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UDC 373.5.016:[159.932:78]

## COMPUTERIZED EAR TRAINING

*Liu Wei*

*Master's Student of the Department of Music and Pedagogical Education  
Belarusian State Pedagogical University named after Maxim Tank, Minsk  
lv479804960@gmail.com*

The paper discusses computerized ear training as the process that involves listening to musical examples and then responding by identifying and reproducing certain aspects of the music, such as identifying the intervals or chords played. It is implemented via the software then provides immediate feedback on the accuracy of the response, allowing the user to learn from their mistakes and improve over time. Computerized ear training has several advantages over traditional methods of ear training, such as using a piano or other musical instrument. The software can provide a wide range of musical examples and exercises, allowing for a more comprehensive and varied training experience. Also, the instant feedback provided by the software helps to reinforce correct responses and speed up the learning process.

**Keywords:** computerized ear training; ear training; music education.

With the fast development of digital education, music education has undergone a drastic transformation. Music learners, in their turn, are “experiencing dissolving boundaries of traditional learning spaces, and new opportunities for creating their own musical worlds and music learning identities” [1]. Every music teacher “should have comprehensive knowledge of the software he will use and know very well how he will benefit from this software at the education” [2].

One of the aspects that have to be developed in music learning is ear training. Ear training is the process that involves listening to musical examples and then responding by identifying and reproducing certain aspects of the music, such as identifying the intervals or chords played. It is implemented via the software then provides immediate feedback on the accuracy of the response, allowing the user to learn from their mistakes and improve over time.

Computerized ear training has seen significant advances, leveraging technology to enhance the development of aural skills in musicians. The methods are as shown in the figure (see figure 1).

There are many facets of musical experience, behavior, and development that are involved in computerized ear training. Let us consider these methods in more detail. First, we will discuss gamified learning. Many ear training programs now use interactive software and apps that gamify the learning experience. This engages users through challenges, quizzes, and interactive exercises, making the learning process more enjoyable and effective [2].

Adaptive learning algorithms analyze users' performance and tailor exercises based on individual strengths and weaknesses. This personalized approach maximizes the efficiency of ear training, addressing specific needs [2].

Virtual instruments and simulations can make up for the lack of some instruments in the music learning environment. Instrument-specific training can provide more specific experience for

ear training. Some computerized ear training tools offer virtual instruments and simulations. Musicians can practice identifying and reproducing sounds specific to their instrument, such as recognizing guitar chords or piano intervals.

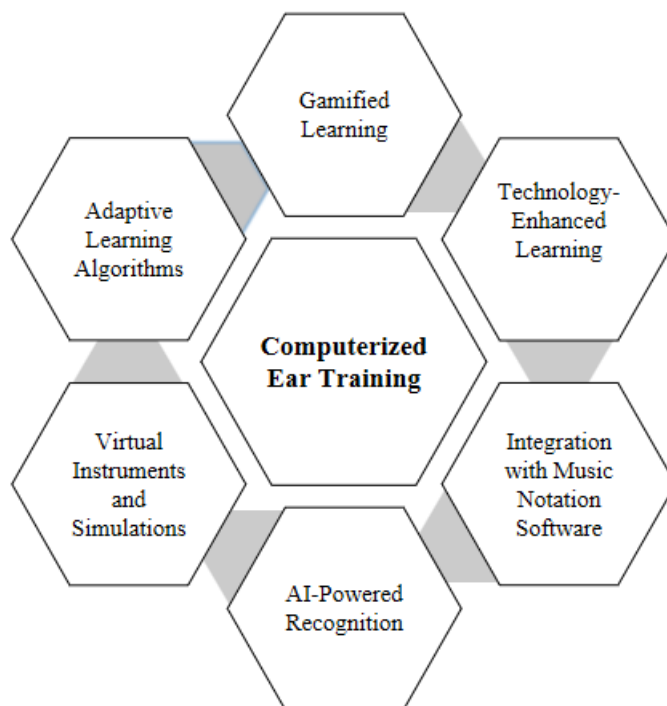


Figure 1 – Computerized ear training

Artificial Intelligence (AI) and machine learning technologies contribute to more sophisticated audio analysis. This allows for more accurate identification of musical elements, including pitch, rhythm, and harmony, enhancing the precision of ear training exercises.

Integration with music notation software can help with matching listening skills to notation and solfege. Seamless integration is integration with music notation software that allows users to practice ear training directly within the context of written music. This connection between aural skills and notation promotes a holistic understanding of music.

The integration of technology, including software and online platforms, offers innovative ways to enhance ear training. Virtual keyboard and ear training software, along with online platforms for collaborative learning, have shown promise in middle school music education [2].

Though computerized instructional programs have been used in music education since the mid 20th century, non-computerized, teacher-led instruction is still the most popular methodology for teaching aural skills and music theory. This is not because there no digital learning tools available; in fact, hundreds of programs have been created in the last few decades to assist students in learning a range of musical principles via electronic means.

Even though there are a number of reasons why computer-assisted technologies are not frequently used in music classrooms, including a lack of funding, resources, teacher training, distrust of computer-assisted methods, and familiarity with traditional, non-computerized strategies, these technologies offer students unique experiences that, when properly implemented, could be beneficial to the process of learning aural skill in the school [2].

The advantages of computerized ear training are the following: personalized learning, immediate feedback, progress tracking, cost-efficiency and others.

Personalized Learning provides student-tailored exercises. Computerized ear training can adapt to individual learning styles and pace, offering personalized exercises to address specific needs. The software can track and analyze student progress, providing detailed insights into strengths and areas that need improvement for both students and instructors. Immediate

feedback means real-time assessment. Students receive instant feedback on their performance, enabling quick correction of mistakes and continuous improvement.

Another advantage of computerized learning is accessibility for remote learning. Learners can access computerized ear training modules remotely, promoting flexibility and convenience in the learning process. Computerized ear training often integrates multimedia elements, combining auditory and visual cues for a richer learning experience. Digital platforms can potentially reduce the need for physical materials, such as printed music sheets or additional resources thus ensuring cost-efficiency and reduced material costs.

Many computerized ear training programs use interactive and gamified interfaces, making the learning experience more engaging and enjoyable. Moreover, the software can be used to customize learning and create dynamic curriculum. AI-powered systems can adjust the difficulty of exercises based on the learner's proficiency, ensuring a suitable level of challenge.

At the same time, computerized ear training has some disadvantages. First, it is the lack of human interaction and personal guidance. Computerized training may lack the interpersonal connection and nuanced guidance provided by a human instructor. In unsupervised environments, there may be risks of students using external aids or seeking assistance from others, compromising the integrity of assessments. Some computerized programs may lack the flexibility to accommodate diverse teaching methods or address unique learning preferences. Moreover, the absence of a human instructor may result in a less emotionally connected learning experience, which is important in music education.

Second, there is certain dependency on technology. Reliance on technology makes the learning process vulnerable to technical glitches, internet connectivity issues, or software malfunctions. Depending solely on computerized training might neglect the development of traditional musicianship skills acquired through non-digital methods. This can lead to overemphasis on technology and loss of traditional skills.

Thirdly, there is limited contextual learning. It means, ear training as it is can lead to the isolation of skills. Computerized training might isolate ear training skills from broader musical contexts, potentially hindering the ability to apply skills in real-world musical situations. Depersonalized experience and lack of emotional connection can cause limited creativity and constrained artistic expression. The structured nature of computerized exercises may limit opportunities for students to explore and express their creativity in music.

So, it can be concluded that computerized ear training is a method of practicing and improving musical ear using computer software. It involves various exercises and drills that help develop skills such as pitch recognition, interval identification, and chord progression detection. However, it is important to note that computerized ear training should not be used as a substitute for real-life musical experiences. While it can be a valuable tool for developing basic ear skills, it is crucial to complement it with active listening, playing an instrument, and participating in ensemble settings to fully develop one's musical ear. Therefore, computerized ear training has many applications and advantages, there are also some disadvantages that still need to be improved.

It's essential to approach the use of computerized ear training with a balanced perspective, recognizing its advantages in terms of accessibility and personalization while addressing potential drawbacks related to technology dependence and the need for human interaction in the musical learning process. A thoughtful integration of technology with traditional teaching methods can provide a comprehensive and effective music education experience.

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UDC [378.016:78]:159.924.24

## CULTIVATING CREATIVITY IN COLLEGE MUSIC EDUCATION

**Shen Shuxian**

*Master's student of the Department of Music and Pedagogical Education  
Belarusian State Pedagogical University named after Maxim Tank, Minsk  
Shenshuxian5@gmail.com*

In today's society, the importance of creative thinking is becoming increasingly prominent. In college music education, creative thinking cultivation can not only improve students' artistic accomplishment, but also stimulate their innovative ability and imagination. This paper suggests strategies to develop students' creative thinking in college music education: developing curiosity, encouraging independent thinking and questioning spirit, utilizing innovative methods and techniques, enhanced practice, encouraging team teamwork and communication, interdisciplinary learning, cultivating critical thinking and judgment.

**Keywords:** music education; creativity; innovative thinking; music teacher training

In the era of knowledge economy in the 21st century, creative thinking has become an important driving force for the development of individuals, organizations and countries. Especially in the university education, cultivating students with creative thinking has become an important goal of education.

It is necessary to cultivate students' creative thinking, namely innovative thinking ability. At present, most countries in the world have included innovative education in the important agenda of higher education. In the process of education, creative thinking refers to the thinking process in which the human brain makes valuable new exploration of objective things to obtain original results. It is the thinking process in which people use novel and unique ways to solve problems, and it is an advanced form of thinking.

Many famous psychologists believe that people have great potential abilities. Of these potentials, creativity is also the most valuable ability. With the development of science and technology and the progress of human civilization, the competition of all countries in the world must be attributed to the competition of creativity. Therefore, there is a need of modern society to study the human creativity and develop one of the important tasks of modern education [1, p. 269].

Creativity is the ability to combine or connect elements to form a new relationship. Individuals with creativity have psychological traits such as curiosity, adventure, challenge and imagination in their emotions. Creativity explains the psychological process of transcending existing experiences, breaking through habitual limitations and forming new ideas in new situations. It is not restricted by conventional rules and can flexibly apply experience to solve problems.

Students' creativity is a kind of ability with which the individual can demonstrate flexible, unique, progressive characteristics in the supportive environment through the process of thinking to produce divergent views, endow things unique, novel meaning, and gain the results not only make themselves, but also make others satisfied. For students majoring in music, their creativity is of great value to their own creation, especially improvisation and performance [2].

Creative thinking is an important force to promote social progress and development. In university education, cultivating creative thinking is an important way to improve students' comprehensive quality and future career development. This paper will discuss how to develop creative thinking in university education from the following aspects.