

MUSICAL THINKING AND ITS EDUCATIONAL IMPLICATIONS

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Abstract

Many papers, articles, and even books are devoted to musical thinking, approaching it from different perspectives. After a long development of the concept, it appears to be most elaborated in the field of music psychology. However, it also has its representation in aesthetics, ethnomusicology, computer science, and, marginally, in education. Although it receives less attention today than in the past, it still has its own meaning, and its development is also occurring in music education. Musical thinking is being developed in all music education activities, perceptual, vocal, instrumental, musical-motor, and music-dramatic. Although the musical mindsets of performers, percipients, and composers differ, it is possible to contribute to their development in music education lessons by introducing new, optional subjects and adjusting the teaching methods and the classroom climate. The quality of musical thinking influences the quality of musical activities, so it needs purposeful attention.

Keywords

music activities – music education – music psychology – musical thinking – music theory

The aim of the study is to summarize historical theories of musical thinking, characterize its nature in terms of interdisciplinarity, and describe the educational implications of current understandings of musical thinking.

Diversity in the Understanding of Musical Thinking

To this day, the concept of musical thinking does not have the character of a scientifically defined term. Increased attention was paid to it in the 20th century when extensive research activities were carried out. It resulted in numerous theoretical studies with a considerable thematic dispersion and different approaches – historical, aesthetic, semiotic, psychological, or linguistic.

The connection between music and thinking is undeniable, but the theories explaining the nature and different aspects of musical thinking are not uniform. In practice, it is possible to distinguish three modes in the use of musical thinking:

1. thinking by/during music, during which free associations of various kinds arise (at this mode, music forms a soundscape and activates the emotional and/or rational components of consciousness);
2. thinking about music, its organization, and impact, i.e., standard form of conceptual thinking;

3. thinking through/via music – includes forming, understanding, and expressing ideas, attitudes, and subjective relations to reality. “To think through music is to create and organize sound structures in such a way that they express and communicate something.” (Kulka, Poledňák, Pražáková, 1988, p. 186; translation: the author of the article).

In the fields of music aesthetics, music pedagogy, and psychology, all three activities leading to musical thinking are the subject of research. While the first one is exclusively related to musical perception, the sounding music could be an aid in the second one. However, an educated musician can also think about music based on musical notation or even without it. The third alternative is related to compositional activity or the interpretation of musical works. In these activities, the thinking individual works with musical material, i.e., sound, musical notation, or mental interpretation of these phenomena to which he/she applies musical thinking. It can be studied from the aspect of logic, aesthetics, psychology, or even ethnomusicology.

Nowadays, the term musical thinking is associated with modern content, and in search engines, it is (for musicians) misleadingly found also in connection with non-musical fields. For the sake of interest, one can mention the concept associated with leadership and business, with Agile methodologies, organizational change, design thinking, etc. It is understood as “a mindset to think from diverse perspectives at the same time and to get inspired to work in meaningful collaborations above silos.” (Zürn, n.d.).

Historical Development of the Concept of Musical Thinking

Musical Thinking as a Psychological Category

Psychology is probably the most frequent area where musical thinking is explored. Nowadays, scientists emphasize the nature of musical thinking as a process of understanding in which not only the specific individual's characteristics but also social and cultural background and aesthetic aspects are reflected. It can be assumed that “... it is based on musical feeling, musical perception and relies on sound, musical and artistic images. Musical thinking is an understanding of the specifics of musical culture, a specific intellectual process of learning the laws and works of musical art.” (Murodova, 2021, p. 196).

Let us consider musical thinking from a psychological point of view. We can classify it as one of the higher cognitive processes (equivalent to general thinking but associated with music). Alternatively, we can view it as an accompanying phenomenon to the musical experience (which could be associated with the perception, performance, inner experience of music, emotional input, and thoughts processing of musical material). These views developed gradually from the mid-19th century onwards when the conceptus of a theory of musical thinking appeared in Herbart's *Psychologische Bemerkungen zur Tonlehre* [Psychological Notes on the Theory of Music] (Herbart, 1811, pp. 99, 194, 259, etc.). Herbart first used the term “*musikalisches Denken*” [musical thinking] as a factor that enables one to understand the meaning of music. He limited it to a recognitive process that complements perception.

Friedrich Theodor Vischer further developed the idea of the need to use rational functions during music perception. He assumed that these functions include memorization, recollection, and ideas/images hierarchization, all of which require the involvement of

thinking (Vischer, 1922, p. 85). However, he did not use the term musical thinking. The term itself reappeared in Eduard Hanslick's work *Vom Musikalisch Schönen – Ein Betrag zur Revision der Aesthetik der Tonkunst* [On the Musical Beauty – A Contribution to the Revision of the Aesthetics of Sound Art] (Leipzig, 1854). He suggested a connection with the use of the figural imagination during music perception, i.e., “further mental processing of the perceived musical material” (Burjanek, 1970, p. 30; translation: the author of the article). Hanslick's theses were further developed on the Czech scientific scene by Otakar Hostinský. He explained the active music perception as “a process of comparison, of assigning new perceptual material to a general image of the same material that has previously arisen in the psyche (the psyche, meanwhile, functions analytically) ...” (Burjanek, 1970, p. 34; translation: the author of the article), thus reaching a particular stage of thinking.

After a short time, a separate line of music psychology began to develop concerning, besides others, the connection of music-theoretical thinking. Its direct initiator was Hugo Riemann, who was the first to use the term *Musikalische Logik* [Musical logic] (1873). He defined the musical logic in his dissertation *Über das musikalische Hören* [About Musical Hearing] and described it as “the sum of all the rules of music which have their roots in physical and physiological conditions and continue in the ranges and laws of the psyche” (Burjanek, 1970, p. 40; translation: the author of the article).

He drew attention to the specifics of musical thinking when listening to music and its parallels with standard logical operations. His explorations resulted in the knowledge that when listening to music, the following applies:

- comparison (when following consonances and dissonances, the percipient compares currently perceived chords with ideas of already heard chords);
- analysis (the listener breaks down the overall sensory impressions into parts);
- induction (induction allows understanding of the whole musical idea through the analyzed parts).

“The deductive (analytical) method would therefore divide the whole piece of music into parts, periods, movements, bars, and time signatures. To a certain degree, however, great artists are capable of comprehensive conceptions, which do not arise gradually, but all at once, so that the artist, with a glance of the mind, overlooks (hears intuitively) the whole thought at once. (...) Of reproducing artist and even of the listener, the inductive (synthetic) method is the only one that enables understanding.” (Riemann, 1874, pp. 41–42; translation: the author of the article).

Riemann documented the necessity of a programmatic exploration of musical thinking in *Die Lehre von den Tonvorstellungen* [The Theory of Sound Ideas] (1915).

The complicity of thoughts in artistic experience became the subject of interest of Richard Müller-Freienfels. He refined and developed Riemann's views on musical analysis and synthesis. Drawing on general psychology, he documented the existence of musical thinking with concrete examples in the two-volume *Psychologie der Kunst* [Psychology of Art] (1912, 1923, and 1938). He argued that if the recipient follows the theme's exposition or understands one motif as a variation of another, he uses not only his/her memory but certainly also thinking.

Otakar Zich further analyzed the musical experience. His description of semantic ideas in *Estetické vnímání hudby* [The Aesthetic Perception of Music] (1910) was a significant

contribution to the theory of musical thinking. Zich's theses resulted in the observation that musical images "quite certainly sum up into musical ideas/thoughts according to the laws of musical logic" (Zich, 1910/1981; translation: the author of the article). He divided meaning images into three groups: musical, sound and technical. The first group, typical for music images, is represented by work with musical themes or motifs (named "individua"). Moreover, the music images could be divided also into three groups: melodic, harmonic, and rhythmical. The second group, sound images, were images of the composition material, i.e., tones and their characteristics, such as absolute pitch, timbre, or intensity. The last group, technical images, was an overarching term for musical and sound images, and their system was called music theory. (Zich, 1910/1981, pp. 159–168). Zich used the term musical thinking as "a kind of semantic thinking" whose "essence is the abstraction and combination of the sensory tonal substrate of music" (Zich, 1924, pp. 5–6; translation: the author of the article).

The influence of Zich was manifested in the theories of Vladimír Helfert (1886–1945), who operated with the concept of musical thinking, explaining it as "the mental ability to reproduce and produce distinctive tonal ideas/images. This ability is enriched in its very germ by musical logic, which is the ability of aesthetic organization of tonal ideas/images, from which melodicism, intervallicity, harmony, rhythmicity, and work with dynamics and timbre emerge" (Burjanek, 1970, p. 65; translation: the author of the article).

Zich's theses also inspired Jozef Hutter. Highlighting the abstractness of the cognition process in his predecessor's teachings, he brought a new theory that explains musical thinking as "a specific kind of thinking in a specific substance, which is conditioned by the ability to merge the substance of a tone into a tonal concept" (Hutter, 1943, p. 17; translation: the author of the article). Thus, he created a form of nonfigurative-figurative musical thinking in which he applied the equivalents of Zich's basic general thinking principles: analysis, synthesis, and the recognition of "unity and change." He fundamentally differentiated the lay music experience from musical thinking in his writings.

Simultaneously with Hutter, Ernst Kurth published essential works about harmony, counterpoint, and many others. Although his contribution to the musical thinking theory was little, the link between musical thinking and musical psychology began to crystallize in his *Musikpsychologie* [Music Psychology] (1931).

In sketching the development of the theory of musical thinking, one must mention Boris Vladimirovich Asafiev's specific conception. In *Musical Form as a Process* (1965), he characterized intonation as "an expression of thinking of its own kind," melody as "an intellectualized reflection of the continuity of musical sound," musical form as "the thought component of music," and the artistic, musical experience as "a complex of aural perception accompanied by mental work, speculative thinking..." (Tull, 1977). All of these elements are unstable and ever-changing, "... no single aspect of intoning is evaluated as self-contained, but always as a stage of transition into the following one." (Tull, 1977, p. 195). With his views, he crossed the barrier and combined sensuality (sensory perception) with rationality (thinking). He suggested that understanding a form is understanding the rationality of the flow of sound, and the sound combinations reflect the intonations that appear rational to the composer. "In the assimilation of music, there occurs a constant battle between sound combinations which are crystallized in the memory (usually such sound combinations are perceived as forms, and from them, constructive schemes are derived by which the teaching of 'forms' occurs) and the equally continuous process of organization, i.e., the reduction to some rational unity of a variety of sound relations inspired by creative instinct in the search for new stimuli" (Tull, 1977, p. 214).

A valuable contribution to the theoretical works was Jozef Burjanek's publication *Hudební myšlení* [Musical Thinking] (Prague–Brno, 1970), in which he drew on historical information, opinions, and theories of renowned scientists. He created a more modern theory of musical thinking, in which he determined the contribution of thinking to the musical experience, differentiated its components with a specific musical character, and analyzed its relation to the overall musical experience. He defined musical thinking as “an unmistakable kind and content of the mental activity, as a permanent genesis of abstracts and their structured functioning” (Burjanek, 1970, p. 85; translation: the author of the article). He stated that it is “a real phenomenon conditioned by an abstract disposition which, in the case of music, manifests itself in its specifically own and possible way on the content of consciousness by reworking its figurative components partly into non-figurative” (Burjanek, 1970, *ibid.*).

Musical thinking is a specific form of artistic, i.e., figurative thinking in “images.” Its sensory basis is auditory perceptions and images, which become the subject of abstraction and combination with the use of thinking operations. It is “a complexly conditioned heuristic process in the psyche of the individual during her/his contact with music and musical works, which enables her/him to know music, to experience it, to penetrate its structure, and to provide versatile musical activities” (Sedlák, 1989, p. 142; translation: the author of the article). The more difficult and complex the musical structure of the work that one encounters, the more necessary the involvement of higher rational functions to understand it.

The level of involvement of various rational functions depends on the maturity of the individual engaged in music. Four phases can be distinguished in connection with the ontogenesis stages: latent, elemental, conscious, and hypertrophic. That is also described in the literature as the multi-layered nature of musical thinking, where “the lowest layer is the basic perceptual analysis, stating that the following musical unit is identical or different or even contrasting ... to the previous one... The highest layer of thinking is the application of the logic of challenging musical units, understanding challenging music already in the process of its perception by understanding identity, variability, or contrast of as many comparable components of its overall structure as possible.” (Burjanek, 1970, pp. 81–82; translation: the author of the article).

Ivo Osolsobě brought his perspective on musical thinking, in which he emphasized the movement awareness of music. He considered musical thinking only a special kind of thinking through movement (Osolsobě, 1973).

Musical Thinking as an Ethnomusicological Category

When considering the social, cultural, or biological conditionality of thinking as a psychological category, and if it is linked to music as a socially, materially, and culturally conditioned phenomenon, we inevitably enter the field of ethnomusicology.

An essential contribution to the scientific clarification of musical thinking in this context was made by the Slovak scientist Jozef Kresánek, who in 1977 published his extensive work *Základy hudobného myslenia* [The Basics of Musical Thinking]. He approached the topic based on ethnomusicological research from the point of view of a historian (Kresánek, 1977, p. 320). His study focuses on musical language – musical shapes, among other issues. In his attempt to grasp as broadly as possible the concept of musical thinking, he analyzed its two verges:

- the first one accepts the “metahistorical moments and moments abstractable from the expressive-emotional point” (Kresánek, 1977, p. 317; translation: the author of the article); it is heading towards the autonomous nature of music;
- the second one pursues “moments determined by the connection of music with economic, social, cultural development in an emotional-expressive way” (Kresánek, 1977, *ibid.*); it leads to the artistic connection of music and out-musical reality.

The process of musical thinking results in products that reflect not only the individual himself but also the time and culture in which musical thinking occurs. “In ethnomusicology, this curiosity about the products of musical thinking is satisfied through extensive musical analysis, sometimes using transcriptions or notations produced by the musical culture under study. This type of detailed formal analysis of works and music performances as an art declined after about 1980 in favor of research that used other metaphors to situate music within culture and society.” (Rice, 2014, p. 34).

At the end of the 20th century, scholarly attention also turned to questions of musical thinking in non-European countries. An exemplary contribution in this field is the work of Bruno Nettl from the University of Illinois (1994). He analyzed musical thinking and thinking about music. According to him, “the way in which musicians think musically, the ways in which they, as it were, think their music, depends in large measure on the ways in which they think of their world at large. And within that context, the ways in which a society thinks about the concept of music, about music in culture, about musicians, may determine much about the way in which the musicians of that society think their music” (Nettl, 1994, p. 147). He pointed out the difference in the public views of W. A. Mozart (the child prodigy, often misrepresented as a carefree individual composing based on sudden inspiration and enlightenment) and L. van Beethoven (the hard-working composer with amounts of elaborate sketches), the difference between professional musicians (respecting the demands of their employers) and amateurs (having freedom in their choice of playing duration and time, choice of melodies and modality; improvising according to own desires). His study also touched on the tension between authority and freedom in musical thinking.

Musical Thinking in Terms of Aesthetics

A different perspective on musical thinking can be obtained by reflecting on the communicative mission of music. In this case, a musical work could be considered a communiqué – information sent by the author/sender and received by the listener. Communication presupposes the existence of a language capable of encoding a message comprehensible to the recipient – the communicant. In this process, musical thinking plays an irreplaceable structure-creating function because it creates the structure of the musical expression, encodes the information in it, and helps to decode it (Aranovskii, 1974). This theory lacks an analysis of the mental structures and processes involved in the perception of a musical artifact and does not consider psychological aspects of perception.

In aesthetics, musical thinking can also be approached as a phenomenon influenced historically and socially. In this case, it is determined by musical logic, understood as “the laws of a particular, socially historically conditioned system of musical thinking” (Fukač & Poledňák, 1979, p. 75; translation: the author of the article), i.e., by quasi-contemporary musical norms.

When we reflect on the genesis of music, the essence of musical thinking can be expressed in three spheres:

1. sonoristics – soundness – influences musical thinking in the sense of evoking pleasant or unpleasant sensations through consonances and dissonances;
2. dynamism – could be distinguished:
 - a) sensomotoric – expresses the nexus with physiological factors;
 - b) musical – it is related to the dynamics, agogics, tonality, and tectonics of a musical work;
3. thematicity – shapeliness – is manifested while following motivic and thematic work in composition; it presupposes “the analysis and the synthesis as well as abstraction, which cannot be denied the expert rationality with which human thinking operates in general” (Kresánek, 1977, p. 44; translation: the author of the article).

“A new area in the field of musical thinking is opening up by the study of various modes of thinking (associative logic, logic of Gestalt, logic of language, formal logic, dialectical logic)” (Fukač & Poledňák, 1979, p. 79; translation: the author of the article). Music is connected with other types of thinking by applying the principles of general and special logic and language.

The perception of music as a parallel of language is nothing new. “Language and music share many properties... For example, both domains rely primarily on the auditory modality and involve the perception and production of sound. They require memory capacity for storing representations (words, chords...) and the ability to combine these representations by means of a system of rules or structural schemata.” (Jackendoff, 2009 in Rebuschat, Rohmeier, Hawkins & Cross, 2012, p. xvii).

Music and languages represent cognitive systems in which the use of thinking represents a specific cognition. In spoken language, language acquisition is conditioned by the cognitive abilities that the individual uses to make connections within a collective culture. These connections enable him/her to acquire personal knowledge of certain circumstances to interpret different events. “Music involves a myriad of context-dependent phenomena, some of which are specific to music (e.g., consonance) and some of which are not (e.g., expectations and implications, intuitions of coherence and anomaly, and memory). Yet the characteristics of each of these phenomena, as they apply to music, seem to be inextricably tied to constraints on musical structure.” (Bharucha, 1987, p. 2). The acquisition of musical language then presupposes making connections that enable the individual to interpret different phenomena and their sequences and connections and to create a schema in which he/she could interpret the heterogeneous information acquired.

Regarding musical language, one has to consider that there are many “dialects.” They may differ to such an extent that a person who understands one of them may not understand the other, much less be able to “speak it” or even read/write it. These include, for example, the classical musical languages of Western Europe, the jazz language, the languages of Asian music, as well as written language expressions created for various instruments (lute tablature) or computer-readable protocols.

Contemporary Theory of Musical Thinking

In modern science, musical thinking is most often understood as a specific type of thinking that operates with musical material and is frequently associated with listening to music, performing, or composing music. "Musical thinking, which consists in processing, evaluating and creating new musical information and expressing the ability to understand and analyze what you hear, mentally imagine and operate elements of musical language, evaluate music and the quality of its sound, helps to achieve a good result in interpretation." (Xin, 2021, p. 69).

Musical thinking is tied to musical material, artistic images, and musical images and is thus necessarily linked to some form of musical activity. Depending on the nature of the musical activity, specific musical thinking operations and reasonings can be performed. Musical perception, musical reproduction, and imaginative production of a work of art represent the three modalities of musical experience:

1. Musical thinking of the recipient

During the reception, the perceptual sensory substrate is abstracted, and the resulting musical ideas merge with each other and with the flowing music. This process can also be identified in the listener – the layman, who knows the onset of familiar themes and motives, their repetitions, and variations, apprehends some form, perceives instrumentation and its changes, etc.

2. Musical thinking of the performer

In the sound realization of composition, the musical thinking of the recipient is applied in a considerably refined form. The excellent performer must not only understand the meaning of individual notes and tonal units, their metamorphoses, the method of harmonization and functionality, but he/she must also have a clear idea of the content, meaning, and poetic essence of the whole work. That means that he/she must be able to thoroughly analyze and justify all the elements of the performed composition, even from a theoretical point of view. The decisive factor of a good interpretation is understanding the details and creating a meaningful whole from them (Nejgauz, 1963). Memory is an indispensable phenomenon, especially logical memory (besides all types of implicit and explicit memory, such as perceptual, sensory, visual and hearing, emotional, movement, tactile, procedural, semantic...), which enables reproduction according to the meaning links in the structure of the composition.

3. Musical thinking of the composer

The expedient of a musical work uses during his composing activity operational thinking, which, according to Shochor (1974), includes three complementary and mutually conditioned types:

- Subject-instrumental thinking is applied when the musical idea arises while musicking quasi-directly from the possibilities of the instrument;
- figurative-imaginative thinking is used when the composer transforms, varies, modifies the musical idea, discovers its possibilities, verifies its carrying capacity;
- abstract-logical (conceptual) thinking is applied when the composer, based on theoretical knowledge, chooses suitable possibilities and means from available ones, searches for details to create the intended whole, combines, transforms, and finally creates the whole.

Kulka summarized the most frequent reasoning operations used by the composer: “transformations of musical structures, repetition, the introduction of new ideas, division, shortening, expansion of motifs, condensation, dilution, strict and free inversions, retrograde procedures, permutations, rotations, concentrations, interpolation and selection of motivic elements and surfaces, change of the theme position, dynamics, tempo, contamination, thematic montage, mixing, collage.” (Kulka, 1979, p. 121; translation: the author of the article). In addition to operational thinking, it involves non-operational thinking, reflectivity, metacognition, agglutinating and magical processes, and other procedures that cannot be converted into logical reasoning operations.

The presence of conscious processes in composing is essential. However, the subconscious also plays an irreplaceable role in the entire creative process, in several stages defined by Wallas in 1926 (as described in Lehmann, Sloboda, Woody, 2007, p. 133). Already the choice of the topic/subject and the basic inspiration may be based on previous experiences, thoughts, ideas, and inner impulses, which may not be processed and stored on a conscious level. Further, few composers can write their works from the beginning to the end without some pauses, stops, and blocks that temporarily inhibit their creative activity. The incubation stage – when the creative intention matures under apparently reduced conscious control, for example, during sleep or daydreaming – is therefore usually necessary to create new original work. Even during conscious activity, excluding direct composition processes, the composer’s mind is influenced by unconscious processes. It focuses (albeit not consciously) on processing the compositional intention (e.g., in the form of perceived stimuli selection and their interpretation, conditioned perception, selectivity of attention and interests, influencing memory...). Likewise, in the inspiration phase, the subconscious plays an important role, from which original ideas and thoughts can spring, further expand, wander, intertwine, appear, and disappear. In the next stage of illumination, subconscious processes are also implemented. “In self-observation, intuitive maturation appears as a sudden insight, an understanding, an idea that sprang up unexpectedly. It is easy to succumb to the surprising experience and understand it as a ‘divine’ inspiration.” (Kulka, 2008, p. 388; translation: the author of the article).

Similarly, unconscious processes are very active in the subsequent stages of elaboration (working out the details) and verification (evaluating and selecting the most appropriate means). Intuition makes it possible to link the composer’s knowledge of various composing techniques and his/her mastery to the realm of feeling capacities (Kaschub, Smith, 2009, p. 16). In selecting means, “the composer employs intuition – the knowledge gained in the subjective experience of implicit learning – to inform explicit artistic decision-making. Therefore, as composers make musical decisions in the process of composing, there exists a balance between intuition (feeling based/knowledge within) and intellect (conscious awareness/knowledge about). This balance, in constant flux from a decision to decision, represents the knowledge base for compositional decision-making.” (Kaschub, Smith, 2009, p. 16). Moreover, unconscious processes are still present even during the last stage of the compositional activity (corrections and final adjustments). “In those final moments of writing furiously ... you might encounter a small voice—your gut instinct—that questions whether one small part of your piece is exactly how you want it... I urge you, for the sake of your future self: Listen to that voice... That instinct... can be trusted.” (Trumbore, 2019, p. 41).

In all modalities of musical activity, musical thinking is linked to ideas involving musical images and their elements, such as melody, rhythmic structure, dynamics, agogics, motive,

musical idea, and harmonic structure. Moreover, it is concerned with connections between music, feelings, moods, ideas, and thoughts. In some cases (especially in compositional or conducting activities), a special kind of imagination is an essential part of musical thinking, so-called “inner hearing,” which allows the musician to “hear what he sees, and see what he hears” (Campbell, 1989).

Musical thinking can reach different levels. The lowest is the aesthetic response, which is characterized by passive input. “Lower order musical thinking is when inter-relating, rearranging, and extending musical information does generally not occur. There is little or no problem-solving in operation.” (Persson, 2011, p. 8). The higher level of musical thinking is more complex and includes other processes. “The process is active and intentional by creating, recreating, generating, analyzing and/or communicating a musical product.” (Persson, 2011, *ibid.*). Therefore, musical thinking understood in this way leads to a musical product that is absent at a lower level.

Surprisingly, musical thinking does not appear as often in contemporary theory as it did in the past. Theories of musical thinking reached their peak in the late 20th century when it was explored in music psychology, neuroscience, ethnomusicology, aesthetics, linguistics, and, in the early 21st century, computer science. Nowadays, much attention is paid to critical and creative thinking, which are becoming the subject of research primarily in terms of their nature and development, and thus often are the subject of educational psychology, and musical thinking falls behind. It is important to pay attention to musical thinking because its specific nature requires its deliberate and purposeful stimulation in the school environment, similarly to critical and creative thinking.

Pedagogical Implications – Development of Musical Thinking

Musical thinking is a characteristic that can be developed. Music pedagogy emphasizes that it “characterizes the student’s ability to use the musical language (to understand the meaning of the artwork, to transmit it in performance, to create and improvise music)” (Xin, 2021, p. 70). From a pedagogical point of view, equivalences between general and musical thinking seem important. In musical thinking, the reasoning operations such as analysis, synthesis, generalization, typification, comparison, and others are applied. In addition to operations with musical ideas, musical thinking also requires abstraction (in deepening perceptions), induction, and deduction (in evaluating a music piece and trying to place it in a particular epoch of musical development). All thinking processes have a rational basis; they are abstractions of the musical work’s aural and/or visual sensations. These facts explicitly indicate a progression from sensory perception to rationality.

However, limiting oneself to emphasizing rationality’s role in musical thinking would be very misleading. Emotionality also plays a significant role in any musical activity – from the basic feeling of pleasant or unpleasant, through the evocation of associative imagery, to the overall experience of the sounding or produced music based on the excitation of the emotional sphere of the human personality.

Several programs and methods have been developed to support musical thinking development. They are based on the premise that every child can think musically, at least at an elementary level, and with the proper guidance, can master this process at a higher level. Most of these methods involve the development of imagination, aural abilities, performance skills,

and possibly, the basics of composition. In essence, they do not differ from ordinary music education, which includes vocal, perceptual, instrumental, music-motoric (music-movement), and music-dramatic activities.

Considering different approaches to the music art, it is possible to focus on the purposeful development of musical thinking through different components of general music education: listening to music, playing musical instruments, singing, improvising, learning the history of music, means of music expressions, theory of music, essential musical elements, music vocabulary, analyzing and evaluating music pieces, reacting to music by movement, providing reasonable arguments and justifying own opinion, creating elementary/more advanced compositions, performing music dramatization, etc.

Besides general music education activities, specific methods and concepts could be applied in classroom instruction. Some examples are given in the following paragraph.

1. Implementing an alternative discipline into a curriculum.
2. One was prepared by V. Brainin, who identifies teaching musical language with the development of musical thinking. He explains that “the ability to predict the incoming musical information and to ‘co-intone’ and ‘co-compose’ will be a sign of the degree of maturity of musical thinking.” (Brainin, 1996–2004). In order to develop musical thinking, he requires coverage of all disciplines such as Solfeggio (singing from a music sheet, as well as intonation exercises, acoustic analysis, dictation, and mastering rhythm), theory of music, musical literature, the study of musical cultures such as various interval structures, chords and their inversions, modes, basics of composition, etc.
3. Michele Kaschub is primarily concerned with the development of imagination and participation in composition exercises. Initial activities include exploring sounds by listening, which should be associated with actively imitating what is heard. He equates learning a musical language with learning a mother tongue: the child listens to it from birth, then imitates it, and thus actually learns to use and understand it. The second alternative is exploring sound by composing, using imagination. For the realization of composing activities, one can use exercises described by Kaschub (1997, p. 30–32), such as:
 - “Blind duet” – two students stand back-to-back (to rely more on hearing rather than on visual keys), and one of them starts singing to establish the character of their new composition. After one or two measures, the second student continues to support/compliment the first student. Then the first student adapts his/her song in response to the material presented by his/her colleague. The goal is to practice a related improvisation based on listening and responding to the new musical material (melodies, ideas, motives).
 - “Improvisatory web” is based on speech imitation. The teacher provides students with a short sentence, asking them to repeat it with changes in the dynamics, rhythm, tempo, word order, pitch, range, register, direction, articulation, etc. The graphic manifestation would be a web, in which the phrase is the center, and the other elements are placed around it (similarly to mind mapping). The exercise helps teachers to introduce new musical terms.
 - “Vocaphone” – one student acts as a composer/conductor, who selects the scale/key, and the other eight students represent various grades of this scale.

First, all of them sing the scale a couple of times together to become comfortable with its pitches, and then, the conductor points to students, and they sing “their” pitch using solfège syllables, numbers, or neutral syllable (each student is assigned one pitch of the scale). The conductor experiments with duration, dynamics, intervals, rhythm, and even with harmonies (by pointing at two students at the same time). If more students are in the classroom, these can stand behind the eight students and be assigned the pitches forming a chord to improve ear training, learning chords, and harmony progressions.

- Melodic limits exercise – each student creates his/her own melody, and the other students repeat it. Then the teacher limits the melodies with instructions such as: “Sing an eight-note melody that begins on Do,” “Sing a four-tone motive that ends on Sol,” etc. Afterward, the limitations could include limited intervals, pitches, steps, etc.
 - Internal composing – is suitable for a higher level of music education. It requires thinking in sound and musical memory. The students work internally; they think in music (similarly as if they were thinking in words), i. e. they imagine the short motives, phrases, or songs without making any sounds. Afterward, they start internally imagining and inventing short melodies that are gradually longer and longer. The next step would be adding voices to their melodies. At the end of the exercise, students can use a notation system or sound recording to record their ideas.
4. Another option, according to D. Murodova, is the development of musical thinking based on Asafiev’s formula in three stages: impulse, movement, and conclusion. According to her, the initial impulse involves one or two themes (exposure or expression), and then, “after the storytelling begins the development of musical thinking, and one of the simplest examples used here is return and comparison. Change and exchange is another example of the development of musical thinking.” (Murodova, 2021, p. 197).

Thus, in order to develop musical thinking, various musical activities based on working with musical materials can be implemented. Through these activities, the pupil is encouraged to understand the musical materials and to work with them in various ways, such as listening to music and conscious reasoning, creating musical ideas using basic compositional processes, consciously reacting to music heard by movement reactions, singing and performing activities with the possibility of engaging imagination, predictive ear, critical thinking, and a wide variety of thinking operations and procedures. Simply said, the pupil should learn to “think in sound.”

Nowadays, educators have at their disposal a variety of software and programs that can help develop students’ musical thinking, particularly singing programs, Solfège programs, computer-supported listening and improvisation activities, and many others. Solfège programs are designed to help pupils/students learn Solfège and thus increase their musical literacy. They can practice Solfège being guided by artificial intelligence, which will provide them immediate interactive feedback on the correctness of the pitch and duration of the sound, sung syllables, and dynamics. Programs include diverse content and online materials ready to be presented visually and audibly at any time. They allow teachers to assign homework and monitor and coordinate students’ activities both in the classroom and outside the class – asynchronously remotely (Koren & Strenacikova, 2021, pp. 92–99). Newly developed

online learning programs that allow collaboration between future musicians are also a significant aid. An exciting program is *CrossSong Puzzle* consisting of mashed-up excerpts from different songs. It is “a novel type of music-based logic puzzle that integrates musical and logical reasoning (...) CrossSong has been designed to encourage ‘musical thinking.’ The puzzle requires solvers to isolate rhythms, timbres, and melodies in their minds in order to identify connections between the tiles. Such careful listening may flex their musicianship.” (Smith, Kato, Fukayama, Percival, & Goto, 2017, p. 214).

Since musical thinking is a complex phenomenon, its purposeful development requires not only to include specific classroom activities, teaching methods, and aids but also the creation of suitable conditions to motivate pupils to actively participate in the educational process and be responsible for their learning. According to Xin (2021), the development of musical and performing thinking could be facilitated by:

- “creation of a special musical-centric situation of development, the center of which is a musical work and through it, music as a phenomenon, as an artistic reality, is objective and self-sufficient;
- stimulation and expansion of cognitive capabilities of students due to metaphorization of the content of the subject of cognition;
- formation of music-aesthetic competence of the student as a special intuitive form of his current knowledge;
- creating an atmosphere of positive emotional support for the student’s creative performing attempts” (Xin, 2021, p. 71).

Conclusion

Musical thinking can be viewed from several perspectives. Its psychological, aesthetic, and ethnomusicological aspects, which have been explored and results presented in various scholarly publications, are of particular relevance to pedagogical practice. The music pedagogical approach to musical thinking reflects scientific theories that emphasize different aspects of this complex phenomenon. The purposeful development of musical thinking is thus based on the development of its various components in a specific musical activity. The classroom activities should be sufficiently heterogeneous to cover all the components of music education. Also, teachers should implement various MusicEd programs and ICT.

For pedagogical implications, it is essential that: “Musical thinking is directly related to the birth of an artistic image. The artistic image in a musical work consists of a unity of material, spiritual and logical origin. Note to text, acoustic dimensions, melody, harmony, metrorhythm, dynamics, timbre, register texture, mood, imagination, expression, will, and emotion to the spiritual beginning; the logical beginning includes form, genre, and content. A composer, a performer, a listener can have musical thinking only if he has the beginning of all these musical images in his mind.” (Xaydarovich, 2021, p. 23).

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