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**ENACTIVISM AND EMBODIED COGNITION IN EDUCATION OF  
MUSIC TEACHERS**

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*Abstract*

The relevance of this work is related to the need to modernize the content of professional training of future music teachers in accordance with the current level of development of pedagogical science. The research problem is to consider the possibility of introducing some new aspects grounded on modern scientific approach to cognition and learning into the theoretical and practical training of teachers. These include the theory of enactivism and embodied cognition, based on the interactivity between an organism and its environment. These theoretical premises open up new prospects for improving the professional training of a music teacher of the 21st century. It has been found that several methods of musical training, which are inherently enactive and embodied, were found in the past practice in an intuitive way. The study of these methods from the point of view of modern scientific achievements gives them a new meaning and evaluation and should enter into the content of training of future music teachers.

More effectively the students' acquisition of new knowledge was realized on a complex basis, in the interrelation of theoretical and practical educational activities. A greater role in this process is played by the experience of students' own musical performance, because it allows to feel the effectiveness of these methods through their own body

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**Keywords:** Teacher education, enaktivizm, embodied cognition, motor simulation, music learning, piano training.



## 1. Introduction

A qualified music teacher, like any other teacher must possess advanced knowledge and educational technologies. This is due to the problem of refining the quality of teacher training, reorientation of the of "teacher-trainer" model to the "teacher-researcher" and "teacher-educator" model. Therefore, the main task of scientific research in this area becomes a rejection of the simplistic dichotomy of ideas and appeal to a better understanding of 'highly complex intellectual and situated activity that is teaching and learning to teach' (Tatto et al., 2016).

This is especially important in the field of music education, in which the main objective is a psychologically difficult process of cognition and emotional sense of music. Recently, in the science of emotions and emotional communication, critical successes have been achieved, opening new prospects for teachers. New scientific data on the nature of music and musical emotions were obtained as a result of study at the level of neuroscience, in which researchers viewed music as "the ideal tool for studying the work of the human brain" and also as a means of improving the health and quality of life of people (Koelsch, 2011, 2014).

Among the revolutionary discoveries that have revolutionized the science of cognition, it is necessary to note the discovery of mirror neurons in the human brain. This mirror mechanism (the system of mirror neurons) displays a sensory description of the actions of other people, emotions and sensations on their own organism: "The mirror mechanism maps the sensory description of the other's actions, emotions, and sensations on the perceiver's own motor, visceromotor, and somatosensory representations of those actions, emotions, and sensations (Gallese et al., 2016).

Recently emerged were new theories of knowledge that go beyond the purely "cortical" cerebral cognition that have proven effective in recognizing emotions and meanings. One of these ideas is enactivism, which is based on the assertion that cognition arises through the dynamic interaction between the operating body and the environment (Varela & Thompson, 1998; Gallagher & Bower, 2014; Maturana & Varela, 1987). Having arisen in philosophy and cognitive psychology, this idea has been extensively developed in various fields of education, especially in mathematics and computer science. This theory was developed in studies in musicology and in music education.

However, in musical education, these new approaches have not yet received the proper recognition and development, they are not reflected in the content of the training of music teachers. To move forward, it is not enough to simply copy new ideas and artificially introduce (transplant) them into the educational process. A preliminary analysis of their effectiveness and mechanisms of action in the new conditions is necessary. Of great importance is also the appreciation of new scientific ideas in terms of achievements of practice, which often outruns scientific research. So, Grossman accurately notes that " Educational research in general, tends to engage in a kind of historical amnesia, forgetting the past in the rush to invent the future," and argues that "for research in teacher education to move forward, it must reconnect with these fields in an effort to address the complexity of both teaching as a practice and the preparation of teachers (Grossman & McDonald, 2008).

## 2. Problem Statement

Unfortunately, today in the practice of music education in Russia and abroad, the most commonly used methods are based on the traditional knowledge of logic. Such methods are good for studying the formal aspects of the musical language, history and theory of music, but they are not efficient enough for understanding specific emotional contents of music.

This inclination toward "rational" as well as its futility were noted by H. Neigauz, a brilliant Russian pedagogue-pianist and the teacher of Gilels and Richter. "Talent is passion plus intellect, - wrote Neuhaus. - The main error of the majority of "Methodists from art "is that they understand only the intellectual, or rather rational, aspect of artistic" action "and try to influence it only with their speculative advice and reasoning, forgetting completely about the other side - the inconvenient " X" they simply ignore, not knowing what to do with it. That is why, every method is barely empty (at least, it has been so far), and that is why it inevitably causes an ironic smile in people who really know and are involved in active artistic work" (Neuhaus, 1987, p. 30).

A similar situation is noted by foreign researchers. The results of a questionnaire study of music students' conducted by Lindström, Juslin, Bresin, & Williamon suggest that expressivity deserves more attention in music education than has hitherto been the case. (Lindström et al., 2003). The study of Bonastre et al., aimed at studying of the ideas of teachers and students on teaching expressiveness in music, showed that despite the general interest in these issues, it remains unclear to what extent this is reflected in practice, or what specific activities are being developed to enhance expressiveness (Bonastre et al., 2017, p.10).

All these proves the fact that many aspects of the emotional component of music education and training in the scientific and methodical plan still remain insufficiently studied.

## 3. Research Questions

This article discusses the following questions:

3.1. To consider the prospects of using the theory of enactivism and embodied cognition in the aspect of music education and training.

3.2. Analyze the past experience of musical pedagogy from the point of view of applying the enactive and embodied approaches in musical education and training.

3.3. The application of the method of bodily simulation of melody in teaching piano.

Identify the conditions for effective mastery of these approaches by students at the level of basic theoretical knowledge and practical skills.

## 4. Purpose of the Study

The aim of this report is to find and to prove new approaches to musical cognition in the educational aspect and the prospects for including these approaches into teachers training both at the level of theoretical knowledge and at the level of practical skills. The theory of enactivism and embodied cognition, based on the interactivity between an organism and its environment, is well suited to the specific nature of a musical experience, in which sensorimotor reactions are often present. New

interdisciplinary approach will contribute to the effective training of music teachers, both in terms of music performance, as well as in terms of teaching music in general.

## **5. Research Methods**

In solving this problem, a convergent approach was used, based on the analysis and synthesis of theoretical and experimental studies in related fields - philosophy, psychology, pedagogy, musicology, history and theory of musical education and training (Gallese et al., 2016), as well as experimental training using the Embodied Simulation methods in teaching piano lessons.

The main stimulus for the study was the author's long work on the professional training of future music teachers, aimed at the development of musical cognition and understanding of the emotional meaning of music.

## **6. Findings**

### **6.1. The theory of Enactivism**

The theory of Enactivism is an interdisciplinary view of human cognition, which integrates ideas from fields such as phenomenology and philosophy of consciousness, cognitive (neuro) science, theoretical biology and development and social psychology (Black, 2010; Stewart et al., 2010; Thompson 2007; Varela et al. 1991 Colombetti, 2014). Most centrally, it explores the deep continuity between mind and life, taking into account the cognitive processes occurring as embodied in perceptively manipulated actions. In short, the enactive approach decisively departs from the understanding of cognition only from the point of view of skull-bound related structures, but considers it as an activity formed by circular interactions occurring between the organism and its environment (Colombetti, 2017; Gallese, 2012). Scientists note that the recognition of emotions is supported by automatic sensorimotor modeling of the observed expression in its own motor system. (Jensen & Cuffari, 2014; Wood, et al., 2016). And more importantly, this relationship is bilateral, which is convincingly shown in experiments with an artificially induced smile that influenced a change in the emotional assessment of the perceived (Niedenthal et al., 2010). These studies date back to the theory of mirror neurons in the brain (Rizzolatti & Craighero, 2004; Gallese, 2012), due to which the observed actions of the other are reflected in the human psyche as his own. This mechanism plays a huge role in interpersonal communication as a means of recognizing the emotions of another person through the bodily "acceptance" of his expressive movements (Clay & Iacoboni, 2009). It's interesting to note that this mechanism comes in action also when empathizing with fictional characters such as literary ones (Clay & Iacoboni, 2009Clay), which can help to understand the Emotional response in art.

### **6.2. Enactivism in music science**

In musical communication and in musical cognition one can also observe processes similar to those described above. Union Music and movement has always attracted the attention of specialists from different fields of art and pedagogy. Thus, Asafiev argued that the musical art is constantly affected by

the "silent intonation" of plastic and human movements (including the language of the hand) and that "the musical intonation never loses its connection with the word, or with the dance, or with facial expressions (Pantomime) of the human body..." (Asafiev 1963, p. 212.)

The researches of scientists studying the problems of enactive and embodied approaches in music confirm its effectiveness and real prospects in the mechanisms of understanding and experiencing of music (Schiavio et al., 2016; Matyja, 2016; Matyja & Schiavio, 2013). Moreover, they note that understanding of the expressive power of interaction with music can shed light on cognitive processing in other areas (Leman, 2016). Lehman argues that the main link of musical perception and understanding is the human body, with its need to act and interact with the environment through voice, hands and motor reactions. In Hutten's opinion, "This bypasses the traditional mind/body duality which has relegated much of musical analysis to a linguistic exercise; simultaneously, it moves beyond a mere physical description of musical phenomena" (Leman, 2016, Endorsements)

Also, numerous studies have confirmed the ability of music to engage listeners in motion synchronization with rhythm (Dalla Bella et al., 2015; Leman et al., 2017) and also revealed the relationship of this motor involvement with emotional involvement.

### **6.3 Enactive and embodied approaches in music education**

As noted above, the essence of the active approach to cognition and learning lies in active sensorimotor interactions between a person and the world, and with his environment. Some of these methods have already been found in the practice of musical education and upbringing even before the very theory of enactivism appeared. But since there was no theoretical and methodologically correct explanation of the effectiveness of these methods, they were sometimes underestimated and used incorrectly or formally. An analysis of the past and present experience in teaching music showed that the most suitable of these methods was the method of motor simulation (reproduction in movements and gestures) of individual elements of music. Motor simulation involving the whole body is used mainly in the field of musical education of children. Gestures are also used in professional training, usually as an effective way of explaining the structural elements of music or technical tasks by the teacher. In the book of Godøy and Leman, musical gestures were considered in various aspects - in cognitive, communicative, and also shown in its role in the formation of the embodied meaning (Godøy & Leman, 2010). The studies of Simones are devoted to the use of gestures in piano teaching (Simones et al., 2017).

#### **6.3.1 Music and movement in children's pedagogy**

For the first time, the idea of the relationship between musical knowledge and the child's active motion was declared by the Swiss composer and educator Jacques-Dalcroze. On this principle, he created a whole system of general rhythmic and musical education. He repeatedly stressed that "in the formation and development of a sense of rhythm, all of our body is involved" (Jaques-Dalcroze, 1967, p. 9).

It should be recognized that Jacques-Dalcroze became the pioneer of the method of motorization long before his scientific and theoretical basis was developed. Various forms of the inactive approach were also empirically found and used in the work with children Orff, Kodai, Cohen.

Amongst Russian researchers of education this approach was developed by Vetlugina, who in her book "The musical development of the child" revealed the sensorimotor nature of musical abilities of a child and substantiated the ways of their development in the activity (Vetlugina, 1968). She and her colleagues created a pre-school education program, which served as the basis for further development in this direction. Thus, in the practice of children's musical education, methods of work such as plastic intonation, free conducting, the reception of "musical mirrors", the game "echo", imitation of playing musical instruments and others like that are widely used. As can be seen from these titles, they are all based on different forms of motor involvement of the child in the processes of perception and experience of music.

As we can see in the field of musical education of children, methods based on the principles of enactivism have long been found and widely used. In this case, we see an example when practice is ahead of scientific research and the motto of Grossman "Back to the future" in this case looks topical (Grossman & McDonald, 2008). However, without a clear scientific justification, these methods are not always understood by the teachers correctly and are often used formally. Therefore, it is so important to introduce the concepts of enactivism and related teaching methods into the content of the professional preparation of future teachers.

### **6.3.2 Embodied Simulation in piano teaching**

Movements and gestures are widely used by teachers in music learning to explain techniques and complex concepts, to acquire symbolic and functional musical knowledge (Simones et al., 2017).

Often, they are used to order rhythmic representations, since it is known that the sense of rhythm is inextricably linked with bodily motor sensations, and we cannot "measure" the length of the sound without using our movements (Jaques-Dalcroze, 1967). Embodied Simulation is also an effective means of recognizing and understanding the emotional meaning of musical rhythms, as discussed in the author's previous article (Nadyrova, 2016). However, as we know, the movements of the body can reflect not only the rhythmic, but also the pitch structure of the musical tissue. The musical education of children is based on this principle, in particular, the "relational" system and its variants in use. With the help of the movement of the hand in the air, a kind of spatial model of the melody is created, in which, through plastic movements, its sound structure is transmitted. It is also well known that an expressive gesture is an effective means of identifying and expressing the nature of music. This is also true with respect to the melody, musical phrases and intonations. The musical intonation, as noted by some musicologists, is connected, on the one hand, with the emotional intonations of speech, the sound of a person's voice, and on the other hand with an expression of feelings in gestures and pantomime. "A gesture is like an intonation realized in motion, and intonation is a kind of a voice gesture," - believes Mazel (1983, p. 18). In the plasticity of gestures like pantomime, which is a natural human instrument of expressiveness, the character of music is grasped and accurately transmitted intuitively, quite easily and naturally.

Therefore, the method of gestures - in the form of a relative free hand display of the structure and character of the melody - can be used to better understand the emotional meaning of music. It is very important that this method is not used by the teacher (as usually happens), but necessarily by the pupil himself. Only in this case there will be a positive effect from the method of corporal embodiment.

Earlier the author had already formulated the method of motor modeling in the study of piano works (Nadyrova, 2008). The development and systematization of these methods was based on the experience of musical pedagogy, their effectiveness was confirmed by practice. But a full explanation of the mechanisms of action of these techniques from the point of view of psychology, psychophysiology, and neurology was not yet made. Today, thanks to the scientific discoveries of mirror neurons and the emergence of the theory of enactivism and the embodied reality, we have received this opportunity.

In the report at the previous IFTE conference, the materials of an experimental study on the motor simulation of the rhythm and their interpretation in the aspect of the embodied simulation (Nadyrova, 2016). In this work, let us dwell on the method of the embodied simulation applied to the melodic (pitch-sound) structures of music. These techniques will be presented fully in the report at the IFTE 3 conference, but now we will limit ourselves to two examples.

**Episode 1.** In the work on the Prelude 7 of F. Chopin the expressive movement of the hand reveals the beauty and the airiness of the initial ascending intonation on the 6th interval:



**Figure 01.** F. Chopin, Prelude 7.

The following phrases have similar constructions, but there are changes in the direction of movement

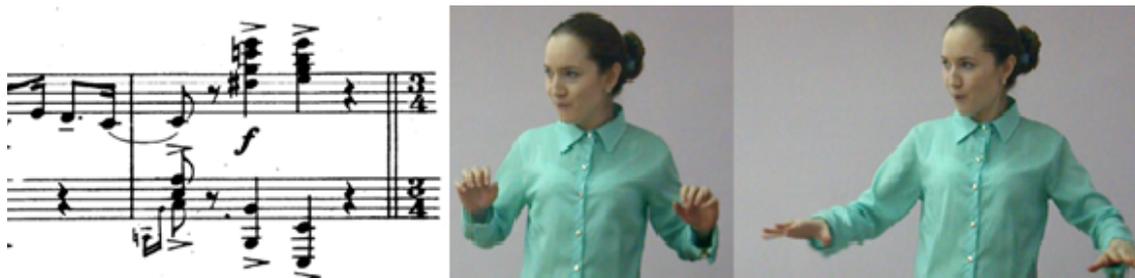
from top to bottom - and a gradual decrease in the first step of the interval. The aspiration of the intonations to a strong beat, to the sounds of C-sharp, D-sharp, A-sharp sharp G-sharp and subsequent

indirect resolution, gives the melodic line a special charm, flexibility and unpredictability. All these

features of the melody, its plasticity and expressiveness can be easily transmitted and in hand movement,

and then in the game on the piano.

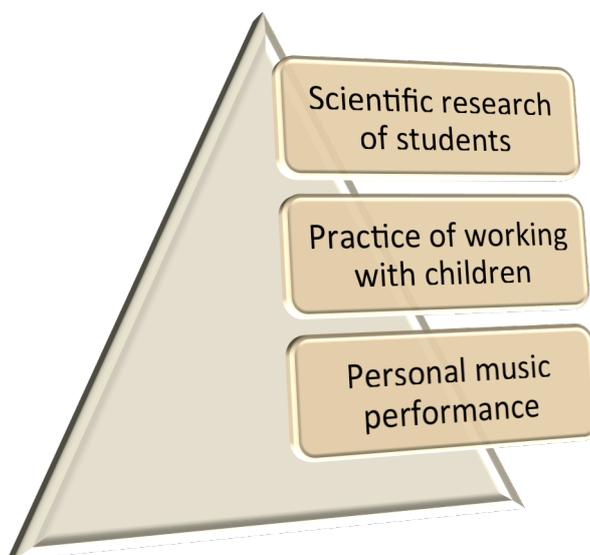
**Episode 2.** An example of the opposite property is S. Prokofiev's play The Dance of the Knights. Here, with the help of a gesture, the stubborn, straightforward nature of intonation, a resolute irreconcilable statement, is clearly manifested.



**Figure 02.** Prokofiev. Dance of the Knights (from the ballet "Romeo and Juliette")

### 6.3.3 Enactivism and embodied cognition in teacher education: an integrated approach

As already noted, the theory of enactivism and embodied cognition is very different from the traditional forms of considering the processes of cognition and learning, as a purely intellectual, "brain" phenomenon. Therefore, it is unusual for students to understand, and is difficult to master at the theoretical level. For a better understanding of the theory of enactivism, students also require an enactive approach that is, going beyond the usual logical speculative consideration and turning to the experience of one's own active activity. Therefore, students' mastery of these approaches should take place in a complex way, combining the theoretical and practical spheres of educational activities: on the one hand, at the level of the foundations of theory and methodology of general and musical education, and on the other hand at the level of their own musical performance and pedagogical practice. So, in individual playing of a musical instrument, the student can use the methods of motor modelling of rhythm and melody and feel their effectiveness, as it were, "from within", from his own body. In the pedagogical practice of working with children (in preschool and junior school), the application of methods based on the motor involvement of children in the experience of music, and the comprehension and analysis of these methods from the point of view of an enactive approach will help to better understand their physiological and psychological mechanisms. Finally, the next stage can be the research work of students on this topic.



**Figure 03.** Three levels of development of the enactive approach in the training of a music teacher

Thus, students' understanding of the theory of enactivism and embodied methods will proceed step-by-step: starting from personal practice of execution to theoretical awareness and scientific analysis, and used in several academic disciplines. This interdisciplinary approach would effectively facilitate the preparation of music teachers - both in terms of their performance competence and in terms of musical and pedagogical theoretical competence in general, including research potential.

## 7. Conclusion

In this paper we have considered the prospects for applying an enactive approach to music education and training.

- This enactive approach, based on the interaction of the organism with the environment (in this case acoustic) and on cognition through the whole body corresponds with the nature of the music itself, in which the sensorimotor reactions and the coordination of the auditory motor and emotional elements of the musical experience play a great role

- We can state that this new approach to cognition surprisingly corresponds exactly to the specificity of musical activity both in terms of perception, and in terms of performance and learning.

- Obviously, this explains the fact that many methods of musical training, which are inherently enactive and embodied, were found in the past practice in an intuitive way.

- The analysis and study of these methods from the point of view of modern scientific achievements gives them a new assessment and interpretation and must enter into the content of the training of future music teachers.

Active practical self-activity of students in the form of musical performance creates unique conditions for understanding the basic principles of the theory of bodily cognition, because it allows one to feel the effectiveness through their body.

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