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The Role of Computer Technologies in Music Teacher Training: Implementing the Humane Education Strategy

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Abstract: *The ever-evolving nature of society dictates educational policies, which is mirrored in the challenges of training music teachers in higher education. Pedagogical universities are constantly investigating ways to revolutionize education and introduce new pedagogical tools. This article analyzes the experiences, difficulties and directions of music teacher training in the scope of the humane education strategy. Surveying the condition of music education, its current status and potential for progress has demonstrated that the career of a musician-educator is and will remain in high demand as long as it is augmented with new professional content. This can be used to broaden the role of a music teacher in both regular and extra schooling, such as designing and implementing numerous musical and creative progression programmes. Importantly, the article delves into the issue of developing a model for teaching information technologies to future music teachers, which follows an interdisciplinary and context-oriented content selection principle. It advocates for a comprehensive approach to shaping a continuous sequence of educational subjects throughout the entire period of university education. It also highlights the integration of music and computer technologies as a means of teaching information technology and as a subject for study. Finally, the article highlights the significance of computer technologies in training future music teachers as there is a growing demand for music education specialists who are proficient in the technological processes associated with music software and can effectively employ computer technologies in their professional duties.*

Keywords: *Musical art, the humane education strategy, music teacher training, music computer technologies, information technologies, information competence, high-tech information educational environment.*

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Introduction

Nurturing comprehensive, multidimensional abilities in future music teachers is a key priority in the field of music education and pedagogical practice. This involves developing cutting-edge training approaches for relevant professionals. They should be ready to pursue ongoing personal growth and be adept at addressing novel challenges in an ever-changing environment. Additionally, they must be adept not only in traditional, specialized tasks but also in a wide variety of multifaceted professional duties. These encompass various forms of music education, aesthetic development and communicative tools in the domain of musical art.

Kaplan & Norton (2005) have highlighted that in the current era of development, the need to promote and cultivate musical culture among individuals and society generally has become more prominent. This is seen as a means to address the tasks of aesthetic education due to the impact of technocracy and computerization, which have markedly reduced the opportunities for humanistic and intellectually aesthetic personality development.

According to Popova & Zhukov (2020), music, one of the essential aspects of aesthetic education with its immense emotional effect on one's spiritual life, is taking on greater significance within the educational process for the comprehensive and balanced growth of students.

At the same time, Popovych (2014a; 2014d) argues that engaging in musical art can foster one's musical culture and can help elevate spiritual culture in the community. In this regard, the role of music teachers is critical, and they need to possess special requirements, particularly in terms of the growth of their teaching skills.

Indeed, the challenge of preparing future music teachers to employ computer technologies in their professional activities is highly significant nowadays (Kaplan & Norton, 2005). The advent of computerization has had a profound influence on the music domain, with virtual manifestations of music now holding little power to astonish. Consequently, there is an increasing need for music teachers who have the technical aptitude required for using music programmes and can effectively make use of computers in their professional activities. They must be able to comprehend the ambitions and inspirations of computer technology-related pedagogical and professional activities and be well-informed about the goals, material and conceptual foundations of computer technologies.

The article aims to explore ways to enhance the development of musical and creative skills of university students, identify the challenges in

music teacher training within the context of the humane education strategy and demonstrate the effectiveness of informatization in music pedagogy. Furthermore, it seeks to reveal the significant role of computer technologies in music teacher training.

The Role of Computer Technologies in Music Teacher Training

It is imperative to gain an understanding of effective methodologies, acquire practical skills and become proficient in the use of ICT for computer technologies to be employed as a powerful and versatile teaching tool in today's educational environment (Peha, 2011).

Musical informatics, a rapidly growing field, is an integral component of music education and is beneficial not only to sound engineers and composers but also to future music teachers. A music computer is a highly effective tool for addressing a broad array of tasks in musicology, performance practice and music pedagogy, and it is an invaluable assistant for electronic music production, giving musicians unprecedented chances to refine their professional skills in all fields of musical creativity (Popovych, 2014c).

When it comes to preparing music teachers in this area, the new discipline "Musical Informatics" is of particular importance, with the aim of supplying theoretical knowledge, grasping methods and technologies of informational support and automation of educational activities to increase, personalize and optimize the educational process. Studying "Musical Informatics" aids in building familiarity with the latest digital music technologies and facility in applying computer hardware.

To maximize the effectiveness of a computer as a technical tool, quality computer educational programmes must be centrally developed and designed after a collaborative effort of educators, psychologists and computer programmers.

The computer facilitates the execution and confirmation of creative thoughts, sound file editing comparable to a professional studio, the inclusion of multiple effects and the quick composition and printing of any work. There are multiple computer applications designed to accommodate users from a variety of educational backgrounds (e.g., Finale, Sibelius, Encore, Score for DOS and others). Finale is a powerful musical notation editor, perfect for composing and reproducing scores, however, its extensive array of functions and resources can make it complex to learn, requiring dedication from both professionals and amateurs (Moroz, 2020).

Computer technologies have enabled music teachers to make use of computers as a technical teaching resource in their professional practice.

Notably, music teachers need to employ computer technologies following specific didactic principles, correlating technical tools with the needs of music art methodology, computerization and technical and technological resources (computer labs, musical computer equipment). Still, using electronic information resources, e-learning courses and multimedia components to provide educational material should be convenient. Awareness and observance of the sanitary and hygienic regulations for computer-based instruction is a necessity for music teachers to be able to professionally use computer technologies (Chaachoua, 2000).

Examining the curriculum frameworks employed in pedagogical universities shows that the study of particular scholarly fields can stimulate the acquisition of knowledge, capabilities and enthusiasm needed by future music teachers to perform their professional tasks using computer technologies. The training of future music teachers to use computer technologies in their professional practice occurs within the framework of such subjects as "Musical Informatics", "World Art Culture", "Musical Interpretation", "Choir Practice", "Conducting", "Instrumental Ensemble Work Methodology", "Music Pedagogy Methodology" and "Computer Arrangement". They also gain proficiency during pedagogical practice and in various other professional subjects, ensuring they acquire the necessary knowledge and skills (Dobrovolska, 2019).

Fostering Musical and Creative Skills in University Students

Educational institutions have been presented with new demands as a result of the socio-economic changes of recent years, a change in the ideology of the state and the switch to a democratic society. Quality education has increasingly been seen to play a pivotal role in the economic and social success of society and the development of one's creative skills. Under the current circumstances of higher education, teacher education is a means of not only conveying culture but also a requirement for forming a creative and self-developing identity for future teachers.

Popovych (2014b) states that education is identical to one's culture, and if culture is a never-ending cluster of objectives and responsibilities regarding the nation, then education is a perpetual task for a single human being. Education, in its fundamental nature, is an endeavour with no end.

The efficacy of measures for advancing professional education is ensured by a balanced blend of rational instructive approaches, both objective and subjective conditions that help orient one towards humanization. To implement *the humane strategy of education*, music teacher

training must involve enhancing professional abilities and mastering the profession creatively.

Strengthening the cultivation of musical and creative skills among university students should be accomplished through the logical and effective use of educational procedures. Achieving this requires an examination of applicable interdisciplinary relationships, an appreciation of the dynamic and progressive structure of the topics being taught and a strong emphasis on professional practice in the teaching process (Chaachoua, 2000).

Music education departments face a substantial challenge in coordinating this process concerning the varied pre-university musical learning of students. Since there is a scarcity of qualified music educators, the student body often consists largely of applicants from rural areas, where, for various objective reasons, high-quality music education is not always obtainable, even at a fundamental level.

Recently, one has encountered the complex issue of "staggered admission", where student admission occurs every other year, making the situation no less challenging. This harms the quality of professional training as it upsets the continuity of training, especially in fields such as arranging choir groups, pedagogical practice, performance activities and so on. Besides, those who have an academic leave cannot return and resume their education the next year (Anderson & Krathwohl, 2001).

The system of teacher training and professional development for music teachers is another major issue within music education.

Lately, there has been a noteworthy focus from society on electronic music and particularly on music computer technologies. A variety of factors has led to this occurrence. Firstly, computer technologies are becoming integrated into various fields, offering new opportunities for self-realization. Secondly, the multifaceted and globally applicable nature of electronic music aids in learning on a new level, with music activities being in demand among a wide range of art and creativity enthusiasts. Thirdly, the compatibility of electronic music with traditional music technologies creates conditions for the continuity of musical epochs and styles, their interpenetration and synthesis, fostering the development of students' creative potential and strengthening their interest in musical culture as a whole.

Until recently, the school was the primary shaper of musical culture and aesthetic taste in younger generations. Now, it has been replaced by electronic media and information technologies (Dobrovolska, 2019). Consequently, it is necessary for music teachers to continually explore methods of delivering educational materials while finding a balance between

the educational content and the interests of their students, which exist outside of school.

Given that science becomes ever more integrated into professional training of various specialists, there is an increasing need to cultivate research activities among future music teachers. This should be aimed not only at cultivating research skills and scientific thinking but also indirectly at nurturing an appreciation for their profession and a need for self-education. For music teachers to be successful in providing musical and aesthetic education and teaching, they must adhere to the current requirements of pedagogical science and practice.

The authors of this article believe that one of the most important factors that define the specificity of the music instruction profession is undoubtedly the ethno-cultural regional environment and geopolitical position.

Music Teacher Training in the Context of the Humane Education Strategy

As society evolves at a rapid pace, it is necessary to consider music teacher training as part of the humane education strategy. Indeed, the paradigmatic orientations of each stage of social development are formed by the historical and cultural peculiarities of the time.

As per the views of philosophers, when transitioning from the humanistic strategy to a humane one, the individual is the main focus, encompassing their multifaceted character, within the convoluted mesh of connections and relationships with the external environment. The essence of an educator's humane nature lies in dialogism, while the aim of humanitarianism is the growth of human qualities, which are the real human core as it relates to values, culture and human connections (Fink, 2002).

In a concise explanation, the humane strategy signifies the recognition of the following factors: the holistic nature of educational processes and phenomena; their dependence on internal causal factors of self-movement; the non-linear, crisis-prone nature of self-development; the necessity to assist (support) in human development.

Reasoning in a humane way requires more than just logical thinking since it is intertwined with metaphoric, allegorical, associative and figurative thought. This is evidenced by the use of descriptive definitions, which are essential for understanding the prospects of music art development.

In today's pedagogical theory and practice, the terms "humanistic" and "humane" are frequently interchanged. The distinction between humanistic and humane paradigms is well illustrated by "the boomerang

metaphor", as mentioned by Moroz (2020, p. 31). A boomerang is not designed to return to its thrower but to hit the target. It is the boomerang that missed its target that returns. Similarly, when one is preoccupied with oneself, fixated on self-actualization, it indicates that one has not achieved one's life's purpose or the meaning of one's existence in the world, which one's activities should be directed towards. In this case, like a boomerang, one returns to oneself, closing in on one's "self".

In this metaphor, the "misdirected" boomerang illustrates the extreme, individualistic variant of the humanistic paradigm, while the boomerang that reaches its destination embodies the humane paradigm. Consequently, the goals of the humane paradigm pertain to the realm of spiritual values and culture, which is what defines one's humanity.

Music, as an art form that reflects the spiritual quest of individuals in their search for their place in the world, assists them in today's complex world in finding the meaning of life and contributes to their self-actualization.

Humane-based education involves an ongoing dialogue between the culture of the individual in development and the spiritual culture of the world, which is enabled through cultural-creative activities such as music. The emerging individuality should become the guiding force that determines the educational processes, perception in general and the complex and multi-faceted process of forming and developing the musical culture of the younger generation (Popovych, 2012).

Regarding the afore-mentioned, within the context of the humane strategy, the goal of music education is to cultivate one's musical culture, which should be the dominant focus of music teacher training.

The authors of this article believe that building one's comprehensive musical culture is essential, with the development of musical taste at its core, which is the foundation of today's music art. A range of elements, including the family culture, affect this complex and multifaceted process. However, the fundamentals of musical culture should undoubtedly be cultivated within the framework of school music education, which, depending on one's skills and interests, can be further developed through additional education or private lessons.

Music teaching as a career will become increasingly in demand, provided that it is enriched with new relevant professional content. This content should be connected with broadening the role of music teachers, encompassing the creation and execution of diverse music and creative development programmes both in the context of secondary education and additional education. This also includes entrepreneurship activities (Berbets et al., 2021).

Therefore, music teacher training should rely on a) the key principles of the humane education strategy, b) individual and personal meanings of education, which act as both transformative and transformative elements; c) the customization of music education for students with diverse pre-university backgrounds; d) the continuity of professional education, including teacher qualification improvement; e) the development of ways to perceive, comprehend and subjectively interpret phenomena in sociocultural and pedagogical reality based on reflection and the search for personal meaning; f) the promotion of an in-demand sphere of additional education that entails preparing teachers as versatile professionals capable of meeting society's educational demands. Consequently, they should be adaptable and competitive in the labour market, equipped with health-preserving, music therapy and information technologies. This perspective underscores the importance of understanding the cultivation of research competencies as a foundation for professional development and taking into consideration the ethnocultural peculiarities of the region (Onishchuk et al., 2020).

The Informatization of Music Teacher Training

The informatization of music teacher training has prompted the examination of effective ways, techniques and means of teaching IT and the revising of the methodical content of the educational process.

Currently, the development of information competence is a prerequisite for preparing a qualified music teacher. The swift advancement of IT and virtual learning systems has established a novel high-tech instruction educational environment which constitutes the workplace of a music teacher. For music teachers to be successful in today's schools, they must possess an appropriate level of ICT competence. The interdisciplinary field brings together music and computer science, and a music teacher must have a good understanding of both to take advantage of the many computer software and hardware solutions available.

Music and Computer Technologies (MCT) provides a unique learning setting for the application of a multi-disciplinary tactic which has developed at the crossroads of two distinct disciplines, namely computer science and music. At this point, however, students' knowledge in the subjects of computer science and IT applicable to music pedagogy is discovered to be inadequate to properly use the current information tools and instruments essential for professional activities of music teachers (Kaplan & Norton, 2008).

There is a significant disparity between the elevated demand for music teachers who are competent in IT, MCT and the process of their

application and the acute lack of teaching staff who hold such knowledge and know how to apply it in music classes, due to the lack of preparedness of pedagogical university graduates to use IT.

It is evident that the main causes of the afore-mentioned contradiction are not isolated individual shortcomings in the educational process but have a systemic nature and are influenced by a series of circumstances. In particular, it refers to *the absence of a sufficient level of knowledge in computer science and IT acquired during pre-university education, which is due to several reasons*: a) learning in music schools and lyceums, specialized humanities classes in regular schools, with a noteworthy proportion of time spent on specialized topics rather than computer science and IT education; b) enrolling in university after completing secondary vocational education which is based on general secondary education, thereby breaking the continuous progression of computer science and IT learning; c) little incentive for future music teachers to enhance their informational literacy, owing to the disconnect between the knowledge they gain and their forthcoming professional engagements (Zhukov, 2019).

As the basis of university music teacher training for IT relies on existing knowledge, it is not powerful enough, resulting in an inadequate level of effectiveness. The basic teacher training programme should contain instructions that offer an invariant component of their professional instruction in ICT, guaranteeing the acquisition of necessary ICT knowledge.

Before tackling the issue of developing information competence in future music teachers at pedagogical universities, it is necessary to equip them with the necessary level of knowledge in the field of IT. This task is typically resolved during their university education. Given the limited number of hours allocated for IT training for music students, it is challenging to address it comprehensively, especially since future music teachers typically have to fill in any lacking knowledge within the scope of classes designed to build information competence.

Another problem is *the absence of a context-oriented approach in teaching IT-related subjects, as well as a low level of correlation between the knowledge acquired by music students and their future professional activities*. It is therefore necessary to consider the specificities of teaching computer science and IT within the framework of music education and music teacher training.

However, as evidenced in a series of studies, IT-related subjects are often taught without taking into account professional needs of today's music teachers.

Inadequate advancement of IT teaching approaches, aimed towards fostering information competence in future music teachers as an essential component of their

professional roles is a critical issue, too. This situation arises from the absence of comprehensive approaches in today's pedagogy. At the same time, these approaches pertain to the effective use of ICT for the manipulation of data related to the subjects and their interconnections within a specific domain of study. They involve modelling and applying ICT tools that emphasize the research aspect of comprehending patterns within that particular subject area (Byrne, 2002).

Educational materials applicable to teaching IT to future music teachers are mainly concentrated on particular software. Besides, there is a limited number of resources to work on creative projects while concurrently demonstrating the integration of IT and professional musical activities. This is reinforced by the results of a formative pedagogical experiment conducted by the authors of this article. The obtained results indicate the insufficient availability of methodological materials and a lack of knowledge about how to use IT tools in music pedagogical activities as significant obstacles to actively implementing MCT in their lessons.

It is also essential to address *the problem of disrupting the regular course of IT instruction, with special emphasis on MCT, in vocational and higher education institutions*. For instance, IT instruction (covering topics such as "Information Technologies" and "The Fundamentals of Mathematical Data Processing") is offered at pedagogical universities in the initial year, employing a single curriculum for all students (majoring in a bachelor's degree in education). Most frequently, for future music teachers, this training only finds its logical continuation in the third year (e.g., when studying subjects such as "Computer Music" and "Computer Technologies in Music Education"), bypassing the second year of study. In turn, this disrupts the continuity of the educational process in this particular field and leads to a reduction in the level of information competence. This is one of the reasons for their lack of in-depth knowledge and a holistic understanding of the possibilities of the high-tech information educational environment.

Finally, *there is a disruption in the sequence of structuring subjects within IT and MCT*. Indeed, fragmented subjects with minimal content continuity can hamper students' comprehension and recognition of the potential of current IT and MCT. Occasionally, MCT-related topics are substituted with those from other curriculums, typically due to the lack of appropriate teaching materials and competent instructors. This is frequently compounded by the conventional mindsets of those in the music teaching profession, the majority of whom obtained their education at a time when IT and MCT were not incorporated into the formal education system (Honchar et al., 2021).

These conditions point to the necessity of changing the approach to teaching IT to future music teachers to help them develop information competence.

Additionally, one should acknowledge the crucial role of the educational environment, which is expected to facilitate a harmonious integration of both informational and musical subjects. As such, an educational environment at the intersection of two distinct fields of knowledge, namely computer science and music, is known as MCT. Considering its ability to combine these subjects, its use in training music teachers to be competent with information technology is essential within the high-tech information educational environment.

MCT provides the opportunity to explore new possibilities for creative experimentation, expand the cognitive horizons of future music teachers, employ a profound pedagogical toolkit for traditional music education alongside the capabilities of music computing, optimize the educational process and make it both highly technological and creative.

In the context of music teacher training, IT instruction involves implementing a methodology that encompasses a sequence of the following subjects: a) "Information Technologies" (Year 1); b) "Information Technologies in Music" (Year 2); c) "Computer Music" (Year 3); d) "Computer Technologies in Music Education" (Year 3).

"Information Technologies", through the use of MCT capabilities, provides students the opportunity to gain a better understanding of IT and use it in their professional roles (Moroz, 2020). As part of studying this subject, students become acquainted with the hardware and software, taking MC for instance, attaining mastery of the primary operational abilities and user interface of applications for computer-based audio production. Besides, future music teachers acquire fundamental skills in working with Internet services and resources and grasp the basic principles of communication tools. At the same time, engaging in creative music projects necessitates taking advantage of distance learning, cloud technologies and collaborative remote work.

"Information Technologies in Music", with a pronounced focus on studying MCT and building upon the knowledge acquired during "Information Technologies", ensures the continuity between the latter and the following subjects ("Computer Music" and "Computer Technologies in Music Education"). Practising in this field, students improve their proficiency in working with IT hardware and software based on music computing. Future music teachers acquire the ability to make use of professional software and e-learning resources.

"Computer Music" aims to develop information competence through computer-based music creation. It also helps students acquire professional skills in using IT for sound engineering, arrangement, composition and performance (Chaachoua, 2000).

"Computer Technologies in Music Education" is designed to equip future music teachers with a theoretical and practical understanding of current forms and methods in music education. Within this subject, students study and gain practical experience in using IT in general, and MCT in particular, as a means of teaching music in secondary schools.

Also, students develop multimedia educational materials for music lessons on specific topics. They create electronic test assignments, design lesson projects that incorporate music software (audio editors, sequencers, auto-arrangement programmes, notation editors, sound libraries and VST instruments) and explore various forms of distance learning.

The integrated set of subjects has enabled the use of MCT for teaching IT and developing information competence in future music teachers. By adhering to the principles of continuity and progression in its development, this complex has prevented the fragmentation of students' learning experiences, establishing a unified educational trajectory geared towards the successful training of music teachers capable of professionally using IT and MCT in their future pedagogical activities, especially within the framework of the high-tech information educational environment

Conclusion

The significance of this article is rooted in its investigation of methods to cultivate musical and creative skills in university students. It emphasizes that improving such skills should be accomplished through the thoughtful and efficient use of educational resources, taking into account pertinent interdisciplinary links, dynamic instructional sequences and a robust professional, practice-centered approach to learning.

Additionally, the article highlights the issues related to the preparation of music teachers in the context of the humane education strategy. It demonstrates that the humane strategy, which centres around the comprehensive nature of individuals and their diverse connections and relationships with the surrounding world, is replacing the humanistic strategy. For the future musician-educator, a humane stance should be dialogical, to develop the "human quality" in its entirety, in its connection with values, culture and human relationships.

The supplied data furthermore supports the idea that the proposed methodology can be employed to design an effective teaching system that

will create a highly qualified music teacher with an extensive awareness of information technology and the ability to apply it in their creative professional activities.

In conclusion, the article establishes that computer literacy is an intrinsic part of professional competence, which is a fundamental necessity for proficient professional teaching activities for music teachers in today's circumstances. Therefore, computers can be perceived as a powerful and beneficial instrument for pedagogical activities of music teachers and the preparation of future music teachers, strengthening the educational process and encouraging individualization and differentiation.

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Authors 1 and 2 investigated methods for enhancing musical and creative skills among university students. Author 3 analyzed the challenges of music teacher training within the context of the humane education strategy. Author 4 demonstrated that digital technologies are an effective means of differentiating and personalizing educational activities. Author 5 proved the effectiveness of informatization in music instruction. Author 6 highlighted the significant role of computer technologies in music teacher training.

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