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Developing Musicality Formal and Informal Practices

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Once upon a time there was a young child who had a very nurturing and caring father. More than anything else in the world the father wanted the child to learn to love music and to be able to sing and play the piano. The dad loved opera. He listened to opera night and day. His favorites were Caruso, Nelson Eddy, and Jeannette McDonald. Once a week he might listen to Mitch Miller or Lawrence Welk but he knew that these were not great musicians. He wanted his daughter to be a great musician like Licia Albanese or Maria Callas.

The daughter never heard her father sing, and he couldn't play the piano but he played the harmonica. He taught himself to play the harmonica. He could play anything he heard. His #1 chart topping selection was the "St. Louis Blues." Of course he never taught his daughter the harmonica or how to listen to the songs and play what she heard. He had her listen to 78 records of famous opera singers and told her the stories of the operas. When she turned six, he bought a piano and enrolled her in piano lessons. He found a voice teacher who would take her; she auditioned with "The Italian Street Song." All were amazed when she sang because she sounded like a 40-year-old opera singer, not a six-year-old little girl.

The little girl studied music throughout her school years and college. She learned to read music and play the piano very well. She also learned how to sing very well. The dad's dreams of a musical child were fulfilled. He played his harmonica until he could no longer play it because of illness. He bequeathed his harmonica to his daughter. When the daughter looks at that Hohner harmonica she thinks of a man with great musicality, able to audiate and copy what he heard, able to improvise different arrangements of what he heard and even compose songs. She wishes she could tell him about his great musicality because he never thought he was musical. He thought she was.

Musicality

The purpose of this paper is to examine formal and informal music teaching practices and the relationship these practices have to the development of musicality. By examining the perceptions, definitions, and origins of musicality we might better understand formal and informal education practices and how they relate to music education today. The premise of the paper is that educator's and philosopher's views of musicality relate to how it is presently taught.

Musicality is a loosely used term with many meanings. It can be applied to a small child who chants a nursery rhyme, or to a harmonica player who plays by ear, or to a conductor like Toscanini. Some educators and philosophers believe that musicality is manifested in the technical achievements of musicians. Others believe that technique is secondary and musicality is the level of expression a musician is able to bring to a work.

Philosophers such as Bennett Reimer acknowledge that attention to the technical aspects of music is needed for the development of musicality. In 1989, Reimer addressed the need for balance between "the technique as a means for achieving expressive performance and technique as an end" (p.169). Reimer wrote that "heightened aesthetic experience," which occurs through listening, comes to those who are truly musical.

In the 2003 edition of his *Philosophy of Music Education*, Reimer returned to the issue of musicality and elaborated upon its definition, origin, and means for development. Reimer uses the term "musical intelligence" rather than "musicality" possibly to differentiate between his concept of musicality and the view that musicality is equated with talent and skill. He acknowledges the work of Howard Gardner, who included musical intelligence amongst all the other human intelligences. Gardner's theory provides support for elevating music as a school subject that requires intelligence just as language and math. Some previous assumptions about music intelligence were based on beliefs that music was not cognitive but a talent, skill, ability, or degree of musicality.

Where Reimer feels Gardner's theory falls short is in Gardner's idea of music intelligence being a single, general factor. According to Reimer, there are many ways to be musically intelligent. A person can be musically intelligent in composing, performing,

improvising, and listening, and in doing music theory, musicology, and music teaching. While many people may achieve a certain level of success in one or two of these roles, it is unlikely that they will be competent in all of them. Reimer warns of the dangers of creating a definition of musicality that imposes “rigidity.” In his words, a definition should be used as “tools for thought rather than a prescription to be followed slavishly” (2003, p.204).

Reimer’s defines intelligence as the ability to make connections by using ever-increasing subtle discriminations. Innate ability or aptitude and our environment determine the amount of success we achieve. Reimer believes that a student’s ability can be realized through proper education. Musical intelligence then is the “level of one’s ability to experience music as meaningful, informed by sensitive discernment and broad understandings, in each particular musical role engagement in which one becomes involved” (p. 213).

For music educator, Edwin Gordon every human being is born with the some level of a capacity to develop musicality. Gordon calls this capacity “music aptitude”. Exposing a child to quality early childhood experiences is the best way to insure a child will come close to reaching their full potential. The extent to which someone develops their musicality would be a measure of one’s ability to audiate, which Gordon defines as the ability to hear and comprehend in one’s mind the sound of music that is not or may never have been physically present” (1997, p.361).

Gordon acknowledges the importance of teaching technique to music students. There are six stages of audiation and eight ways to audiate. The teaching of technique should be coupled with the teaching of audiation. Gordon describes performers as being “technically proficient” (p.346) but often having limited audiation skills. It should be noted that Gordon believes that while becoming technically proficient on an instrument or voice is important, he feels it is just as important to teach students to become “musically intelligent listeners” (p.347). Artists and listeners alike should audiate. In other words, the whole of society should be intelligent listeners or musical in order to “preserve the place of music in our society” (p.348).

Therefore, both Reimer's and Gordon's definitions of musicality extend beyond performance to include some aspect of music listening. For Reimer this listening leads to an aesthetic experience. For Gordon, audiation is the means for listening intelligently.

Is the ability to perform and audiate the extent to which music teachers gauge musicality? In 1999, Sture Brandstrom asked music teachers this question and found that teachers used many names for musicality. Teachers refer to musicality as "musical ability, aptitude, talent, achievement, intelligence, etc." (p. 21). He discovered two broad views of musicality—an absolute view and a relativistic view. An absolute view is that musicality is inherited and can be measured by music achievement such as performing, composing and improvising. This view suggests that a minority of the population is musical and can demonstrate musicality. The relativistic view is that all humans are capable of being musical. Many popular music teaching methods of today, such as Orff, Dalcroze, and Suzuki are based on this belief. Ethnomusicologist John Blacking also maintained that all people were able to achieve a level of musicality (Campbell, p.344). A child sweetly singing and a trained opera singer are on equal footing and both valued.

Formal Music Practices

Now let us examine formal music practices and the methods in which most students become musical? There is evidence of two methods by which musicality is acquired: formally and informally. Formal music education practices are those methods used by music teachers in classrooms today. Informal music education practices are methods by which students develop on their own. *The National Standards for Arts Education* (MENC, 1994), which was developed from a grant by the U.S. Department of Education, provides music teachers with specific content standards and achievement standards for arts education. By examining the differences between these two methods we might better understand and improve music education. Along the way, we may discover a new view of musicality.

One way to define musicality in formal practice is to examine the *National Standards for Arts Education* (MENC, 1994). The standards were developed and endorsed by MENC: National Association for Music Education, which represents

approximately 90,000 music educators across the United States. The nine content standards in music are singing, performing on instruments, improvising, composing and arranging, reading and notating music, listening, evaluating, curriculum integration, and historical and cultural understanding. Each standard has to do with musical involvement and is organized by grade level. By the time a student completes high school the highest level of accomplishment should be attained. The standards are:

- Singing challenging solo and ensemble repertoire with technical accuracy and expression.
- Performing challenging instrumental repertoire in ensembles and solos with technical accuracy and expressively.
- Improvising in variety of styles.
- Composing and arranging
- Reading and understanding full score notation
- Understanding whole musical experiences
- Evaluating for aesthetic qualities
- Comparing and contrasting other curriculum concepts
- Describing music from other cultures and the traditions that influenced them

So how are these standards played out in real practice in schools today? Many educators would emphatically state that music is for all but in actual practice music education does not look that way. Many elementary schools embrace philosophies such as Orff, Dalcroze, Music Learning Theory, and Suzuki. These promote the relativistic view at the elementary level, however, a shift occurs at the secondary level. In most secondary schools the absolute view would seem to be the rule. In secondary schools the large majority of students do not stay in arts programs. Those who do stay are usually students who have been designated as having high music ability, although many who do possess high ability are not enrolled in music programs. So while the standards are benchmarks for music education, very few students achieve the range of expertise the standards propose.

In 1999, Susan Byo asked music teachers how prepared they felt they were to teach the standards. She surveyed both music teachers who had been music majors in college and music teachers who had not been music majors. Her survey revealed that non-music majors almost completely rejected the standards. This was based in part on lack of training. Music teachers who were music majors felt the least prepared to teach composition, improvising, music's relation to other cultures, and playing instruments. As Catherine Schmidt stated in 1996 it is unjust to set up a set of standards that we can't teach and then criticize students for not being able to achieve. She also points out that most secondary education is based on performing groups. Perhaps this is because as Cecil Adderley in 2000 noted, most university teacher training centers on performance and not other areas. Indeed, most colleges do not have required courses in improvisational studies or composition.

In 1994 Jerrold Ross proposed that the standards were rather like "The Emperor's New Clothes" because we are not able to clothe our children or fulfill these standards. For example, how can we suggest that children learn how to play instruments accurately when many schools do not have instrumental music classes? He also criticizes the standards for being outdated in method of delivery. They are "teaching dominated, not learning oriented. They are couched in terms of what children should know, not how they should be taught, nor are they even suggestive of the best ways through which children can learn" (p.29).

Although the National Standards are the "official" version of formal musicality, there are problems with them in terms of philosophy and implementation. Formal music practices vary from school to school. In reality, we don't have a set of standards that all teachers follow. A consistent practice is that the standards and objectives are teacher centered. The teacher makes decisions about the curriculum and the students follow. Also, a large majority of secondary education is heavily dominated by performance in ensembles.

Informal music practices

Contrasting formal music practices with informal music practices, one asks how students, who have had little or no formal training, become musicians? Music is created and nurtured in a society and the musicality of the musicians depends upon the unique perception and existence of music within the community. This relativistic approach is played out in informal music education practices. Informal music practices are natural and spontaneous responses to music. There is no evaluation, formal or otherwise, and no teacher direction or guidance

One of the first writers to address relativistic views of music education was John Blacking. John Blacking did not believe that an inherited musical ability accounted for musicality. Blacking's personal experience as a classically trained musician gave him a unique perspective on formal versus informal music education.

Blacking's work with the Transvaal Venda people of South Africa was especially important in the study of the development of musicality. He was an advocate of music and arts. Blacking learned to collect and analyze songs; he studied the cultural background and the technical and functional aspects of music within cultures. He identified movement as a basic component to musicality development. He said, "so often, the expressive purpose of a piece of music is to be found through identification with the body movements that generated it...without this kind of coordination, which can be learned only by endless experimentation, or more quickly by direct aural transmission, there is little possibility that music will be felt" (Campbell, 1973, p.110).

What Blacking discovered was a difference between the Western notion of musicality and the rest of the world's view of musicality. Eventually, he criticized the Western approach for the difficulties he himself encountered with attacks on his own musicality. His performances had been criticized as lacking feeling. He said that his society promoted a "confused doctrine relating success to a combination of superior inheritance, hard work and moral integrity" (p.109). He found Venda musicality highly technical. If someone did not play well, the process of helping the musician was not "ego-deflating" (p.109). A Venda performer would be shown how to move to the music

and would play with expression because of the union of movement with the community of players. In Venda culture everyone works together.

This concept of enculturation is important to informal music practices. Barring a hearing deficiency, it would be hard not to be acculturated with the music of a society; we cannot help but hear the sounds around us. Lucy Green draws from Blacking's writings, as do many educators in formal practice. The value a society places on music and the ability to make music may be an indication of the level of musicality individuals attain. Green contrasts a baby from a London family banging a spoon on a table, with a Venda baby in South Africa doing the same. Typically, in the London family, the spoon would be taken away. From Blacking's studies and observations about the Venda people of South Africa, she says that a child banging an object in a Venda home in South Africa would be warmly approved. Others would join in and spontaneously convert the rhythm into other polyrhythms.

Lucy Green's 2002 publication entitled *How Popular Musicians Learn* is described by Professor Derek Scott in the preface as "as relativistic outlook" for the study of popular music. Green, who is from Great Britain, refers to informal music practices as those that musicians pick up on their own. Although there may be help or advice from friends or family, these musicians teach themselves. They are sometimes referred to as "garage musicians."

Lucy Green did an empirical study of fourteen musicians who ranged in age from 15 to 50. These musicians studied music in an informal non-traditional manner. They imitate other musicians, study recordings or performances. Non-traditional musicians are self-motivated, they desire to become musicians and are willing to spend many hours practicing and honing their skills. Their reasons for motivation are varied, from camaraderie with other band members, to self-esteem, money, and fame.

Green's musicians are active musicians making music in amateur or semi-professional groups. None of the musicians Green studied have achieved any major notoriety or fame. They are "vernacular musicians....who have acquired their practical skills primarily through aural learning practices" (p.73). Based on questions about their

abilities, values, methods, motivations, and experiences, she has written a comprehensive text on informal music learning practices.

What would the content and achievement standards for informal music learning practices look like? The content standards would be singing, performing on instruments, improvising, composing and arranging, listening, and evaluating. Based on Green's work, these are skills found in the practices of non-traditional musicians:

1. Listening-able to glean information for copying the music. Learning through listening and remembering what is heard. There are three types of listening: 1) purposive listening; listening for use later, to remember and compare so you can put it to use or describe it later, 2) attentive listening; listening with same concentration as purposive but without trying to remember for later, 3) distracted listening: listening to music intermittently with no intention for later use but for reasons of enjoyment.
2. Evaluating-ability to judge correctness, modify and evaluating continually.
3. Chord progressions-ability to play standard chord progressions as in 12 bar blues. This ability advances over time. Eventually players hear changes that are more complex and unfamiliar, they copy and use what is heard.
4. Timbre qualities-ability to detect timbral qualities in the music they want to copy. These styles might be country, heavy metal, rock and roll.
5. Style sensitivity-familiar with many styles and sensitive to individual styles. Adaptable to the idiosyncrasies of the style and able to change quickly even if unfamiliar with a selection.
6. Technical proficiency-can play in any key and easily maneuver around the instrument or voice.
7. Repertoire-has a repertoire of between fifty to several hundred songs.
8. Re-production-can reproduce exact imitations of songs they hear; able to copy the key structure, harmonic structure, timbre, textual and rhythmic qualities.

9. Improvisation/Creativity-can “make it up as they go along,” embellish, arrange and contribute creative ideas to the music.
10. Reading-ability to read is not required but those who can read use it as a “memory jogger,” accurate sight reading is not required.
11. Continually improving and growing-seeks ways to widen knowledge and skills. Listens to all genres of music for new ideas.
12. Inter-personal skills-ability to communicate with others in peer-directed group verbally and non-verbally, can read each other. Able to get along with and cooperate with members of the group, team effort with no one person in charge. Respect of each other and good character are also requisites.

These standards develop over time. The musicians begin with little background knowledge other than the enculturation of the music that is around them, a small degree of music experience, and some parental support and approval. Musicality for musicians in the informal practice has multiplicity and may be stronger in some areas than others.

Defining Musicality in Informal Music Practices

How do these modern musicians view their musicality? When asked what they valued most, the answer was expressiveness or feeling. They value the ability to “play with feel, sensitivity, spirit” (Green, p.107). Secondly, they valued and respected the technical abilities required to play the music. Two of the musicians admitted that when they were younger the technical abilities of others impressed them but that over time this changed. Lastly, these musicians all felt that the ability to get along with other musicians was an important part of an individual’s musicality.

Green was surprised by this last attribute because it is not normally considered an aspect of musicality or musicianship. She credits this aspect with the fact that these musicians share a commitment of time, passion, and want to make music with others who feel the same. Players placed a high value on “friendship, shared taste, tolerance, and the ability to listen to each others’ ideas” (p.114). This is important in light of the fact that there is no one “in charge.” Completely opposite from formal music practices these

musicians do not have a “dominant ideology” or set of standards that someone is telling them they need to follow to learn how to be musicians.

Formal versus Informal Music Learning Practices

How do formal and informal music practices compare? There are similarities where these practices overlap as well as differences. Of significance, is that the members of informal music practices are musicians and want to be musicians. When music instruction is taught in schools it is offered to everyone but children do not have choices with regard to whether they will enroll in the class or not. Unfortunately, many students will say that they do not want to become musicians. Formal music practice has someone in charge, there is evaluation by one person, and the information is given in a linear manner. The information students receive in informal practices is in a much more haphazard and global manner. In the formal music practice there is also an overall feeling that students don't learn unless they are properly “taught.” This undermines the value of what is learned by musicians who have learned through informal practices. Finally, it should be pointed out that the list of standards for formal music education is what educators strive to teach their music students. The standard skills for informal music learning practices are what these musicians can already do, not what someone else hopes they learn.

Since the 1960's formal music instruction has begun to embrace more styles and genres of music. Jazz was introduced first, followed by popular music, and most recently world music. Both groups acknowledge all kinds of music. Interestingly, there seems to be more respect from the informal group for the classics, especially as they reach a certain level of musicianship. Rob, a musician in Green's study, reminisced about his teenage years and the excitement he developed for classical music. He said, “I remember buying Brandenburg 3 because I loved the bass line. This is how I got into prog rock.... I heard them doing the Karelia Suite by Sibelius. I went and bought the score for that,” (p.123).

When I was a senior undergraduate music major at another university in Michigan, a professor told my class that the undergraduate music career would be the pinnacle for

most of us. He said that once we graduated our knowledge and expertise would never improve beyond that point. Some musicians trained in the formal education setting may feel that once they have graduated from the conservatory or college, they have gathered all the knowledge they need. Also, formal music practice doesn't allow for the teacher not being present. Musicians in the informal environment have a passion for learning and music making that is life-long and there is not a reliance on the need for a "master teacher."

Composing music, arranging music, improvisational skills, and learning to sing and play instruments proficiently are common goals between the two practices. However, most music classrooms do not teach composing, arranging, and improvisation skills. You will recall that when asked what preparation they had for teaching with the standards, the formally trained music educators said that these areas were their weakest. Listening to instrumental music and copying it exactly is not a skill promoted in formal music education. Teachers may model a vocal piece and ask student to replicate what they hear but it would be uncommon to hear a music teacher ask a class to replicate an instrumental selection. The reasons for this are varied. Educators may feel that it would be too difficult for students to copy exactly what they've heard. Also, traditionally, music educators teach in a linear manner. Music is commonly broken down into the elements and each is studied individually. Copying the music means that the students must do it all, listen and record melody, harmony, and rhythm. Additionally, with the dawn of copyright laws, educators may want to discourage outright copying. For some, just copying what others have done lessens the value of the performance because the performer didn't compose it or create a new interpretation himself.

Of course, the kind of music that is being performed is also a difference between these two practices. Popular music has been criticized by music educators who believe it to be a simple form, often with inappropriate texts. Many educators believe that classical music is in decline because our students are not being trained to understand it.

As Green states, historically, formal and informal music practices have existed together for a long time. While some of the musicians from the informal music practices

felt that they were still somehow inadequate because of the lack of formal education they still valued their abilities.

Philosophers, educators, pop musicians, and the National Standards for Arts Education agree that the expressiveness of a musician is a key component of musicality. For Green's subjects also, a musician's expressiveness is what they valued most.

What other characteristics define musicality? Musicality has multiplicity in its definition. It is more than just a skill. Musicality is innate and strengthened by a nurturing environment. Musicality does not have to be taught in a traditional manner to be learned. After examining the difference between formal and informal music learning practices the following list describes characteristics of musicality agreed upon in both practices and is perhaps a new definition of musicality:

- Musicality is to be technically proficient and expressive on an instrument or voice- this is a common goal for both practices.
- Musicality is to compose good music-a common goal

The last nine goals for the development of musicality are not common practices in formal music education. Musicality exists in those who are classically trained. No one would deny that Leonard Bernstein, Placido Domingo, and Wynton Marsalis have these abilities. By recognizing the success of many popular musicians who have attained these skills on their own we might become more successful music educators.

- Musicality is the ability to remember musical experiences-
- Musicality is to listen globally and grasp all
- Musicality is the desire to search out what is important.
- Musicality is to anticipate what is needed
- Musicality is to keep the music alive
- Musicality is to feel what counts
- Musicality is to know how and where to fit into the overall feel of the piece.
- Musicality is to delight and enjoy in the listening, performing, and composing of music.
- Musicality requires a high degree of interpersonal skills

Another obvious difference between informal and formal music learning practices is the style and type of music being performed. Some would say that you couldn't compare the brilliance of classical compositions and composers, such as Bach, with the popular musicians of today. However, we are products of our society and, just as in Bach's time, the music of the day is what new composers, performers, and listeners want. Just as the Venda people of South Africa value their music and pass it along, so it was before and after Bach's time, and is now with popular music. Coincidentally, as in Bach's day, a popular musician's practice is to copy the music of famous composers and then emulate them. Bach didn't have a CD player, or burner. He audiated, copied, emulated, and then went on to create his own works. The popular musicians of today audiate. They develop their musicality by emulating what they hear, some go on to create their own. Perhaps the biggest question is the difference between the music itself. Zimmerman (2001) said that musicality is about the relationship between man and the music. This paper is not about degrees of greatness in the popular music of today. Our society values modern rock star groups and other music styles of similar status. The level of musicality needed for each has come from the time and place that each has existed in. This is their time and place.

References

- Adderley III, C. (2000). Preparation of future K-4 music teachers relative to the national Standards—goals 2000. *Contributions to Music Education, 27*(2), 59-70.
- Blacking, J. (1973). *How musical is man?* Seattle, Washington: University of Washington Press.
- Byo, Susan. (1999, Summer). Classroom teachers' and music specialists' perceived ability to implement the national standards for music education. *Journal of Research in Music Education, 47*(2), 111-123.
- Brandstrom, S. (1999, Summer). Music teachers' everyday conceptions of musicality. *Bulletin of the Council for Research in Music*
- Jaffurs, S. (2004). Developing musicality: Formal and informal practices. *Action, Criticism, and Theory for Music Education, Vol.3, #3* (December 2004). http://act.maydaygroup.org/articles/Jaffurs3_3.pdf

- Education*, 141, 21-25.
- Campbell, P. S. (2000, Winter). How musical we are: John Blacking on music, education, and cultural understanding. *Journal of Research in Music Education*. 48(4), 336- 359.
- Campbell, P.S. (2003, Winter). John Blacking for teachers of music of children. *The Orff Echo*, 35(2), 36-38.
- Gordon, E. E. (1997). *Learning sequences in music*. Chicago: GIA Publications, Inc.
- Green, L. (2002). *How popular musicians learn*. Hampshire, England: Ashgate Publishing Limited.
- Music Educators National Conference. (1994). *National standards for arts education*. Reston, Virginia: Author.
- Reimer, B. (1989/1970). *A philosophy of music education*. Englewood Cliffs, New Jersey: Prentice-Hall Inc.
- Reimer, B. (2003/1989/1970). *A philosophy of music education*. Upper Saddle River, New Jersey: Pearson Education, Inc.
- Reimer, B., & Wright, J.E. (Eds.). (1992). *On the nature of musical experience*. Niwot, Colorado: University Press of Colorado.
- Ross, J. (1994, November/December). The national standards for arts education: The emperor's new clothes. *Arts Education Policy Review*. 96(2), 26-30.
- Schmidt, C. (1996, Fall). Who benefits? Music education and the national standards. *Philosophy of Music Education Review*, 4(2). 71-82.
- Schuler, S. (1995, January/February). The impact of national standards on the preparation, in-service professional development, and assessment of music teachers. *Arts Education Policy Review*, 96(3), 2-14.
- Swanwick, Keith (1994). *Musical knowledge: Intuition, analysis and music education*. London: Routledge.
- Jaffurs, S. (2004). Developing musicality: Formal and informal practices. *Action, Criticism, and Theory for Music Education*. Vol.3, #3 (December 2004). http://act.maydaygroup.org/articles/Jaffurs3_3.pdf

Zimmerman, M.P. (2001). *On musicality & milestones*. M.R. Campbell (Ed), Urbana-Champaign: University of Illinois.

Jaffurs, S. (2004). Developing musicality: Formal and informal practices. *Action, Criticism, and Theory for Music Education*. Vol.3, #3 (December 2004). http://act.maydaygroup.org/articles/Jaffurs3_3.pdf