Implementation of Information Technology into the Education of Music Teachers

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The goal of the research is to study the process of introducing information technologies into the training of music teachers in Ukrainian pedagogical universities. To undertake the research, a study on the scientific literature on the professional training of music teachers in pedagogical colleges, as well as an analysis of the curricula of music pedagogy in general education schools and higher educational establishments. As a science, research on music education technologies focuses on phenomena related to music education technologies through the prism of a modern information society. There is a great interest in music technology creation in the context of constructivism. We propose to use constructivist methods as a philosophical basis for an online music education course for graduates. For Ukraine, it is necessary to study how students use this technology in preparation for a presentation in class, and the results were rated as moderately successful.

Keywords: education, musical instruments, software, teaching material

INTRODUCTION

Today, knowledge and information are the keys to achieving productivity, competition, wealth and comfort. Therefore, people have focused on approaches that can improve the quality of education – as it is the core that all changes and developments come from in the 21st century. Information technologies contribute to the facilitation of education, as well as the education and training of music teachers at pedagogical universities (Bassachs et al., 2020). Information technology includes the collection,

systematization, storage, publication and the use of information in the form of sound, graphics, text, numbers using computer and telecommunication tools. Significant changes brought about by information technologies have been a source of fundamental changes in classes. The major changes are rooted in the fact that technology has allowed students to focus on extracurricular activities, which has increased their motivation to learn. Information technologies have affected the changing methods, purpose and perceived potential of education; they can provide the necessary educational information when needed.

Technologies certainly control the present and the future: it has affected different aspects of life and has influenced the way society live. Computers and, in particular, Internet technology plays a significant role and have undoubtedly revolutionized the sphere of education. The interaction between students and teachers has changed dramatically since the implementation of technology into the basis of class structure. The teacher is no longer the center of the class, but rather a mediator between the information and the student. Instead of being passive listeners, students now become active in collecting, regrouping, and information representation (Smit et al., 2021). The necessity to learn: both education and learning are the processes of life with no boundaries for when to start and when to stop. Learning brings new experiences into everyday life, as it changes the human mindset, lives, and values of human behavior (Wu et al., 2021). In the educational process, students receive different information. With the help of information technology, students can get knowledge faster, so this can be used to improve the teaching and learning environment. Teachers, as well as students, use different technologies to achieve certain academic goals.

Information technology reduced the cost of education (Anisimova et al., 2020). For example, the increased use of broadband Internet allows students to access academic information in time. Teachers also use this broadband Internet to create and transfer information via video and graphic illustrations (Carmona-Serrano et al., 2021). This allows teachers and students to communicate with each other with the help of e-mail. Information technology accelerates the transfer and dissemination of information. Students receive degrees through online examinations that allow them to find better employment. Nowadays, educational institutions publish grades and studying results on the Internet, so students do not have to wait long to learn about their performance. Information technology also facilitates the panel discussion, it has changed the students' studying process through the implementation of audio-visual technologies into the educational process (Carmona-Serrano et al., 2020). It reaches individuals, groups and masses, privileged or underprivileged, through its means or media. Information technology can provide teachers, students, researchers, administrators and education planners with easier access to the valuable knowledge treasures, skills and applications to improve their objectives. Distance learning, virtual classrooms, e-learning and mobile learning are the latest concepts and trends that have been appearing in the educational sector of the country (Max et al., 2020).

The research aims to study the development of the implementation of information technologies into the educational program of music teachers in Ukrainian pedagogical universities.

MATERIALS AND METHODS

The scientific literature that was studied during the research includes information on such issues as professional education of music teachers in pedagogical colleges. Moreover, the educational programs of music pedagogy in general schools and higher education institutions were analyzed. At a time when researchers around the globe are gathering and archiving huge amounts of data, the practicality of using existing data for researches is becoming increasingly common. Secondary data analysis is the analysis of data collected by someone else for another primary purpose. Using these existing data provides a viable option for researchers who can be limited in time and resources. Secondary analysis is an empirical exercise that applies the same basic principles of research as studies that use primary data and contains steps that need to be followed as in any research method. This article states that secondary data analysis is a viable tool that can be used during an investigation when in compliance with a systematic process.

The paper contributes to the discussion of secondary data analysis as a research method in computer science teaching materials and uses the study. School librarians should describe and illustrate the process, benefits and limitations of secondary data analysis investigations. In conducting the study, the research area

and questions determine the method that is followed by the researcher. The method of research is how a researcher collects, analyses and interprets data in a study. Secondary analysis is a systematic method with procedural and assessment stages, but there is not enough literature to define a specific process. Therefore, this article proposes a process that begins with the development of research questions, then definitions of specific data sets and thorough analysis. Evaluation of the dataset. This procedure is illustrated by a study in the library and computer science of teaching materials in which a researcher studied and reviewed school librarians as leaders in the field of technology integration.

The key to secondary data analysis is applying theoretical knowledge and conceptual skills for the use of existing data to address research issues. Consequently, the first step in this process is to develop research questions. In the case of this study, an in-depth review of the literature in the areas of interest was carried out, examining the past and current work of information technology experts. In the course of the literature review, other researchers on the subject have been detected, as well as agencies and research centers that conducted relevant researches. Recent studies and the results of high-rated school library training programs have been identified and analyzed, as well as dissertations on technology, leadership and music teachers. Finally, local informal networks can also provide valuable information to determine what researchers are currently underway. It is this kind of research that makes it possible to study the best way to implement information technology into the music teachers' learning process in Ukraine's pedagogical universities.

RESULTS

In most cases «music education technology» means the use of technological applications while teaching and learning music, both on the Internet and in open learning environments. As a science, research on music education technologies emphasizes aspects that are related to music education technologies in the modern information society (Murphy et al., 2021). Modern technologies offer new versions of old tools and goals. Technology is important, but it is worthless with no proper ability to use it. This means that know-how and practical skills in the use of technology are the main core, while technology is mostly the knowledge of them. Music education technology does not mean replacing live music, teaching music, and students with equipment, but rather developing, researching, and promoting new methods in music teaching and learning – primarily, increasing the use of modern technology. As soon as this serves an approved and positive purpose, it will become part of the culture (Bush et al., 2020).

Music technology can be approached from different angles. This may be a pedagogical, educational perspective that monitors the impact on learning, or it may be focused on a technological basis, trying to develop pedagogically useful, practical and effective solutions in the teaching and learning of music. Music technologies can also be viewed in terms of their correspondence and relevance to the current curriculum and working culture at school. It is also possible to consider how new ways of communication have changed and are invariably changing the whole music scene and the processes of its acculturation. First of all, the main music technology applications can be considered as help and support in the process of learning the instruments. Examples of this are training via video (master courses) and accompaniment or other similar software for interactive music. Second, technology is a platform for creative actions, such as children's composition projects or projects on overcoming barriers in which the voice landscape is built on an image. The third point is the use of online learning and studying in various projects. The fourth possibility is the introduction of multimedia materials into music education. The fifth point of view is the integration of music technology into the curriculum and national standards (Juskeviciene et al., 2020).

Music technology has been developing along with media and communication technologies. Varying ways of expression and the introduction of new apparatuses have also influenced teachers' concerns. Attention should be paid to the connection between knowledge of school and the knowledge outside of it because educational institutes suffer from a lack of it. The boundaries between formal and informal learning are thus blurred. Several web pages use a peer-to-peer computer network, which utilizes different ways of connectivity between network members and their combined bandwidth. Due to their extreme popularity, these networks have become a public domain. They are mainly used for the exchange of music, movies and computer software over the Internet. Much of the copyrighted material via these networks is illegally

distributed, as noted by film and music producers. There is a lawsuit that is currently underway against websites that offer links to private users' computers but do not store, and do not send any files or data to anyone (Casado and Checa, 2020).

Knowledge seems to have become widespread in modern society. Internet users can also serve as creators of new information and music, which has become possible due to a variety of websites with music content. In addition, the number of Wikipedia pages contains a significant part of music information. The World Wide Web offers a large number of materials suitable for teaching and learning music. The materials are best suited for self-study and home music education. The internet user is required to have a functional technical infrastructure as well as a certain level of technical capabilities and information search skills. For example, music learning websites can be roughly divided as follows:

– Pages with informative and illustrative materials;
– Pages containing interactive challenges and practices;
– Dynamic pages created by web communities;
– Pages with curricula.

The pages, presented as an example above, are on music history, groups, music writing, production and marketing, lyrics and chords for songs, music theory pages and hearing training for independent students, as well as studying various instruments. Many pages designed for music creating are also a form of marketing for self-promoting groups (Husar and Oparyk, 2021). Well-designed pages often lead clients to other interesting websites. Music teachers can start searching in «music jungles» of the Internet via common pages, collect music technology materials from various educational workshops. Nowadays, many «social bookmarking» (for example, Facebook) also provide useful music programs. It may be noted that it is no doubt that student who requires information will find it on the Internet. The basic idea of teaching and learning via the Internet is to expand opportunities, introduce new flexibility and, especially, decentralize learning into social processes. Music technologies and networks can add new value to music learning by presenting information in various ways, integrating and consolidating it into an overall working environment. According to many researchers, non-formal education has greatly expanded and changed the educational landscape (Campos et al., 2019; Popovych, 2021).

Music-themed websites and networks are in a certain way similar to modern public secondary schools or workhouses. That's the place where musical achievements are being made; they motivate young people to create music, and the websites work as a self-organized and demand-driven learning environment at their best. Networks help young people to collaborate with enthusiasts who share both musical and social purposes. The new technology also allowed to produce high-level music performances in small home studios at low cost, independently. Define «open music network community» as a www-page, where independent (from record companies and copyright organizations) musicians share and discuss their music. It seems that one of the basic principles of free network communities is to create music for others to listen to it. This element also separates music network communities from peer-to-peer networks that illegally distribute copyrighted music. A teacher needs to understand the online community, even if he or she is not interested in music education technologies at all. Most of the students' musical successes take place outside the school, and the Internet is a fundamental part of it. A music teacher can help students to act in this environment by offering them the necessary skills, as well as teaching them critical attitudes towards information from the Internet. When information technologies are carefully planned, developed and integrated into good music studying in classrooms, this can support student motivation and improve the quality of the learning process.

DISCUSSION

Reviews of music researches and development have shown a significant increase in the output and availability of hardware and software for music teaching and learning, but existing teachers have lagged in the efficient use of these resources. There seems to be little evidence that this has changed dramatically in the last five years of research. There is some evidence that students go to college better prepared for using

computers, but not necessarily for music software. We still lack conclusive proof of to what extent teachers are committed to the idea of integrating technology into music education. What is also lacking is an extensive dialogue on the conceptual basis of including music technologies, with little effort to develop a philosophy of using technology (Kajamaa and Kumpulainen, 2020). The quantity of the research, multimedia and creative programs have increased over the past five years (Arikhan and Coban, 2021). However, the ability to evaluate the efficiency of new games remains a major concern. The real positive development is that the bigger number of qualitative researches has led to a better understanding of the subtleties of learning, but there must be further evidence regarding a number of research methodologies (Kessler, 2018).

The new interest in the role of technology in terms of the work of teachers and undergraduate students also merited consideration. The additional attention given to research on distance learning and the use of the Internet over the past five years is noteworthy and is likely to continue. Most importantly, music technology research over the past five years has continued at a faster pace than ever before. Substantial research in many categories has been reported, research interest is growing, as evidenced by work in professional associations around the world. More comprehensive research is needed on technology-based learning strategies, gender issues and technologies, equality in the availability of the best resources and the real impact of technology on the long-term learning of music for professional musicians and the educated community. Social media have also made it possible to publish and participate in virtual networks globally. New features of the Internet, including image galleries, blogs, podcasts, etc. are a common ground to young people but often remain a mystery to older generations. Again, the threat and almost limitless possibilities of new digital culture raise up. In the discussion about digital games, there is a growing tendency to protect the new culture of learning and experience provided by games and their characteristics, and support can be found even in neurology. Speaking of media education in the 2000s, one cannot ignore the role of games (Hsu and Lin, 2020). Indeed, the games have attracted the attention of Finnish researchers in the fields of education, culture and technology.

Music and games are closely related, it can be seen even in the word «play», which means playing instruments and games. A pitch game, characterized by Karaoke Revolution or SingStar series, tests the player's ability to match the pitch of a piece of music provided by the game. Players use their voices and a special microphone as input signals, and their tonal accuracy is evaluated. These games are usually associated with rhythm because of the basic nature of rhythm in most music; However, pitch games are characterized by relatively simple rhythms and an emphasis on pitch elements of songs. Singstar and Staraoke can be considered as teaching and learning tools, although they are commercial entertainment games. They focus on making music, singing. In Instrument Frenzy, the player must sort instruments falling from the ceiling, depending on what group of instruments they belong to. It is necessary to understand the values, attitudes and information that computer games encompass (Cairns and Areepattamannil, 2019).

Various types of music games are becoming increasingly popular among schoolchildren. Specifies that the popular argument for using learning games is the positive and motivating effect they have on students. At the core of the pleasure of the game is an experience called the «flow of the game», which is created when the idea of the game, its complexity and possibilities are in balance with the player's skills, forming internal motivation (Wilder et al., 2019). The potential of media culture has been multiplied in one decade, and now it is bigger than the violent shootings and explosive games that it was earlier. Modern children are born at the center of media culture, and they cannot separate it from the rest of life, as older people do. Public discussion of the media usually focuses only on the effects and limitations of the Internet and the media, rather than on the skills, knowledge and learning that they similarly produce. That is because the whole media culture is so young and new for most adults. Moralization will decrease as knowledge of the Internet grows (Dunnett et al., 2018).

Non-formal learning has already become an important part of music education (Marin-Marin et al., 2021). The importance will grow steadily in the future as young people will continue to focus on learning outside the school. Although computers can be used to teach and demonstrate various elements of the play on musical instruments thoroughly, control over manual skills and learning is more difficult if not impossible (Tsybulsky and Oz, 2019). The multifaceted process of learning how to play a musical

instrument remains largely dependent on a real teacher and his or her control, rather than on a computer, no matter how advanced the programs may be. However, a real-time video training and live or saved live teaching stream may students who live in remote areas, where it may be difficult to find a qualified musical instrument teacher (Anito and Morales, 2019). Music-producing software has become widely available over the past decade.

Methods of music creating vary depending on the type of software. It seems that the main principle is to allow the music creator to compose the entire song with only one program. Many producers of software have also created websites, that are full of songs created by this particular software. In practice, a music teacher must focus on the simplicity and clarity of software so that students can use it (Lin and Tsai, 2021). The interactive community works as an excellent information platform to discuss any music or various software issues. The Internet is very helpful, especially in independent music learning, as it is easy to find any information when you need it. The Internet can be classified as a learning environment based on requirements. Those who study music through the Internet can easily become producers themselves. The Internet is becoming more and more a social and collective means of production, in which participation and interaction, the exchange of products, and the collaborative and arbitrary production of music are typical. The Internet is also a strategic place for marketing, sales and shopping. In the music business, the online store Thomann has become a standard, when a discussion comes up about the price of musical instruments and compare them in Europe (Chen and Huang, 2020).

Musical technologies have become very close to people who did not get any formal musical education and could not play any musical instrument. New «stars» can appear on the Internet in one night, as well as in the strangest places. It is interesting to follow software producers as they try to meet the needs of a large group of people who want to learn more and more about music and its creation (Murphy et al., 2019 b). Public debates often highlight the dangers and disadvantages of the Internet (for children). For children themselves, however, the Internet, digital games, television and other media are only a place to learn, a source of communication and joy. Media culture was not given much space in the school system, although at best the media could facilitate school work and the learning process by implementing a new, modern studying culture (Murphy et al., 2021). Music teachers seem to use technology more for administrative purposes than for use in music curricula. This trend has recently been supported. The results of the researches on music education programs in colleges are known. All of the responding institutions except one pointed out that knowledge of music technology is crucial (Lohbeck et al., 2018).

Students completed a well-thought-out study to enroll in five randomly selected and government-sponsored music schools. Three hundred and eleven first-year students completed a survey (return rate 83%), aim of which was to determine students' experiences, skills and attitudes to technology. The relationship between these variables and demographic data, as well as the use of technology by secondary school teachers, were also of interest. The data obtained demonstrated that the vast majority of new entrants to the music profession have experience of working with text-processing software (97%) and other music-related applications, such as e-mail and spreadsheets (20-46%). The students' familiarity to music software was generally lower - about a third of the surveyed had some experience with music software of various types (Davis et al., 2018). The Internet environment has gradually become a kind of general notebook that students can use to solve musical issues. They can also accumulate and visualize knowledge by continuously creating new information suitable for them. Internet communities are increasingly using simple solutions, applications, services and tools to support, produce, exchange, teach, learn and communicate. Blogs, wikis, podcasts, and various information, research and educational networks will be an important part of the future learning environment (Tsybulsky et al., 2020).

Completing a qualitative study of keeping online logs in a postgraduate analysis class. The data was collected during the monitoring of participants and included biweekly questionnaires and final private interviews with each student and teacher. Emerging issues were identified, including different perceptions of classroom experience by students and teachers. The collaboration included a collective music review and criticism of each other's writings. It was concluded that such computer communication was useful for learning and that such approaches could play a valuable role in postgraduate studies (Mengmeng et al., 2019). The efficiency of music software aimed to improve memory on timbre, sensitivity to timbre changes,

as well as disciplined auditory attention and its effectiveness were evaluated. Working in the context of professional audio technology, the researcher used computer software in combination with individual sessions with students who did not have much professional experience. He compared this group of students to experienced recording and post-production professionals, based on the index of skills related to the variables of interest, and noted that students who used software and conducted training were superior to professionals (Kessler, 2018).

CONCLUSIONS

As a result of the research, the authors propose to use individualized music software for an investigation of the effectiveness of two educational approaches (explanation and discovery) on the ability to recognize different types of themes and categories of variation. It is necessary to create a minimum of two versions of the same program and to vary the teaching content. The exposition approach presented definitions of various categories of variation (ornamental, figurative, modal and temporal) in simple terms with examples and explanations. The approach to discovery does not reveal the name of the category of variations and encourages students to intuitively understand this type through examples and explanations. The design should be classically experimental with elements of musical ability control and prior knowledge of the categories of variation. The dependent measure was an auditory test to determine types of variation.

To assess retention, a different test was conducted six weeks later. The results did not show a significant difference in the teaching methods after testing right after the use of the software and after a 6-week break. Each method was equally effective; However, differences in the time spent on the use of the software were observed (more time spent on the detection method) and there were more individual performance differences for the group of detection methods. This study is noteworthy, as it does not simply measure technology-based and classroom, but rather discusses different approaches to the applying of technology. There is great interest in music technology in the context of constructivism. It would be appropriate to use constructivist methods as a philosophical basis for an online music education course for graduate students. For Ukraine, it is necessary to study how students use technology in preparation for a class presentation.

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