



## **Development of Students' Music Auditory Perceptions within Multimedia Technology-Based Solfeggio Training Course**

 Larisa G. Parshina<sup>1</sup> and  Larisa P. Karpushina<sup>2</sup>

1.2 .Department of Music Education and Music Teaching Techniques, Mordovian State Pedagogical Institute named after M.E. Evseiev, Saransk, Russia.

### **ARTICLE INFORMATION**

Original Research Paper

Doi:

Received September. 2019

Accepted February. 2020

#### **Keywords:**

Music Auditory Perceptions

Students

Solfeggio

Intonation Auditory Training

Multimedia Technologies

### **ABSTRACT**

The article reveals a pedagogical potential and possibilities of using multimedia technologies within Solfeggio training course as a means of students' musical auditory perceptions. We focus here on functional purpose and methodological support multimedia technologies. Our research has identified pedagogical conditions contributing to the effective development of students' musical auditory perceptions within multimedia technology-based Solfeggio training course. We have put forward the guidelines for multimedia software selection aimed at students' tone and aural skills improvement. We have tested the teaching techniques for students' musical auditory perception development within multimedia technology-based Solfeggio training course, resulted in high effectiveness of the recommended technologies.

## **1. Introduction**

Music hearing, one of the essential components of which is aural perception of music content, is considered an important professional competence necessary for the successful performance of any musician and the main criterion of professional selection of applicants to the department of music of higher education institution. The development of music auditory perception in future music teachers is an integral part of high school professional training of the students attending music pedagogy course.

According to the explanatory dictionary of the Russian language, the term "perception" is defined as the reproduction in the consciousness of previously experienced perceptions – the image of an object or phenomenon. According to Maklakov [1], the term "perception" is defined as "a psychological process of reflection of the objects and phenomena, which are not perceivable at the given moment, but are being reconstructed on the basis of past experience". Aural-oriented activity is implied by the meaning "auditory". The process of auditory perception formation is associated with aural activity mechanisms and based on the impressions, aural perception, and musical experience.

Physiological studies of aural perception processes, the basis for which was laid in Germany at the end of the 19th century, underwent multilateral processing. The beginning of music hearing theory development is associated with the personality of Helmholtz [2], who proposed three approaches to the study of music hearing, viz. physical, physiological and psychological, interrelated with music and theoretical aspects. The study, aimed at the formation of music auditory perceptions, is of great importance for the fundamental nature of this phenomenon as to the



performance of music hearing and formation of musical thinking and memory.

Music auditory perceptions are viewed as music language elements and music speech units, being formed in a person in the process of musical perception, kept in the memory and used in the process of creative music activity.

Music auditory perceptions result from long-lasting, intensive perception of intonational and semantic structures. Music auditory perception clarity, stability and acuity depend on the individual peculiarities of the musical memory and influence on musical and artistic performance of the students.

Music auditory perceptions are being developed in the process of music theory training and music performance in the course of musical disciplines learning, among which a significant role is assigned to Solfeggio training course. In the context of innovative transformations, affecting the educational process in teacher training universities, one can observe a search for new pedagogical technologies and innovative approach towards teaching of disciplines. The use of modern multimedia technologies opens up new possibilities for teaching and learning process organization and provides certain conditions for students' music auditory perceptions within Solfeggio training course.

Multimedia technologies are computer technologies for teaching, providing the use of audio-visual information in integrated and on-line modes. Multimedia technologies carry a significant pedagogic potential, which makes it possible to use them as a means of students' music auditory perceptions in lectures and practical classes within Solfeggio training course.

## 2. Literature Review

Special attention is given to the perceptions in psychology publications [1]. Musical perceptions are most commonly considered as a characteristic of music hearing [3, 4, 5], a phenomenon of psychological and physiological peculiarities of sound perception by a person [2, 6], a phenomenon of creative music activity [2, 6], and an object being formed in the learning process [7].

A review of the literature on psychology, pedagogy and musicology let us emphasize peculiar features of solfeggio teaching method at different levels of music education: music hearing development based on the prevailing melodic mode approach [8] and use of training exercises [9], style analysis and musical intonations of the 20<sup>th</sup> century [10].

The issues of using multimedia technologies in education have been studying since the end of the 20<sup>th</sup> century [11, 12, 13]. In music education more emphasis is put on information, communication, and computer technologies [14, 15, 16].

Thus, the indicated problem seems to be eclectic and insufficiently developed, but, in the meantime, is of great importance for methodological support of solfeggio training course and focused on the search and identification of effective conditions for students' music auditory perceptions development by using multimedia technologies.

## 3. Methodological Framework

The aim of the present study is to give a theoretical basis and provide experimental effective implementation of multimedia technologies in the process of students' music auditory perceptions development within Solfeggio training course. The research task are as follows: to generalize theoretical grounds for students' music auditory perceptions development within Solfeggio course; to substantiate the need for multimedia technologies use in Solfeggio training; to determine pedagogical conditions for more effective use of multimedia technologies in the process of students'



music auditory perceptions within Solfeggio training course, and to test them experimentally.

As part of the study, we carried out a theoretical analysis of scientific literature on the subject and analyzed standardized documents. In the course of the research, we used empirical study methods (supervision, discussion, teaching and learning activity results study, and pedagogical experiment) and methods of statistical and mathematical processing of experimental data.

The experiment was run at Mordovian State Pedagogical Institute named after M. E. Evseviev from 2017 until 2019. A total of 66 first-year students mastering Pedagogical Education area of studies (with two majors: Music and Music and Preschool Education) were included in the experiment.

#### 4. Results and Discussion

##### 4.1. Pedagogical potential and possibilities of multimedia technologies use in Solfeggio training course

Integrated interactive possibilities of multimedia technologies are highly effective tools for the development of students' ability for music. The pedagogical potential of multimedia technologies lies in activating more than one sensory organ involved in information perception, viz. visual and auditory systems. In a series of physiological, psychological and pedagogical studies [17, 18, 19, 20] it is indicated that simultaneous use of auditory and visual perception of information enhances its effectiveness. Qualitatively new integrated and interactive information environment provides new opportunities for Solfeggio training course, thus enhancing assimilation of information in a shorter period.

Both functional purpose (teaching, diagnostic, and gaming) and methodological (training, checking, reference and information) multimedia technologies can be used in Solfeggio training course.

*Teaching* multimedia technologies are designed to provide teaching information and aimed at memorization and enhancement of theoretical basis of musicology. *Diagnostic* means contribute to both assess students' musical and theoretical knowledge achievement level and diagnostics of their music auditory perception. *Musical gaming technologies* provide the educational process with various means of music and aural activity enhancement.

*Training multimedia technologies* open certain possibilities for knowledge and skills drill in the course of review and consolidation of the learned material. Today, there are multimedia technology-based simulators used to adopt pitch arrangement of the notes and aurally define musical intervals and chords. One can also use *checking multimedia technologies* to assess the level of learning achievement and *reference and information technologies* – to obtain the necessary information.

The use of multimedia technologies within Solfeggio training course proves effective for various types of activity, such as vocal intonation training, beat and rhythm exercises, aural skills, and music analysis.

In the course of vocal intonation training, including a prima vista intoning of sheet music (melodies, exercises, mode scales, mode scale degrees, degrees isolated intervals, chords or sequence of chords), multimedia technologies provide demonstration of the selected note material in the necessary succession coupled with its sounding within the topic of the lesson. Audio playback of the musical text enables one to hear and analyse the intoning purity of different pitch levels sounds and melodies, as well as to identify and eliminate the errors.

When using multimedia technologies in beat and rhythm training, one can observe an effect on visual and aural perception, resulting in a deeper comprehension, performance and writing of beat and rhythm formulas and patterns both off pitch and pitch-associated.

Writing activity within Solfeggio training course, associated with music language elements building (scales,



intervals, chords, etc.) or melodic dictation can be implemented through the use of software applications (notation editors) for music notation and sound playback.

To run auditory analysis, associated with identification of exact composition of music language elements through inner intoning, there have been developed multimedia simulation programmes aimed at hearing music language elements, harmonic sequences, texture, form, and timing, carrying out auditory harmonic analysis of musical literature fragments and writing musical dictation (monophonic, polyphonic, harmonic, texture).

#### *4.2. Pedagogical conditions for multimedia technologies use in the process of students' music auditory perception development within Solfeggio training course*

The effective development of students' music auditory perception development within Solfeggio training course is possible under certain pedagogical conditions:

##### *1) Making selection of multimedia software for students' music auditory perception development.*

Students' music auditory perception development is impossible without accumulation of intonation-auditory experience, the formation of which is taking place in the process of intonation-auditory experience. Regular, consistent intonation auditory training results in musical impressions accumulation, their synthesis and integration in creative music activity; forms internal hearing, furthers intonation auditory experience accumulation, thus extending the sphere of music and auditory perception.

Intonation auditory training based on the extraction of music language elements (melodic formulas, modes, intervals, chords, timings, and rhythmic figures) is the basis for music auditory perception. The extraction of music language elements and musical speech units is one of the fundamental problems of musical text study. There are theoretical concepts in domestic musicology, according to which music is interpreted as a text in terms of intonational nature [21], theory of expressive means and music language [22], psychology of music and notional perception [23], and musical notation theory [3].

Modern competition-based software provides a variety of products for personal computers, smartphones, and tablets suitable for musical development and education. Most of these programmes are intended for reference, training, cognitive or controlling purposes. Training software designed to practise music language elements can be used on the basis of individualized and differentiated approach, enabling the students to gain intonation-auditory experience in the course of self-guided project work, both without pre-higher musical education and with music school- or college-based knowledge.

Multimedia technologies make it possible to design authoring multimedia tools in accordance with the elaborated curriculum and personal scenarios [24]. To date, there are multimedia study guides which can be used within Solfeggio training courses and are suited to the students majoring in different disciplines.

##### *2) Multimedia-based activization of students' music auditory perception development in the course of self-guided project work.*

Multimedia technologies are one of the means of students' involvement in the process of intonation auditory training, aimed at music auditory perception of the students. Both classroom activities and self-guided project work of the students based on functional purpose and methodological support multimedia technologies make the teaching-learning process dynamic and exciting, thus contributing to the control of memorization processes and use and

comprehension of music language units, interactive communication with integrated music information (sound, text, music notation, etc.), and self-check of music speech units.

Training multimedia tools make the educational process information-intensive, while music gaming software provide a means for both learning and entertainment; diagnostic software makes it possible to correct the educational process in order to enhance its quality; training software – to hone the hearing skills in students, enabling them to aurally define music language units; checking software tools allow to assess the level of hearing skills, while reference and information technologies – to provide a theoretical background for auditory analysis practical skills.

For instance, *Intervaller* training software is designed for beginners and professional musicians and allows them to develop aural perception of musical intervals. This simulator facilitates consolidation of theoretical basis for building intervals and drilling of intervals auditory perception skills. If the task is fulfilled correctly, there is an automatic switchover to another task. If not done properly, there is an error notification, and the student is requested to complete the offered task correctly. Functionally, this software application allows to perform the following tasks:

1) *to check the knowledge of qualitative and quantitative interval length*: the students are offered to build an interval from a specified sound in treble or bass clefs, up or down;

2) *to check auditory perception of qualitative and quantitative interval length*: the students are offered to recognize the sounded interval in melodic (at higher or lower pitch levels) or harmonic sequences. At that, any number of intervals can be chosen to drill hearing skills.

There is also other training software, such as *Accordion* (focused on building chords), *Pianist* (designed for mastering notation), etc.

3) *to hold an educational workshop for the students on multimedia software*.

To teach operation use of software applications, teachers are recommended to hold an educational workshop on software use, including software possibilities and peculiarities demonstration. During the workshop, students get acquainted with multimedia gaming software (e.g. *Musical Mosaic*, *Memorize the Melody*, *Sound Track*), multimedia simulation software (e.g. *Musical Notation Knowledge*), *Intervaller*, *Accordion*, *Music Theory*, *Pianist*, *Note Trainer*), multimedia dictionaries, encyclopedias, multimedia manuals, and educational gaming multimedia software.

#### 4.3. *Experimental check of the efficiency of multimedia technologies use in the process of students' music auditory perception development within Solfeggio training course*

The priorities identified in the present study were subject to a practical testing within Solfeggio training course in the two groups: experimental group (EG), consisting of 33 persons, and control group (CG), also including 33 persons. Experimental verification of realization efficiency of multimedia technologies in the process of students' music auditory perception within Solfeggio training course was carried out in several stages, viz. statement, formation, and experiment.

The statement stage included analysis of scientific literature, pedagogical and musicological literature, selection of multimedia software applications, identification of music auditory perception constituents (cognitive, analytic, and activity components) and their verification.

*The cognitive component of music auditory perceptions* included assessment of music theory competence and knowledge of music language and music speech elements building scales, intervals, chords, melodic formulas with turns of stable sounds, etc.).



*The analytic component of music auditory perceptions* suggested auditory analysis skills of musical elements and understanding of music language and music speech based on semantic perception.

*The activity component* assumed the use of music auditory perceptions (music language and music speech elements) in creative music activity (composition, improvisation and adaptation of melodies in software programmes), in musical performance (intonationally clean vocal and expressive instrumental performance of melodic and harmonic structures and pieces of music), and in the course of intonation analysis (analysis of musical language elements, expressive means and imagery of musical pieces).

At the formation stage, we implemented the developed methods of EG students' music auditory perceptions within multimedia technology-based Solfeggio training course. Multimedia software was introduced in the classroom activities and self-guided project work of EG students to activate their intonation auditory training. At lectures, we used authoring multimedia software, thematically designed in accordance with discipline curriculum. At practicals, the following multimedia gaming software applications were used:

– *Musical Mosaic*, which consists in making a melody out of separate puzzles (in the form of music note text divided into measures);

– *Memorize the Melody*, which is based on recognizing a familiar song from the note text, its limited visual memorization with further finishing puzzles in the form of divided into measures blocks, and reproduction of the obtained result and its relaxing listening;

– *Sound Track*, which is based on composition of musical build-ups of various classic works out of suggested sound fragments;

– *Composer*, the objective of the game is to make sense of the process of composition, improvisation of melodic and harmonic sequences out of suggested rhythm blocks and samples.

For self-guided project work, EG students were offered the following multimedia simulation software: *Musical Notation Knowledge, Intervaller, Accordion, Music Theory, Pianist, Note Trainer*, and other software programmes. To consolidate theoretical material, the students were suggested to carry-out self-guided project work, using multimedia dictionaries, encyclopedias, multimedia manuals, and informative gaming multimedia software.

The achievement level of students' knowledge on music theory and auditory experience was assessed through testing and diagnostics of music hearing, using software simulation programmes based on music language elements aural recognition.

At the control stage of the experiment, we carried out a comparative analysis of the results of the statement and control stages of the experiment and presented a summary of experimental study results.

## 5. Conclusion

The results of the comparative analysis showed the effectiveness of the elaborated methods of students' music auditory perceptions development within multimedia-based Solfeggio training course. Judge by the ratios of music EG auditory cognitive component at the control stage, we haven't identified low level of students' achievement (at the statement stage, low level was registered in 31,8% of respondents); the above-average and above-high ratios of achievement levels increased by 31,8% and 28,3%, respectively. In CG, the ratios of cognitive components at the control stage remained at the low level in 14% of the respondents, and increased only in 17% of the students.

The verification of EG analytical component identified that the ratio of students' self-orientation decreased by

36,4%, while activity-oriented ratio increased by 34,8%; in CG students, experiencing the natural learning process, self-orientation ratio decreased by 21,4%, while activity-oriented ratio increased by 18,8%.

Verification of activity component in the Control Group showed visual imagery, distinctiveness and originality of music compositions, intonationally clean vocal performance of the melodies and music language elements, and the ability to analyze the expressive means of music and imagery of melody lines in the sheet music. Certain difficulties while composing, improvising and arranging melodies, analytical errors of music language elements and music expressive means, and incorrect reproduction of sheet music during melodies performance took place in the Control Group.

Consequently, the use of multimedia technologies in Solfeggio training course makes lectures and practicals enriched with integrated and interactive information, facilitates controlling of memorization processes, application and understanding of musical language elements, contributes to progress achievement testing and self-checking, makes the teaching and learning process dynamic and interesting, and contributes to multimedia-based effective development of students' music and auditory perceptions.

## 6. Acknowledgements

This work was supported by the grant programme for scientific research in priority areas of scientific effort on network cooperation of partner universities (Perm State Humanitarian Pedagogical University and Mordovian State Pedagogical Institute named after M.E. Evseev, Russia) [registration No. 2019-08-18, date of registration: August 15, 2019].

## Conflicts of interest

The authors declare that there is no conflict of interest.

## References

1. Maklakov AG. General psychology: Textbook for higher education institutions. St. Petersburg: Piter; 2005.
2. Helmholtz HF, Ellis AJ. On the sensations of tone as a physiological basis for the theory of music. 2nd ed. London, New York: Longmans, Green and co.; 1885.
3. Aranovsky MG. On psychological factors of subject-spatial auditory apperception. In: Problems of Musical Thinking. Moscow: Music; 1974. P. 252–271.
4. Teplov BM. Psychology of musical ability. Moscow: Nauka; 2003.
5. Yavorsky BL. Articles, memoirs, epistolary intercourse: two-volume collection of works compiled by Rabinovich I.S. Moscow: Soviet Composer; 1972.
6. Garbuzov NA. Zonal nature of tone hearing. In: Problems of Physiological Acoustics. M., L.; 1950. P. 139–152.
7. Maykapar SM. Musical hearing: its significance, nature, peculiar features and regular development method. Moscow: URSS; 2018.
8. Khvostenko VV. Solfeggio (monophonic): based on the tunes of the USSR peoples. Moscow: Music; 1965.
9. Chen JL, Penhune VB, Zatorre RJ. Moving on time: Brain network for auditory-motor synchronization is modulated by rhythm complexity and musical training. *Journal of Cognitive Neuroscience* 2008, 20(2):226–239.
10. Ostrovsky AL, Soloviev SN, Shokin VP. Solfeggio. Moscow: Classica-XXI; 2006.
11. Mayer RE. Principles of multimedia learning based on social cues: personalization, voice, and image principles. In: Mayer R, editor. *The Cambridge Handbook of Multimedia Learning*. New York, NY: Cambridge University Press;



2005. P. 201–212.

12. Moreno R. Multimedia learning with animated pedagogical agents. In: Mayer R, editor. *The Cambridge Handbook of Multimedia Learning*. New York, NY: Cambridge University Press; 2005. P. 507–523.
13. Parshina L. Multimedia technologies as a tool for teaching supervision over the students' skills (within the course on “music theory training”). *Life Science Journal* 2014, 11(6):547–551.
14. Alberich-Artal E, Sangra A. Virtual Virtuosos: A case Study in Learning Music on virtual Learning Environments in Spain. *European Journal of Open, Distance and E-Learning* 2012; 1:1–9.
15. Bauer W, Reese S, McAllister P. Transforming music teaching via technology: the role of professional development. *Journal of Research in Music Education* 2003; 51(4):289–301.
16. Reynolds N. Technology and Computers in Music and Music Education. In: Reynolds N, Turcsányi-Szabó M, editors. *Key Competencies in the Knowledge Society. KCKS 2010. IFIP Advances in Information and Communication Technology*, 324. Berlin, Heidelberg: Springer; 2010. P. 333–343.
17. Arkhipova SV, Bobkova OV, Gamajunova AN, Zolotkova EV, Minayeva NG, Ryabova NV, Babushkina LE. Specific aspects of information and communication technologies application by teachers within the inclusive education. *Ponte* 2017; 73(10):77–88.
18. Henson RA. Neurological Aspects of Musical Experience. In: Critchley M, Henson RA, editors. *Music & the Brain. Studies in the Neurology of Music*. London; 1977. P. 7–26.
19. Shukshina TI, Zamkin PV, Burkanova OP. Diagnosing the quality of educational achievements in students of pedagogical higher education institutions. *Astra Salvensis* 2018; VI:645–654.
20. Kizrina NG, Lazutova LA, Levina EA, Kostina EV, Karpushina LP. Creative writing on the basis of blog-technologies as one of the most effective pedagogical technologies for development foreign language teachers key competences. *PONTE Journal* 2018; 1/1 Jan:69–79.
21. Medushevsky VV. *Intonation form of music*. Moscow: Music; 1973.
22. Asafyev BV. *Musical form as a process*. Moscow: Music; 1971.
23. Nazaykinsky YeN. *Sound world of music*. Moscow: Music; 1988.
24. Parshina LG. *Pedagogical conditions of formation of competences of students of teacher training University in the course of development of multimedia: PhD thesis*. Saransk: Mordovian State Pedagogical Institute; 2008.