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EXAMINATION OF THE PROBLEMS

For centuries, music teachers and conductors have bemoaned the inadequate listening skills of performing musicians. Guido, in the eleventh century, channeled his frustrations positively by devising a kinesthetic representation of pitches, in the hope of improving his choir's accuracy in singing. And John Cotton, who flourished around 1100, expressed the feeling of many directors when he compared the practicing musician (the singer) with the theoretician (the true musician):

> Whereas the musician always proceeds correctly and by calculation, the singer holds the right road intermittently, merely through habit. To whom should I better compare the singer than to a drunken man who does indeed get home but does not in the least know by what path he returns.[1]

Today, those who direct ensembles or teach private lessons, or who intentionally or accidentally incur the occupational hazard of teaching aural skills, have discovered the problems with much current aural training.

First, most music students who do not have a perfect or near-perfect sense of pitch find ear training at best a dreaded, necessary evil. For a musician, developing aural acuity should be a positive experience, an anticipated class, but how many students view it that way? Instead, they find it distasteful and teachers are often forced to incorporate required attendance policies to make sure students are even there. Students may approach these courses with fear that certain musical weaknesses or ineptitudes will be exposed.

More troubling is that students find aural training to be irrelevant to their musical needs when they should be seeing the connections with

everything they do as musicians. Professor George Pratt of Huddersfield Polytechnic in England has said that, "Everything taught [in aural training] should always be related immediately to real musical experience and thus be applicable by students to their everyday musical life."[2] Aural training should indeed be directed toward practical, needed skills. Most troubling to me has been the dilemma that good musicians sometimes demonstrate a rather low level of aural ability, as taught and tested with traditional materials. That seems to imply that either we are teaching the wrong things or we are not teaching well, certainly not in a way that is compatible with how students already perceive and relate to music.

An additional problem is that our approaches to aural training have been strongly influenced by tradition as well as by the necessity for grading. The same approaches and activities are perpetuated from teacher to student-who-becomes-a-teacher to student, etc. Roy Will, in his research on the history of dictation, discovered that dictation first appeared in classroom theory texts in the early nineteenth century.[3] It began with the teacher's singing of intervals and patterns to be notated and was connected with the teaching of solfeggio. Several nineteenth-century teachers observed that solfeggio seemed easier for students to master than its counterpart, dictation. Will notes that Francois Fetis thought that students' difficulty with dictation was due to "sluggishness of the spirit."[4]

Traditionally, aural training has concentrated on the pitch and rhythmic domains of music, to the virtual exclusion of other aspects such as timbre, dynamics, register, articulation, and texture—aspects that are critically important for performers, directors, and composers. A glance at leading aural training textbooks will confirm that this is the case. Because we are required to assess achievement quantitatively in aural courses, we are forced to find mechanisms that can be readily evaluated. Thus the identification of an interval as a Major 6th or minor 2nd can be easily rated, whereas measuring something like a student's sensitivity to the in-tuneness of intervals is much more difficult.

Another problem in aural training is the lack of clear methodologies for teaching. A few years ago, Professor Pratt (with the assistance of Michael Henson) made a survey of British universities to determine the depth and breadth of their aural training curriculums. A few schools were integrating aspects of timbre, texture, and dynamics into a program of intervals, chord patterns, and dictation. Others emphasized dictation, having it occupy as much as 60% of the course. Some had stringent expectations: notation of a 4-part chorale; noting figured bass from a recording; notation of a twentieth-century piano piece, playing each phrase 3-4 times. Other schools, acknowledging that aural training seems to have little real relevance to music-making and that students do not seem to improve, have "thrown in the

towel" and eliminated aural training from the music curriculum altogether. In some of the latter cases, sightsinging has been retained. One of the reasons cited for eliminating aural training was lack of a method to make it work with students.

While there are several methodologies for teaching sightsinging, no such plans really exist for aural training (dictation, listening activities, etc.). There are a number of manuals and workbooks available, but the differences among them basically concern isolated vs. short contextual examples, and literature vs. newly-composed examples. Nearly all include dictation as a sizeable component, and there seems to be universal agreement that items be played at the piano three times. But the questions these texts raise are WHAT (do we use) and WHEN (do we use it), instead of asking WHY (do we do this) and HOW (should it be done).[5]

Michael Rogers, in his book *Teaching Approaches in Music Theory*, sets forth his approach in a discussion of two stages of ear training: the "perception and labeling of individual events" and later the "comprehension of musical relationships."[6] Rogers continues by saying that analytical listening to the structural relationships in music is not addressed in current teaching materials.[7] In addition, he points out the importance of understanding how the brain works in processing musical phenomena, and in this reference, he touches upon one of the biggest failings of traditional approaches to aural training.[8] And it is this: the workings of the brain and current learning theories seem to have little effect on the WHY and HOW of teaching aural training, and because of that we are still encountering the same frustrations observed by nineteenth-century teachers.

ANALYSIS OF MUSICIANS' AURAL NEEDS

As expressed earlier, aural training has been quite dependent on tradition. Sightsinging is still considered important, as it has been for centuries. And dictation, considered as the counterpart (sound to notation) of solfeggio, has occupied a prominent part in the aural curriculum since the early nineteenth century. Even then, isolated intervals were drilled; the inclusion of isolated sonorities and chord progressions would naturally follow. These elements, then, comprise a typical aural program, with occasional questions inserted about cadences and form. Measured according to Rogers' two-step approach, we spend two years "preparing" students to listen to music with an understanding of structural relationships, but the aural courses end just at the point when months of drills should be culminating in meaningful listening—listening awakened to the way all these isolated elements fit together in movements and entire compositions.

But more elemental than curricular timing, or WHEN items should be taught, is the question of WHY we have aural training and WHAT should we be preparing our students to do. To begin addressing these questions, I make three assumptions: 1) a sharp sense of aural acuity is necessary for a musician; 2) this aural acuity can be developed and refined so the student acquires an increased aural awareness—a heightened sense of musical perception; and 3) a separate course for aural training is necessary. Ideally, aural training should be taught in every component of the music curriculum: applied lessons; small and large ensembles; conducting; written theory; music history; etc. But because training is done in only a minimal way in other areas, a separate course is necessary.

Next is the issue of the specific aural skills needed by different types of professional musicians, who can be divided into three broad categories. Musicians either *recreate* music, as performers or conductors; *create* music as composers or studio musicians; or respond in active *listening*, as scholars, critics, or those simply reacting to aesthetic experience. Teachers of music would probably represent all three activities. One could look at the specific skills needed by those who create and by those who recreate and by those who are active listeners, and consider tracking the aural training of students according to their professional goals. But this is not being proposed because there is quite a bit of overlap in the aural skills needed by each group. Also, these categories of musicians are not mutually exclusive for individuals, as most musicians are participants in two or all three of these broad categories. It is likewise true there are skills that all musicians should know and that transcend specific career choices or present interests.

The first aural skill needed by musicians is an awareness of musical structure, both small-scale structure (such as one or two phrases) and large-scale structure, such as a section or a movement. Such musical aspects as rhythm, texture and density, vertical and horizontal organization of pitches, timbre, dynamics, and formal segmentation and organization would be referenced. These aspects should be considered not only separately but also interactively (how they interrelate structurally) so that students are not only perceiving a window of the composition, but they are also seeing that part as it fits in the total section or work. There should be a continual integration of observing small-scale vs. large-scale structures, because it is often difficult for students to comprehend large structures after a lengthy details-only approach. They often see the methodologies as completely different, rather than as a continuum.

Next, musicians need to refine their awareness of intonation. Whether in ensemble of applied lessons or sightsinging, students should be chal-

lenged to consider the in-tuneness of their performing as well as others' performing. At the same time, there needs to be a heightened realization that intonation issues are fraught with the difficulties of stylistic demands and ensemble constraints.

Musicians need to develop an aural awareness for performance adjustments in small and large ensembles, whether as performers or listeners. Such factors as balance, rhythmic and dynamic ebb and flow, and intonation should be considered. A musician needs to be aware of the individual lines of a composition, whether it is for one performer or multiple performers. As the student becomes more aware of the individual lines and how those lines fit together, the ebb and flow of those parts and the relative balance of the lines will become more evident.

There needs to be a heightened awareness of shades of nuance in students' own and in others' playing. Elements such as dynamics, articulation, timbre, and pace should be regarded.

Especially important is the ability to internally image music, and not just in the pitch and rhythmic dimensions. This ability is needed both with familiar and unfamiliar music, and in students' own performing mediums as well as other mediums. This is necessary for reviewing music, for studying scores, for copying sounds as a composer, for recognition of good vs. bad or correct vs. incorrect performances, for being able to copy performance nuances imagined, and for good intonation. Creators and recreators of music need to be able to copy and/or represent sounds as internally imaged.

Musicians should be able to sight read, and to do so in several clefs.

And finally, there is the ability to symbolize (record or notate) imagined sounds. This would translate into dictation, but the developed ability would not be limited to just rhythmic and pitch parameters, but would also include such factors as dynamics and articulation. This skill is especially important for composers and arrangers.

Of the aural skills needed by musicians, the awareness of performance adjustments and shades of performance nuance are probably the skills given the most attention in a student's ensemble experiences. For many students, intonation will also be stressed in lessons and ensembles. However, these skills could be a part of aural training as well because they overlap with the other skills and because by doing so the music curriculum avoids compartmentalization and the students perceive that the necessity for keen aural awareness doesn't cease when they walk out of the aural theory classroom.

No two-year program in aural training or even a four-year degree can adequately accomplish this complete aural training agenda. Aural training should be a lifelong endeavor, so that the college/university instructors are

simply setting in motion a lifetime of aural development and the avenues, methodologies, and habits for that continued learning.

REVIEW OF SOME CURRENT LEARNING THEORIES

As Michael Rogers has pointed out, it is important that a knowledge of how the brain works in learning and processing musical phenomena be understood for successfully presenting and teaching aural training. In recent years there has been a profusion of articles and books dealing with the brain, its hemispheres and their functions, modalities of learning, learning by discovery and experience, brain-compatible learning, etc. This is partly because progress in brain research has been phenomenal due to advances in electron microscopy techniques and in molecular and neural chemistry. These descr[illegible]dions and theories are challenging the ways in which we view brain processes in learning, and should have a profound effect on teaching at all levels. In fact they should turn current teaching approaches upside down. No area in the education of musicians is in greater need of the influence of these discoveries and theories than aural training.

Carl Rogers presents the approach of Experiential Learning and explains it as learning with a high degree of personal involvement on the part of the student.[9] Experiential learning is learning by doing. A student is involved not only through hands-on activity but also through having a degree of control over the learning process and even the evaluation. David Kolb explains that there is a need for experiential educational approaches that "can translate the abstract ideas of academia into the concrete practical realities of these people's lives."[10]

In current ear training, students usually respond with pen and paper; seldom are they called upon to play back a melody or to harmonize it. Experiential learning must include problems that have a significant amount of relevance for the student, and a learning environment with a low degree of threat.[11] One of the most frequent complaints about aural training from students is that they fail to see activities such as isolated identifications and dictation as being relevant to their professional needs. The notion of threat is also significant because the fear of failure in aural training can have a profound effect on how successfully students perform as critical and analytical listeners.

Jerome Bruner presents the idea of Discovery Learning, by which insights are recognized through reasoning or experimentation, and hence a process of "discovering" information and concepts.[12] Bruner also empha-

sizes the importance of a sense of reality about the learning, and discusses three stages in discovery learning: 1) an action stage (learning by doing); 2) an iconic stage in which a mental picture of the way things function is constructed; and 3) a symbolic stage, in which alternate applications and solutions are embraced.[13] To relate these three stages to music learning, the action stage might involve playing back a bass line, the iconic stage could equate to the evaluation of the aural/mental image of that line, and the symbolic stage could refer to the notation of that line. Bruner further stresses that when students are actively learning, they are building on previously acquired knowledge—that is, the basis for successful learning should always be prior learning. We will have strengthened aural training when we include modes of interaction and music with which a student is already familiar.

One approach to learning is that of understanding and employing modalities, the channels through which learners receive and retain information.[14] There are three modalities: 1) visual; 2) auditory; and 3) kinesthetic. Visual learners prefer to learn by reading, using documents such as handouts, and noticing visual cues; a visual learner responds to comments written on assignments and tests and may choose to sit in the front row. An auditory learner prefers listening to lectures and discussions and responds to verbal critiques; this learner may be the one to arrive at class late and with no paper or pencil. The kinesthetic learner may have fingers, knees, and feet in constant motion throughout class; this student may also doodle while in class and responds to a pat of encouragement.[15]

We all may exhibit visual, auditory, and kinesthetic traits at different times, but perhaps prefer a certain modality for specific kinds of learning. The challenge for teachers is to make use of all three modalities in learning to strengthen concepts and address topics meaningfully for all learners. It should also be emphasized that the kinesthetic mode is very powerful, yet virtually overlooked in higher education learning.

Much has been written about the brain hemispheres, their functions, and the integration of these functions. People have been characterized as being "left-brained" or "right-brained," depending on whether they tend to be more analytical, organized, sequential and logical, or more oriented toward feelings, spontaneity, randomness, and intuition. We all exhibit a mix of traits in various arenas of our lives, although some people are more lateralized while others seem to be more integrated. There have been many studies dealing with dichotic listening: is music processed better in one ear than the other? Since music seems to be felt and understood emotionally in the right brain, should we therefore concentrate our music listening in the left ear? Or, if we are listening analytically, should we then shift to the right

ear to give emphasis to the left brain's functions? Dichotic listening research findings have been mixed, with no conclusive trend toward the advantages of favoring one ear over the other.

But apart from the notion of dichotic listening, the hemispheric theories do suggest that the way our students think about music and the way theorists approach music may not be the same. Howard Gardner makes the distinction between aspects of music naturally perceived and those conceptualized in a more formal way. He cautions that certain aspects of music perceived naturally may be temporarily obscured as an individual attempts to classify music events according to a more formal mode of analysis.[16]

When students begin a music degree program, they bring primarily "right-brain" experiences with them. They have enjoyed performing and listening and responding to music. Then they enter the theory classroom and are expected to approach this cherished art form analytically, sequentially, and logically. The integration of the two approaches cannot happen instantly for most students, and unless we at least incorporate a sort of "right-brain" approach in theory classes, we end up with disenchanted and frustrated students who think that music must not be what they wanted to do after all. And, even worse, we disengage students from the wonders of understanding more about their art through aural comprehension and indirectly teach them that aural training is irrelevant and fearsome and is to be simply endured for two years.

Another, but not conflicting, theory of the brain is that of the Triune Brain by Paul MacLean.[17] According to MacLean, there are three evolutionary brains, each having different processing and interpretive functions. The Reptilian Brain or the R-Complex is concerned with survival, safety, reproduction, and defense, and monitors the body's functions. The Paleomammalian brain or the Limbic System is concerned with emotional processing and imaging, the senses, values and morality. Interactive and kinesthetic responses to music are through the Limbic System. The Neomammalian Brain concerns advanced logic and thought, such as music analysis.

Control moves from the top down, or from the Neomammalian to the Paleomammalian to the R-Complex, but processing is bottom to top with the Limbic System receiving and processing information from the R-Complex and the Neo-Cortex receiving information from the Limbic System.[18] When fear and threat are present, there is a down-shifting to a lower level of brain functioning. For example, if the brain is engaged in mathematical or analytical processing at the Neo-Cortex level and threat is introduced, there is a down-shifting to the Limbic System or even the R-Complex, and the brain seems to "shut down" with regard to the analytical activities. This would explain why some students seem to freeze on tests.

Leslie Hart has put forth the most compelling argument for change in education through his approach to brain-compatible learning.[19] His theories center on the brain and explain the learning process in terms of the brain's nature, history, and mode of operation. He considers the hemispheres, the model of the Triune Brain, and his own theory of learning through "program structures," or "prosters" as he calls them. In learning, the brain detects patterns, characteristics or features, and relationships among these features through the senses. As these patterns are repeated, they are strengthened and relationships of patterns are built; then learning takes place and programs are constructed.[20]

Programs are sequences of events or instructions for events. When we learn to climb stairs, there are programs that must be constructed for the many muscular and balance tasks necessary for this operation. Through trial and error, the correct patterns are reinforced and pattern relationships are formed, and we "learn" a program for climbing stairs. Once the program is learned, it is implemented whenever we are faced with the need to navigate steps.

Some programs are more automatic (such as the program for walking down steps) and some are less so (the program for paying a bill). Automatic programs may operate simultaneously (we could climb steps and shift a parcel from one arm to another at the same time), but those that require conscious choices only operate one at a time. Clusters of related programs form the prosters. All programs are built on existing programs. Hart reminds his readers that when we learn to ride a bike or drive a car, we learn in a non-sequential way, in a random fashion. We don't study the vehicle's history and its mechanics, how to steer, then how to brake, etc. But our brains learn by detecting and relating patterns and putting these together to build programs.[21]

Hart goes on to describe two kinds of thinking: 1) symbolic selection and manipulation (SSM); and 2) perception, analysis, and choice (PAC).[22] SSM requires a high degree of attention, unless the prosters are well-established, while PAC is intuitive, automatic, effortless, and subconscious.[23] Through PAC we can be playing a composition and thinking about something else such as the day's agenda, until there is a mistake and we are forced into the SSM mode and thus an aborting of that piece-playing program. In the PAC mode, learning begins with utter disorder but results in order in a faster, more accurate manner. Another factor is that the SSM type of thinking that prevails in theory analysis cannot function when fear and threat are present.

The impact of Hart's writings on teaching could be enormous. He states the necessity for change when he describes formal education as "obsessed with rational and logical processes, and heavily dependent on

verbalization."[24] We are furthermore dependent on teaching sequentially and in a parts-progressing-to-the-whole way. It would be like giving a student, who has never seen or operated a VCR, the individual components and expecting that student to assemble it correctly. Students must be allowed to learn patterns and build programs related to theory, to develop intuitive musical skills, to proceed at somewhat individual paces, and to see the relevance of their learning.

DESCRIPTION OF A POSSIBLE APPROACH

The aural skills needed by musicians, as stated earlier, include the following:

1. an awareness of musical structure, both large-scale and small-scale;
2. an awareness of intonation;
3. an awareness of performance adjustments in small and large ensembles;
4. a heightened awareness of shades of nuance in performance;
5. ability to internally image music;
6. ability to represent heard or imaged sounds in notation and performance;
7. ability to sight read in several clefs.

In this approach musical structure is investigated in horizontal and vertical planes. Included are pitch (melodic and harmonic) organization, rhythmic organization, and formal organization. While there are occasional directed listenings of isolated events such as intervals or modes, the majority of listening is in the context of complete pieces or movements or at least complete sections from various styles and genres. Students' observations about what is heard are refined over the course of the year. Timbre, dynamics, articulation, use of register, dramatic impact, and stylistic features are considered just as important as the pitch organization, sonorities, cadences, and formal structure. Not only does such a description more faithfully represent the heard phenomena, but the more expressive charac-

teristics are also the ones that are most readily heard by students without formal theoretical training. And, it is not isolated events but rather how musical parameters are present and how they are integrated that become the focus of the listening.

Horizontal pitch organization is investigated more closely through melodies from movies and musicals, patriotic songs, folk tunes, hymns, and classical themes that are familiar to most students. These are listened to, played by ear on any instrument of the student's choosing, and then notated. Students have the option of hearing the melody numerous times and of having an instrument available when the notation is done. Some students can do this readily and others need time to solve the notational problems. For some, the problem is assessing the rhythmic structure and for others it is deciding the tonal structure and how the pitch events relate. At first students are on their own, with assistance from the instructors, to develop individual methods for transcribing sound into notation. Gradually they are encouraged to depend on their aural memory/imaging of these melodies and to relate the background structure of the melody to a tonal spectrum. Students with some keyboard skills are encouraged to harmonize these pieces, long before vertical pitch organization is formally introduced in the aural curriculum.

In this course of study improvisation of melodies is continually a part of the classroom experience. Students are more comfortable with this when certain parameters are set: key, meter, harmony, phrase length, perhaps a choice of one or two rhythmic patterns. Question-and-answer formats are helpful for intuitively teaching cadences, similarity and contrast, and symmetrical and asymmetrical phrasing. A non-judgmental environment, in which the instructor responds neither positively nor negatively, allows students to freely explore and discover facets of horizontal structure without the threat of "messing up." For students and instructors there is the inner delight of hearing the gradual refinement and increasing confidence in improvisation through the discovery of creation. Bruner's three stages in discovery learning (learning by doing; iconic or mental picture of concept; alternate applications of concept) are very much at work.

Vertical pitch organization, harmonic structure, is also taught under the influence of discovery learning, experiential learning, and the brain-compatible learning theory of Hart. A few harmonic structures are experienced through harmonization, playing by ear, and improvisation, and using repetition and alteration to allow the building of pattern-recognition programs. For example, one such pattern is the sequence from Pachelbel's "Canon in D," a pattern already recognized but not given symbolic representation by most students. In addition to the above activities, students learn single line "horizontalizations" of each pattern, and these can be sung

or played. This is especially helpful for single-line instrument performers and for gradually imaging these as vertical structures, a step toward imaging chords. Also, unique gestures or rhythmic movements for each harmonic function are taught as a part of the horizontalization and are readily applied by the students. Thus the hands-on experiences, the incorporation of intuitive learning, the repetition, and the wide variety of experiences (playing, singing, moving) insure the solid building of programs to perceive and understand harmonic organization.

Another emphasized skill is locating and identifying performance errors in a score, when performance and notation do not match. Every student immediately realized the applicability and the relevance of this ability. Errors may be in pitch, rhythm, harmony, dynamics, and articulation. The excerpts are typically prepared (more representative of reality) and this allows more involved examples of three staves and 20-30 measures in length. The skill of music imaging is very important here, and this is an excellent way, though not a perfect or all-encompassing one, to evaluate imaging skills of students.

Sightsinging skills are given much emphasis and taught through individual lessons for pairs of students. There are a multitude of problems in sightsinging, ranging from difficulty with the mechanics of producing vocal sounds, to poor sense of pitch, to poor feel of the rhythmic dimension, or inability to maintain pitch or tonal references, etc. These individual problems can best be attended to in private sessions. The personal attention is also a positive motivation for students and removes the threat and fear present in classroom evaluations. Sightsinging lessons are also opportunities to refine in-tune singing and imaging. Many students have had an "aha" experience of relating difficulty with intonation in sightsinging with that same problem in their performance mediums. Group ensemble singing is an important activity not only with students' partners, but also in class. Rounds are used initially because many students have never sung in an ensemble before. These ensemble experiences foster the ability to maintain an independent line, intonation awareness with another part, an intuitive understanding of multiple parts in a texture, as well as the resulting harmonic implications.

Throughout this aural curriculum, the emphasis is on learning through active experience, through the building and relating of these experiences to past learning, and through intuitive, repetitive learning. Fear is minimized through a low-key approach to grading that rewards active individual participation as well as accuracy, for aural training is an ongoing process and each person brings unique skills and develops at a unique pace. The best evidence for the merit of the approach comes not from the learning theorists but from the students themselves. They enjoy coming to aural

training, they recognize its importance and the relevance of the skills being developed, and some respond that aural training is their favorite class. And that is as it should be.

NOTES

[1]Guido Hucbald and John on Music, *Three Medieval Treatises* (Yale University Press, 1978).

[2]Robert Cockroft, "Heard Instinct," *Classical Music* (Nov. 15, 1986):12.

[3]R.T. Will, "The History and Development of Musical Dictation" (M.M. thesis, Eastman School of Music, 1939), p. 2.

[4]Francois Fetis, *Premiere Annee*, trans. R. T. Will (see above note), pp. 52-53.

[5]There are at least two publications that challenge the way we approach aural training: *Aural Awareness* by George Pratt (Open University Press, 1990) and *Aural Awakening* by Rupert Thackray (published by the University of Western Australia Department of Music).

[6]Michael Rogers, *Teaching Approaches in Music Theory* (Southern Illinois University Press, 1984), p. 101.

[7]ibid., p. 103.

[8]ibid., p. 102.

[9]Carl R. Rogers, *Freedom to Learn* (Charles E. Merrill Publishing Co.,1969).

[10]David A. Kolb, *Experiential Learning* (Prentice-Hall, 1984), p.6.

[11]Carl Rogers.

[12]Jerome S. Bruner, "The Act of Discovery," *Harvard Educational Review* 31 (1961): 21-32.

[13]ibid.

[14]Walter B. Barbe and Raymond H. Swassing, *Teaching Through Modality Strengths: Concepts and Practices* (Zaner-Bloser, Inc., 1979).

[15]Arthur Harvey, "Brain Research and Its Impact on the Learning and Teaching of Music," Workshop given at the University of Kentucky, June 1-2, 1988.

[16]Howard Gardner, *Frames of Mind* (Basic Books, Inc., 1983), pp. 99-127.

[17]Paul D. MacLean, "A Mind of Three Minds: Educating the Triune Brain," *Education and the Brain*, 77th Yearbook of the National Society for the Study of Education (University of Chicago Press, 1978).

[18]Don W. Stacks and Peter A. Anderson, *Toward A Holistic Neuro-physiological Understanding of Intrapersonal Communication* (Speech Communication Association, Boston, November 1987), ED 289181.

[19]Leslie A. Hart, *Human Brain and Human Learning* (Village of Oak Creek, AZ: Books for Educators, 1983).

[20]ibid.

[21]ibid.

[22]ibid., pp. 132-139.

[23]ibid.

[24]ibid.