user, since this It does not make use of the mouse, as this view of the tracking needs to be operated properly – and others

that even though the graphic language also allow access to the screen reader, such as Audacity. In this way the visually impaired can interact with editing processes with audio samples, and explore possible sound manipulation possibilities in various musical processes. These mechanisms open methodological possibilities for a number of musical activities in the context of perception, composition and music theory.

Also part of the research the use of miniature instruments, from creation through 3D printers or acquired through ready collections. With these miniature VI can understand through touch the anatomy of a musical instrument and thus build a mental image of this object. Future experiments will be conducted with VI users exploring the miniature through the sense of touch while listening to the sound equivalent to the corresponding musical instrument in miniature, thus associating the sound of it with the peculiarities of its construction. For example, exploring a miniature trombone at the same time you hear this typical sound, VI can understand how this sound is produced, having a sense of the architecture of your tubes, rod and nozzle.

4. Pedagogical Procedures

This study aimed to follow a methodology that involves the use of ICT associated with musical pedagogy. Although there are many works and authors discussing the influence of ICT in education, as Khan (2013), Kenski (2013), Bauer (2014) and Gohn (2010 and 2012) suggesting methodologies and application forms, this phenomenon is very recent from the historical point of view, which means that there is still no consolidated theoretical basis. However, one of the search paths that are emerging to build a theoretical methodology involving the use of technology in education is the author Mishra and Koehler (2006). These authors proposed a theoretical framework integrating the use of technology to another pedagogical model previously proposed by Lee S. Shulman (1986), the Pedagogical Content Knowledge - PCK (Pedagogical Content Knowledge). According to Salles (2010), the CPC "is a specific knowledge of teaching and emerges and grows when teachers transform the knowledge of the specific content knowledge to be taught" (SALLES, 2010: 23). In this model Shulman (1986) cited by Salles (2010) states that the PCK "is the knowledge of the matter itself and comes to the extent of knowledge of the subject for teaching" (SALLES, 2010: 23). The PCK can be understood as the way in which the teacher translates with illustrations, demonstrations, examples and specific strategies, complex content in an understandable manner to all students. In this way, the pedagogical model is known as PCK.

Bauer (2014) explains how the authors inserted the technological procedure in Shulman's theory. The author says that Mishra and Koehler (2006) implemented was basically incorporate an additional component to the Shulman model - the technological knowledge. So the authors have created a model of teaching and learning called TPACK (Technological Pedagogical Content Knowledge) (BAUER, 2014: 12). In this way the adaptation of the content also through the sieve of the technological process to be used in the process of teaching and learning, or it can be a very significant educational tool, as teachers need to take advantage of adaptation to make ICT accessible to VI. Mishra and Koehler (2006) the TPACK is a pedagogical framework that identifies the necessary knowledge that the teacher must have to effectively teach with technology resources. The central idea of TPACK model is the interaction of three forms of knowledge: content, pedagogy and technology. The TPACK model propose that these three bases should not be viewed separately, but, there intersections between them, so four bases forming: Pedagogical Content Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge and the intersection of the three circles forming the group: Technological Pedagogical Content Knowledge.

5. Discussion

This work is based on the fundamentals of this pedagogical theory, experiencing their assignments and validating their contributions in the classroom; thus verifying its functionality. Regarding the methodology to be used for processing the collected data, the method to be used in this step is mainly Lawrence Bardin Content Analysis (BARDIN, 2011). This methodology can be used both to relate measurable data such as responses to questionnaires closed, but can also be used for the analysis of interviews and footage of volunteers participating in the study. The Content analysis is a research method in which information is organized in a hierarchical manner. The data are separated into categories and units, which are: Context Units: larger pieces of similar phenomena separated by the researcher and the registry of Units: smaller data pieces that are separated and inserted into larger units, the previously mentioned, Units Context. Considering their relationship, these are grouped into categories, ie the categories group the context units which in turn bring together the Registration Units. To Bardin (2011: 125) the content analysis is organized in three sectors: 1) The pre-analysis, 2) The operation of material, 3) The treatment of results, inference and interpretation. The Content analysis is a method that allows researchers to get a more accurate view of the reactions of VI in relation to ICT. After the data is processed and

depending on the frequency of notes in relation to some phenomena, it is possible to understand what worked and what points still need to be improved.

The above two methods are relevant to work with VI by the fact that the research proposal is to improve the study and music education for VI, creating paths that make possible their access to ICTs. The TPACK model assumes that the teacher has to know the content to be taught, how it should be taught (pedagogical knowledge) and what technological resources (technological knowledge) can be used to achieve learning, ie, this model can create a relationship between engineering (programming and computer adaptation) and pedagogy (how to transform ICT into effective teaching tools for VI). In this context it is possible that these two areas are connected so as to join efforts in which a help the other, thus avoiding the expense of effort in a few usual points for VI or hand the lack of a simple tool in certain software that does not They were written in the program development.

6. Final Conclusions

This work aims to contribute to the emergence of technological methodologies that allow the process to include the VI in the digital environment, particularly with applications for teaching and study of music. ICT is ubiquitously permeated contemporary everyday life and increasingly important thus becomes create use of these alternative tools to improve the quality of life and access to information for VI. The study presented here aims not, of course, lock it down, but seeks to instigate the deepening, contributing to the discussion on the inclusion of visually impaired people in all social spheres, especially in music. This research thus aims to foster the inclusion of VI in the technological environment and provide an opportunity to enjoy the same possibilities of access to different areas of music offered by ICT. As future research, in addition to addressing the adaptive possibilities of existing software, it is also considered the possibilities of developing a screen reader tool with different functions of traditional screen readers. The project provides that with a tool in this format, you can automatically read any grouping characters that constitute a word through the mouse cursor movement on the screen and use OCR algorithms (Optical Character Recognition) for automatic recognition of words in text or image. As stated initially, the digital inclusion of VI is above all a right, and bring this approach to academic research helps to allow it to fulfill its role, which is, among others, to provide social improvements and possible solutions to community aspirations.

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