THE APPLICATION OF ICT IN EARLY CHILDHOOD EDUCATION WITH AN EMPHASIS ON MUSIC EDUCATION

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Abstract:

This study deals with the integration of ICT in preschool settings and the use of interactive applications with an emphasis on music education. Music in early childhood has been shown to enhance children's all-around development and helps them to cultivate basic skills. At the same time, the use of ICT is now so well established in everyday life that most preschool children become familiar with these tools, which are introduced by the public system, even in preschool education. A review of the theory and literature on this subject shows that there is indeed development in the creation of such curricula for pre-schoolers and their applications appear to have positive effects.

Keywords: ICT, music, developing interactivity, applications, preschool

1. Introduction

The main subject of this study is the use of New Technologies in preschool education in combination with music, in the form of interactive applications. These applications combine the benefits of music with interactivity and user-friendliness. In addition, for the last twenty years, they have constituted a field that has been a subject of concern for both pedagogic and computer science domains, which are involved in designing such teaching materials (Webster, 2005).

A key reason for choosing this specific topic is the researchers' personal interest regarding the scope of ICT and music in preschool education. Although there has been a lot of literature on this subject in the past years, the absence of similar studies in Greece has contributed to the selection of this specific subject. Indeed, the use of ICT and music in the preschool age is an issue with particularities for Greece, where the use of ICT in

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school is often hindered by attitudes or insufficient training (Panagiotakou & Pange, 2010).

The purpose of this study is to carry out both a theoretical and research review of the use of New Technologies and music in preschool education through interactive applications. The aim is to adopt a modern approach to the subject, which is achieved through the use of the literature of the last 20 years, but also to discuss individual issues, such as the benefits of music and ICT in preschool age mainly, the interactivity and readiness of children for such activities, so that the prospects of their inclusion in preschool settings become clear. Finally, the aim is for the reader of this study to obtain a clear picture of the issues that arise in terms of the nature of these applications, the affordability of their use, and their results at the research level.

2. Clarification of key terms

2.1 ICT
Information and Communication Technologies (ICT) have rich and varied applications in education. The concept refers to all computing systems related to the operation of computers and allowing the dissemination of information and communication between individuals and groups, although there are disagreements about the definition in theory, as the concept is found in many scientific fields (Zuppo, 2012). There is rich literature explaining the relationship of ICT to education and researching such teaching and several of these references are listed below. It is reasonable that the rapid development of ICT and the fact that it has significantly affected the way many daily life processes are carried out could not be ignored by the field of education. As a result, the new curricula introduce ICT education from the preschool age, which means that when asked to consider their use for this group of children, one must bear in mind that children are able to know or be easily taught the operation of a system (https://blogs.sch.gr/vasvelkou/files/2019/11/nipi.pdf).

2.2 Interactivity
The concept of interactivity plays a special role both in technology and in pedagogical science, in order to be able to plan lessons with the greatest possible participation of learners of all ages. Regarding the content of the concept, there is a lot of confusion in theory, as the literature has not settled on a common definition for interactivity, given that it can be examined in different ways depending on the context of each research and the researcher's scientific field (Kiousis, 2002). Key elements of the definition upon which there seems to be agreement are receiver/user participation and feedback, which interactivity presupposes. A dichotomy is observed in the literature, according to which some researchers concentrate on users and their own experience, while others consider that the level of interactivity of a program depends only on technological specifications (Kiousis, 2002). According to another scientific point of view (McMillan, 2000), interactivity cannot be defined only on the basis of the operation of the program but

mainly on the basis of the experience of the participants and how interactive they themselves consider the system. Because the subject of this research is pedagogic, an orientation toward definitions related to the user experience has been chosen.

2.3 Preschool age

Infancy and preschool age refer to the age range from 0 to 5 years. During this period, children leave the family environment for the first time and join the school environment. At this age, children develop rapidly in all areas and at the same time, the anxiety of separation from their parents manifests itself, when they go to preschool for the first time (Institute of Child Health, 2015). Children gradually become more adept at playing and develop their memory and attention, and as a result, they can gradually memorize small patterns and concentrate on an activity. These abilities of children at preschool age must definitely be taken into account in the examination of this subject, which involves teaching based on music and the use of ICT in preschool settings.

3. Bibliographic review of studies and theories related to the use of music at preschool age

The role of music in education has been indisputable since times in ancient Greece. Leading thinkers such as Plato and Aristotle considered music an essential part of the education of the young, with Plato stating that music is the highest of all educational tools. When referring to music, we do not mean learning music theory or a musical instrument, but the use and application of musical patterns and developmentally appropriate activities to enhance the learning process and cultivate children's basic developmental skills. Music has often been associated in the literature with innovative forms of teaching. It is believed that it can ignite children's interest in various subjects and produce positive results regarding the educational process (Delibegović Džanić & Pejić, 2016). But what are the qualities of music that make it so effective in teaching in general?

A key pillar is the motivation children gain when they are motivated by the help of music. At the same time, music can help eliminate stress and create an overall positive atmosphere in the classroom (Murphey, 1992). Research data supports that music can be responsible for a series of automatic tasks, which can help the young child to memorize and assimilate new material faster, as songs and pieces of music involve the element of repetition and logical sequence, which aids understanding. It is also argued that the use of music is a particularly useful tool in the hands of the teacher as it can make the learning process more interesting and attractive (Kuśnierek, 2016). In addition, the use of music enhances children's active participation and interaction helps to reduce their anxiety, and supports creative thinking and ability to a greater extent (Bokiev, Bokiev, Aralas, Ismail & Othman, 2018).

The usefulness of music generally regarding the teaching of various cognitive subjects is well known in theory, but the subject of this study is the use of music during

the preschool period. Even modern literature on this subject refers to theories of well-known thinkers who dealt with child development, such as Piaget, who examined the cognitive development of humans from infancy to adolescence. The music evolutionary theory has been particularly influenced by Piaget. To begin with, as in Piaget's theory there is the concept of multi-level development, in music as well, the development is not considered linear. Piaget's second contribution to music education and development is the idea of symbolic function, which he attributed to preschool children's role-playing and painting (Hargreaves & Zimmerman, 1992). Additionally, Piaget's theory of conservation, which refers to a child's ability to recognize two similar objects as the same regardless of their order, placement, or location, has been important to later research on music education and development as a whole (Hargreaves & Zimmerman, 1992). At the same time, Vygotsky's theory about the child's interaction with someone who has more experience and knowledge is also applied here as the first context conducive to learning. Likewise in musical play, the new stimuli given to children allow them to understand music through interaction with others. This happens because the teacher - who is more experienced - also guides the child in music activities (Wing Chi Lau, 2006).

Music and singing exist in the child's world from the moment of conception. After birth, the child begins to respond to the sounds of the environment. At the age of one year, the child can recognize some basic melody patterns, a skill that they develop to a greater extent until the age of 5, at which the child can reproduce well-known melodies and songs to which he/she is often exposed (Papapanagiotou, 2010). In summary, it can be said that in the international literature, there is a rich theoretical and research background, which supports the presence of music at the preschool age. Music education at the preschool age seems to have significant benefits for the child, since, through it, the child can understand new concepts more effectively and cultivate his/her basic developmental skills in a pleasant and tangible way, both in the field of music education and in the other fields of knowledge (Dogani, 2012). Learning through music becomes more enjoyable, experiential, and therefore more constructive, as children's active participation is enhanced.

On a more practical level, as relevant research shows both in Greece and in other countries, music is used on a daily basis (Nousia, 2020) in the weekly curriculum of preschool settings, as a teaching tool but also as a method of enhancing students' creativity (Wing Chi Lau, 2006; Nousia, 2020).

4. Interactive ICT applications in preschool education

The term New Technologies (NT) replaced Information Technology and in recent years the term Information and Communication Technologies (ICT) has prevailed. During the early 1980s, the majority of literature generally involved learning about computers, while later there was a shift of interest to computer-assisted learning. During the 1990s, new learning environments appear, the internet becomes more widespread and priorities shift towards the inclusion and application of information tools, now called ICT, in the daily

practical pedagogical process. In recent years computers are used in a large field of applications, computers as educational tools have been evidently established and the term ICT is now considered official and established. In the international educational community, we encounter three main methods/models for the introduction and use of ICT in the learning process:

- **Technocentric/technical/vertical method:** ICT as a self-sufficient cognitive tool for ICT literacy. ICT is introduced into the educational curriculum and taught at different educational levels, as well as in early vocational education and training. It mainly concerns the education of older children and adults.

- **Integrated/holistic/horizontal method:** ICT is integrated into the entire curriculum as a realization of a multifaceted and interdisciplinary examination of learning. This method was recently developed and its main feature is that the teaching of ICT, as well as its practical application, are assimilated into the courses of the curriculum. The fields of Information Technology and New Technologies are taught broadly through all subjects and do not constitute a separate subject of study. This integrated method, which aims at ensuring the presence of ICT at all levels of the educational curriculum, can be applied in educational curricula that involve even preschool age.

- **Pragmatic/feasible/mixed method** (combination of the two aforementioned methods): ICT is mostly used as a learning tool in the different subjects of study. The present method is an ephemeral, transitory and realistic solution until the assimilation of New Technologies in the whole spectrum of the educational curriculum is completed. This method consists in teaching a special course of basic theories and applications of Information Technology and in the gradual introduction of ICT as a tool to assist the educational process in each separate subject of study (Nikolopoulou, 2018).

In preschool education more specifically, a good example is the increasingly widespread use of tablets in the educational process. Tablets are characterized by an easy and accessible style of interaction and they are very easy to be used by preschool children. With the tablet, the user interacts with the device with their fingers and it is this way of using it that makes it accessible and simple to use even for toddlers (Kalogiannakis, Papadakis & Zaranis, 2014).

Regarding young children's tablet use and engagement, experts seem to agree that children 2.5 years and older can use computer applications while being aware of the activity they are doing. Children who have reached the age of 3 are at a reasonable age to start delving into learning software/programs that are based on exploration and finding solutions. The goal setting for the 3 to 5 year framework should remain flexible and evolving. The role of teachers regarding the use of such devices mainly concerns the creation of favorable conditions in the school environment, which will promote and help the processes of exploration and finding solutions (Kiridis, Drosos & Dinas, 2003). At this point, it is appropriate to mention that regarding the inclusion and use of electronic devices in the educational process, there is no shortage of counterarguments. The

contribution of new technologies is not disputed, but concerns are raised in relation to their correct use. On the one hand, the concern that electronic content of media and applications should be filtered to avoid inappropriate content (https://www.naeyc.org/resources/topics/technology-and-media), and on the other hand the concern about the time children should spend on the screen. Especially when it comes to pre-schoolers, engagement with technology can't be excessive, because enough time should be spent implementing developmentally appropriate activities that address all areas of children's development (Ford - Winnick, 2018).

4.1 Application of interactive software in music education

As already mentioned in the theory, new technologies can effectively contribute to teaching in preschool education in combination with music. After all, digital applications of music already have a strong presence in our lives, and most children already have this experience before they enter preschool (Formby, 2014). The traditional way of music education, however, which seems to be far preferable to others in preschool education, usually prioritizes the cultivation of focused concentration on a linear source, such as listening to an audio source or reading a book. That is why it is perhaps right to examine ways of introducing music into educational curricula, which give priority to modern and not to conventional ways of children's participation in music activities (Young, 2006). New technologies can help specifically in this, not only because of the multimodality, but also because of the multiple applications they can have in the educational process. As argued, digital technologies and ways of engaging children in musical activity using electronic media can be applied in the preschool classroom, as children already have experience with new technologies and music before they enter preschool settings (Young, 2009).

The challenge for educators, however, regarding the integration of new technological media into the curriculum, will be how to support children in acquiring music skills suitable for their digital music future and also how to develop a range of structures of attention and concentration for the young children who can adapt flexibly to different situations of music activities and especially listening. It thus becomes clear that new technologies can offer pedagogical possibilities in the field of music as well and have particular benefits for the development of new skills in children (McPake, Plowman & Stephen, 2012). Research has shown that new media and music can combine to enhance children's memory, focus their attention, and improve their perception of tonality and listening to music. As a result of this, in recent years there has been growth in the field of making music software for young children, with increasingly better programming to better meet the needs of preschool children (Webster, 2005).

However, despite the fact that on a research and theoretical level digital media have been linked to music-based teaching, in practice, it seems that there are not many such applications in the daily life of the educational curriculum. More specifically, there is still a portion of teachers who do not consider that technological applications can be more beneficial than the more traditional and conventional teaching methods (Formby,

2014). It is often the case that technological means, although being part of the teaching of music, are always used as a convenient supplement and not as independent teaching. Despite the fact that the vast majority of preschool teachers accept the special importance of music for the educational practice, but also the help that technology can offer in this area, the use of technology is in fact limited to the reproduction of multimedia (Panagiotakou & Pange, 2010). Although they argue that the use of technology can make the lesson more interactive, a key concern expressed by preschool teachers regarding the integration and implementation of new technological media and applications in the preschool classroom is about the educational process that they themselves should follow. One of the main reasons for this is the lack of training in music education (Nousia, 2020) and in addition, the use of technological applications and curricula in teaching, so that they are always up-to-date on the new trends in technology in terms of interactive applications (deVries, 2013). At the same time, it is often difficult to evaluate these applications in terms of their educational value and also in comparison with other teaching methods (Webster, 2005).

Though recently, it seems that the application of New Technologies thrives, with increasing use of new technologies in music or technologically oriented musical instruments and games that contribute to the learning experience of musical activities in preschool education.

In recent years, however, the use of ICT in preschool education is gradually spreading in formal Early Childhood Education settings and standards (Nikolopoulou, 2019). Interactive music-based applications, technologically oriented musical instruments, and games that contribute to learning music activities, also seem to be increasingly thriving in preschool reality (Panagiotakou & Pange, 2010). The various technology tools that can be used in childhood music education, include musical games, keyboard instrument games, and percussion and guitar games, in addition to audio and music software. Music games are perfect tools for student engagement because they are user-friendly. Even children with little or no experience can make use of them. There is also a noticeable increase in the design of music education software, especially for young children in early childhood (Ko & Chou, 2014).

5. Conclusions

From this brief analysis, it can be concluded that the interactive applications of New Technologies and music in preschool settings can have a positive effect on preschool education and development. Initially, it is indeed argued that children respond to this type of learning process, as interactive applications seem to promote the quality and effectiveness of the learning process. This is because electronic media provide motivating learning and interactive environments that encourage young children's attention. After all, ICTs are now so integrated into the daily life of every child that familiarity with them is such that it allows their use in the preschool environment as well. The successful integration of technology into music education for preschool children varies according to

each child's physical, mental and social readiness. Therefore, teachers should assess each child's readiness to use certain technologies in music before adopting them in the educational process in the classroom. At the same time, there is enough reflection in the literature about the characteristics that such an educational application should have. It seems to be a common assumption that an interactive system and relatively simple to handle and should be used. Pre-schoolers develop their readiness at different rates, so a simple system is a key to enabling all children to participate in everyday activities. In conclusion, it seems that the development of interactive applications with music for preschool age can have positive effects in preschool settings. This is because these applications seem to increase student concentration, reduce stress, and enhance the cultivation and practice of key developmental skills.

5.1 Suggestions for future research

Since the references on the subject of this study are quite limited, it is important that there are new research efforts on the use of interactive applications and music in preschool settings. Interdisciplinary research from the university departments of computer science, music, and pedagogy would be of interest. Such research could address the design of appropriate applications. In the second stage, a teaching intervention could be designed. The pilot application of this intervention in preschool settings would generate particularly useful conclusions for the topic under consideration. At the same time, the attitudes and opinions of preschool teachers regarding the use of interactive applications and media in the weekly curriculum of preschool settings could be further researched and evaluated.

Conflict of interest statement

The authors declare no conflicts of interest.

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