

Bartel, Lee (2002). Meaning and Understanding in Music: The Role of Complex Constructs” Chapter in Betty Hanley B., & Goolsby T. (Eds). *Musical Understanding: Perspectives in Theory and Practice*. Victoria: Canadian Music Educators Association. (2002), pp. 51-70.

Meaning and Understanding in Music: The Role of Complex Constructs

Lee Bartel

Introduction

Situating Myself

Knowledge is personal. Therefore, my knowledge about meaning and understanding in music is personal and connected to personal experiences. A number of experiences have contributed to shaping this personal knowledge. My dissertation work on cognitive-affective response to music led me to define response to music as constructed by the percipient, “as an accumulation of a series of individual perceptions or registration” (Bartel, 1988). Another was my observation of how my daughter Melanie’s mind worked—which I would characterize as “Nine, ten, big chicken.” Her attempts to memorize things like “One, two, buckle my shoe...nine, ten, big fat hen” revealed comprehension rather than verbatim memory. She often formed the “concept” (big chicken) but lost the specific word “label” (big fat hen) for it. In my son Lucas I observed almost the opposite phenomenon. When he was in grade 9 he was diagnosed with Aspergers Disorder and revealed an amazing vocabulary but difficulty in processing meaning from discourse. His mind seemed to hold individual meaning concepts as word labels, but he had difficulty with the connections among them.

As a research team member at the Bloorview Macmillan Centre, I studied attention in head-injured adolescents and observed that executive management of the mind’s data stock is crucial to functional knowledge. My recent work with EEG neurotherapy, brain response to sound, and the difference between sound as music and music as sound have placed “knowledge” and understanding in a new cognitive context for me (Bartel, 2000).

Most recently, my work on a chapter on trends in research for the *Second Handbook of Research on Music Teaching and Learning* (Bartel & Radocy, 2002) has led me to contemplate things like complexity theory, constructivism, data mining, and knowledge development in databases. As I present my thinking on meaning and understanding in music, many of these experiences may become evident.

I admit that when I approach musical meaning and understanding I have specific interest in the “educating process” rather than “music performed.” I am not simply referring to constructs related specifically to processing performed music but to the development of understanding of music encountered in the classroom. Music learning is integral to music understanding.

Defining Key Ideas

The ideas “meaning,” “knowledge,” and “understanding” have been the constant occupation of philosophy, epistemology, or metaphysics for over 2000 years, and definition of terms is often the focus. In common use we often do not differentiate clearly and possibly confuse the terms by exchanging them. For example, we might say, “do you know the meaning?” or “do you understand the meaning?” or “does this knowledge mean anything to you?”

Although “know” and “understand” are often used interchangeably, “meaning” is a more differentiated construct. “Meaning” can be what something signifies, what something represents (denotes), or the connections one makes to something (connotes). These three meaning functions operate whether meaning is believed to reside externally or objectively “in the music” or whether meaning is believed to be a personal internal construct.

In the “external” view, meaning is an objective property of the music. In the most extreme form of this view, the contemplative tradition, music is believed to have meaning properties that independently “act on” the listener and create their “aesthetic” effect.

The “internal” view is premised on the belief that there is no reality apart from representations of it, with the implication that music only exists once we construct it. Musical meaning cannot be “in” the music, adhere to the music, or be objectively coded in sound, or “in” the communication—we construct our personal meaning from the sound waves bombarding our ears.

I prefer a more moderate realist view, where potential for meaning is believed to adhere to the properties music presents to the listener's mind, but the listener is assumed to engage in a constructivist process of assigning meaning, making connections, developing associations, that function as the meaning-complex for experienced sound. In this view reality is believed to exist apart from personal representations of it. I hold that meaning is the pattern of associations one establishes among sense data, whether internal or external in origin. Music is someone's external representation of inner meaning and, therefore, it must represent that meaning somehow. This perspective still sees some meaning "in" the music.

Although often used interchangeably, "knowledge" and "understanding" do have different meanings. "Knowledge" can be taken to be the sum or range of what has been perceived while "understanding" refers to a comprehension of the significance of what has been perceived. Using a modern analogy, "knowledge" is the basic content of a web page, while "understanding" is a pattern of association among web pages.

The mind works with "bits" of knowledge. Often we equate these with linguistic labels—words. In music for example, our knowledge of "melody" is considered equivalent to the word label, and the characteristics of melodies to other word labels. We realize, however, as musicians that our knowledge of "melody" and specific "melodies" is much richer than dictionary definitions of specific words. In the struggle to recognize this richness, we have developed various terms to denote a "bit" of knowledge. For example, we talk of representation, meme, idea, notion, thought, schema, percept, or concept.

What is the best word for the basic level of knowledge? "Representation" captures the function of "image" of reality, distance from reality, agency inherent in knowledge but seems to distort knowledge by its strong "image" orientation. "Meme" was created by Richard Dawkins (1976) as an equivalent to "gene" and seems primarily applicable to foundational concepts rather than specific word denotations or image memories. The "schema" advocates do not seem to clarify fundamental knowledge. Rather they focus on the "theory" relationships among knowledge bits. The "constructivists" do not explain what is constructed but emphasize the individual role in the creation of knowledge. Those who talk about "percepts" seem to imply these are transferred whole. Words like "concept," "thought" or "idea" are in such common use their meanings lack specificity.

I have decided to use the word “construct” to refer to “bits of knowledge” because of its use in the research vocabulary as a created definition, its meaning in Kelly’s (1955) *Personal Construct Psychology* as an anticipatory structure, and its close tie to constructivism. Perhaps the word in common usage most closely aligned with “construct” is “concept.” Fiske (1996) states “concepts—not words—are in charge of thinking. Language does not direct thought, and ideas expressed by words are not equal to the words themselves. That is, words are not ideas and ideas do not require words” (p. 148). I argue that our knowledge exists as constructs. The content of constructs is not shaped by words. Rather the meaning of words is shaped by constructs.

Some Caveats

Although a discussion of fundamental knowledge and meaning easily moves to the neural network level, I will leave that discussion to Harold Fiske. Also, I am not interested here in what specific EEG pattern responds with activity. Nor will I discuss how, neurologically, constructs come into being. Rather I take a pragmatic approach and draw a leaf from Complexity Theory—there is simplicity inherent in what looks complex and complexity in the simple. “When life seems to be the most complicated, a simple order may be just around the corner. And when things appear simple, we should be on the lookout for the hidden nuance or subtlety” (Briggs & Peat, 1999, p. 89). I will try to make simple what is complex and probably create some confusion about what may really be simple.

A Review of Some Views

Since understanding and meaning are at the core of any philosophy, a thorough analysis of the ideas of some of the contributors to music education philosophy would take much more time and space than I have here. I will, therefore, comment briefly on the work of four individuals whose views directly or indirectly “muddied the waters” of music education in relation to the role of understanding.

David Elliott

To say “Elliott” today is essentially to say “praxial,” and to say “praxial” is to touch a sensitive nerve in many music educators. Praxial music education seems to be something you must be for or against. On this topic I feel a bit like Keith Swanwick (1998) who said:

Although it has been interesting and at times fun to participate in and follow the twists and turns of MayDay thinking, I do feel diffident about producing a paper.... I also worry about the theorising, not in principle...but the kind of mind set that seems to dominate much music education in the USA. Here I agreed with Bob Walker: we need to get outside this incestuous circle.

Let me clarify a few points at the outset: (1) “praxial” is not equivalent to constructivist and neither Elliott nor anyone else holds the “rights” to a particular view of knowledge; and (2) a constructivist view of knowledge does not determine the phenomenological nature of musical experience.

While the term “musical meaning” is basically absent from Elliott’s (1995) book, musical knowing (formal, informal, impressionistic, supervisory, and procedural) is given considerable attention. Elliott argues that “knowledge is the key to enjoyment and control” (p. 117); he refers presumably to the knowledge developed through music education. One might then conclude that more knowledge would equal more enjoyment and that little knowledge would equal little enjoyment. The question this raises for me is how can young children enjoy music? And why is it then that people’s peak experiences with music tend to happen in early years? [Gabrielsson, 1989, 1991]. Why is it that the study of music often reduces pure “musical” enjoyment and increases the enjoyment of criticism and the enjoyment of problem solving?

Elliott argues further that “musicianship” is the coming together of the five forms of knowledge, that musicianship equals understanding, and that, “my musicianship [understanding] lies in the quality of my music making, in what I get done as a performer (improviser, composer, arranger, or conductor)” (p. 57). Note Elliott does not include listener in his list here. Earlier Elliott seems to argue that you can only know what you do (not that doing merely gives evidence of knowing). If this were true, then musical

understanding could never proceed beyond one's ability to perform. What does a conductor, composer, or arranger perform? When does understanding music depart from physical "music making" and develop inside the mind? And does it not develop from listening—beyond what one can actually do on an instrument? How much "performing" is enough for you to proceed in your mind? Is there no place for "imagination" or fantasy? Interestingly, Elliott never defines performing but bases his assertions on performing, not on musicing (e.g., p. 57). In my opinion, Elliott's view of knowledge, learning, and musical experience assumes too slow an ascent, is too linear in progress, and ascribes too little learning from early exposure and none from inherent structure.

One common interest in relation to music is how people respond to music or how they experience music. My definition (Bartel, 1988) of response, as a meaning-construct created from registrations, points to a constructivist approach to addressing "emotional" response and consequently emotional knowledge and understanding. In his clear emphasis on "thinking" cognition, Elliott gathers "emotional" matters into impressionistic knowledge but gives no place at all to emotional response and essentially disregards the phenomenological experience of music. What phenomenological aspects there are seem focused on "artistic decision making" rather than on aspects of feeling or responding. This position may be a result of the priority Elliott gives to performing over listening. He (1995) states: "[M]usic programs geared to recorded music do not provide the proper conditions for developing the several kinds of knowledge required for intelligent listening because recordings place the student as listener outside the artistic decision making process" (p. 99). Is intelligent listening different from feelingful listening? Elliott says further that "educating competent, proficient, and expert listeners...depends on the progressive education of competent, proficient, and artistic music makers in the present" (p. 99). I grant that music making is a special form of connecting constructs (developing understanding)—but not the only one. Understanding cannot be limited to the extent of physical performing ability—or else one must conclude that the vast majority of people who fill concert venues, purchase recordings, and listen to the radio derive some benefit from something they simply do not understand.

Howard Gardner

Gardner emphasizes performance in relation to understanding. Gardner (1999b) says, “An individual understands a concept, skill, theory, or domain of knowledge to the extent that he or she can apply it appropriately in a new situation” (p. 119). Gardner, however, does not argue that understanding is developed through the process of performing but rather that it is only *observable* in some outward “performance.” His claim is easily misinterpreted by musicians who inevitably see performing as “music performing” rather than simply “an outward doing.” But Gardner uses performance to refer to the broad sense of observable behaviour. Where Elliott seems to believe you must perform to understand, Gardner emphasizes that a student must “perform” for understanding to be assessed.

Gardner acknowledges the difference between the real nature of knowledge and understanding as a process of mental representation and the utilitarian assessment demands of schooling today. In addition he seems to differentiate between knowing (as the physical event of the mind capturing information) and understanding (now defined as the ability to provide evidence of knowledge to satisfy testers). He does have some problem with his current strong association between understanding and performance but seems to opt for a view that will satisfy the testing climate.

In *Disciplined Mind* (1999b) he states:

Talk of a “performance of understanding” may seem a bit oxymoronic, since we usually think of understanding as an internal event, one that occurs in mental representations, between the ears. And we have no reason to doubt that much is occurring between the ears, as inadequate representations are being challenged and—should teaching and learning prove successful—more adequate ones are being constructed. Still the focus on understanding as a performance proves salutary. (p 129)

In *Intelligence Reframed* (1999a) he states:

folk wisdom and contemporary psychology convince us that understanding is an event or process that occurs between the ears—in the mind or brain.... I underscore the importance of processes of mental representation that occur in the assimilation and transformation of knowledge...but the physical events that occur in the mind or brain...are irrelevant to their educational missions. Instead, when it comes to understanding, the emphasis falls properly on performances that can be observed, critiqued, and improved. (p. 160)

Despite Gardner's re-interpretation of understanding to fit the current test-driven educational mind-set in North America, honest test makers and interpreters know and always assume that the person being tested knows and understands more than can be tested or "performed" since the context created for such performance brings with it many constraining features.

Gardner's current perform-it-for-the-test approach to understanding is brought into further dissonance given his long-standing commitment to multiple intelligences. Multiple intelligences mean multiple representations, and real understanding would therefore be in multiple representations; however, most performances draw only on one form of representation and consequently do not provide adequate evidence of understanding. Gardner is forced then to pursue the nearly impossible, stating that "one may believe that this 'mental representation' offers the optimal way to convey that particular topic" (1999b, p. 202). In contrast, I argue that the best representations are multiple. And so our search should be for the family of representations that can convey the core ideas in a multiplicity of ways at once accurate and complementary.

Gardner's contribution to education has been substantial and significant. He has done a great service for education in music by identifying music as an intelligence. His theory and pedagogical contribution, however, has been focused on the "intellectual" or "subject discipline" aspect of knowledge. It has had a strong traditional flavour about it (maybe that is why it has been so acceptable). He has, for example, shied away from identifying as "an intelligence" engagement with spiritual phenomena. He has also pursued one of the errors of modern cognitive psychology in essentially ignoring everything in the body but the cortex. The cognitivists basically ignore the emotive and conative aspects of experience and hence their place in learning. In one of his latest books he does finally acknowledge this critically important aspect of learning.

The role of emotions in learning has undergone renewed scrutiny.... Creating an educational environment in which pleasure, stimulation, and challenge flourish is an important mission. Also, students are more likely to learn, remember, and make subsequent use of those experiences with respect to which they had strong—and, one hopes, positive—emotional reactions.... if one wants some things to be attended to, mastered, and subsequently used, one must be sure to wrap it in a context that engages the emotions. Conversely, experiences devoid of emotional impact are likely to be weakly engaging and soon forgotten, leaving nary a mental representation behind. (1999b, p. 77)

What he seems to acknowledge and argue is that emotions are a means to an intellectual end, but he does not recognize that emotional, feelingful “reactions” also form mental representations and form permanent associative links (become knowledge) with all of the “disciplined” bits of knowledge Gardner is so concerned about. In my opinion, he misunderstands the nature of foundational knowledge structures in the mind.

Bennett Reimer

Reimer’s philosophy of music (1989) is clearly not premised on principles of current cognitive psychology and as such does not offer much for my current considerations. He believes “concepts” require linguistic labels to exist. He believes art is “intuitive” and “non-conceptual” and involves a process he calls “perceptual structuring.” This difference is incomprehensible in current cognitive science. His view of the major function of art would be much more convincing to me if he would phrase it within cognitive science. He says:

The major function of art is to make objective and therefore accessible the subjective realm of human responsiveness. Art does this by capturing and presenting in its intrinsic qualities the patterns and forms of human feeling. The major function of education in the arts is to help people gain access to the experiences of feeling contained in the artistic qualities of things (p. 53).

I may find Reimer’s explanations inadequate, but at least he talks about the experience of music. At least he attempts to account for emotional dimensions of the phenomenon. He expands “understanding” by arguing it involves experiencing the “human feeling” captured by the art work.

Harold Fiske

Rather than discussing Fiske’s (1996) dense arguments, I will simply present my favourite quotations (from a hard constructionist):

[M]usic cognition is a very complex and intellectually exciting mental activity... But complexity does not necessarily mean chaos. (p. 145)

[C]oncepts—not words—are in charge of thinking. Language does not direct thought, and ideas expressed by words are not equal the words themselves. That is, words are not ideas and ideas do not require words. (p. 148)

[M]usic-cognitive hypothesis testing consists of comparing incoming tonal-rhythmic percepts with context-derived, expectancy-generated, tonal-rhythmic pattern constructs. (p. 143)

[L]isteners respond emotionally to music, but their responses, even to the same piece, are personal ones and may vary both in quality and degree. (p. 128)

[W]hatever musical meaning is, it is in some way about realized interpattern relationships expressed as aesthetic attitude belief states. (p. 150)

[A] listener's emotional, feelingful, passionate, joyous, sad, ecstatic, melancholic, elated, euphoric, or down right turned-on arousal to music validates the human survival-value of aesthetic attitude states. (p. 152)

Musical comprehension is proportional to the extent of successful negotiation of the hierarchy of tonal-rhythmic pattern-comparison decision-making. (p. 154)

I only differ with the last point [do you mean the last two?] because Fiske argues that the outcome of the process of musical comprehension is an aesthetic attitude. Maybe I just do not understand it. The statement sounds like a Leonard Meyer argument to me. Understanding to me includes making the emotional link—this link is an essential aspect of music meaning and understanding. It is not that you understand the music (finished) and then you respond. I would argue that touching an emotional or feelingful button is part of the understanding.

Knowledge as Complex Constructs

Nine-month old Melanie plays with a Persian kitten. She nuzzles its neck, watches it frisk, pulls its tail, holds and shakes it, listens to it meow. Suddenly the kitten is frightened and scratches Melanie. She cries for a little while but soon returns to affectionate play. A few months later, much to the parents' delight Melanie says "cat." One day she sees a little short-haired dog and says "cat" but is quickly told "dog." She sees a short-haired cat and says "dog" but then hears the cat meow and immediately says "cat." Melanie has developed knowledge related to a specific cat and about "catness." She accumulated that knowledge in her mind as a series of registrations of sensory perceptions and bodily responses. *She "constructed" the sum of the sensory perceptions—the sum became a "construct."* An initial visual image distinct from its field established the perceptual "construct," which quickly assimilated touch sensations of fuzziness and warmth, sound sensations, smell, and probably even taste. Melanie's reactions of interest and pleasure also adhered to her cat construct. Quickly the construct had to accommodate the possibility of pain. Melanie's construct received an abstract representation—a name—that she probably remembered as a label long before she spoke it as a word. Her construct was further enriched with other representations (e.g., pictures of cats in books and stories about cats).

The mind of graduate student Pierre plays with questions of creativity for a research study. He wonders whether creativity is an inherent potential or learned ability and then realizes he needs to clarify what he means by “creativity.” Pierre reflects on instances when he was told he was especially creative. He remembers the feelings of anguish when he had to improvise in music class and the sense of euphoria when he crafted an exceptional poem. He describes the characteristics of some people he considers creative. He realizes the meaning “creativity” has in his mind is an accumulation of at least (1) personal experiences that were designated “creative,” (2) demonstrations of others engaging in “creativity,” (3) stories involving “creativity,” and (4) the meanings of other words like spontaneous, artistic, novel, unique, and special, associated with creativity. Pierre has constructed this set of meaning connections with creativity over many years. *A complex construct relates to and depends on a multitude of other constructs; it constantly and continuously develops.*

Complex Constructs

There is no neat division between basic, simple constructs and full-blown schema (the explanatory “theories” that are used to predict or guide action). The reason there is no neat division is the nature of complex construct. As we encounter something new we establish a “place holder” construct (analogy—create a web page) and then begin to make it more complex by adding things to it (put more on the web page) and forming links to other existing constructs (hot button links to other web pages). This IS the process of Meaning-making. The complexity of an individual construct is expandable and can in itself take on elements of explanation. When we create a “theory” (or at first an hypothesis) of how constructs are sequenced, linked, and related, we may be creating a new explanatory construct (a construct relation pattern that is stored as an accessible whole) or an awareness of links between simpler constructs (e.g., Melanie will soon predict that if she pulls the cat’s tail the cat will scratch). It may be useful to differentiate between basic denotation and signification level (level one) and explanatory level (level two) meaning constructs.

Level One Constructs. One type of construct at the basic level is the denotative “noun” type. A child’s “cat” construct could consist of only perceptions from a picture in a book associated with parents making meow noises. Many constructs begin in that way (almost as dictionary linguistic descriptions) but as such are essentially “empty” constructs (like web pages that have only one thing on them and with no further links, like words remembered as vocables but with no meaning).

Connotations can be added to these basic constructs through further verbal and visual connections, but active experience is what essentially develops the richness of the construct, as in Melanie’s case.

Clearly, a parent or teacher cannot simply “transfer” a fully-formed construct to the child. The person must engage perceptual data and build (construct) or organize it into a mental structure. One type of level one constructs is the noun and verb level—these constructs relate mostly to objects and actions (but always have links to all modes of perception and sensation).

A second type at the basic level of constructs is one that is essentially abstract—involving adjectives and adverbs. These emerge as a locus of meaning from attributions or characterizations of other constructs (objects and actions) and tend to take on values on a dichotomous continuum (e.g., hot/cold, excellent/mediocre, loud/soft). For example, “creative” is a construct that derives from generalized attributions of observations of production and product.

There are others. But, I am not trying here to make a complete catalogue and taxonomy of constructs.

Level Two Constructs. A second level of construct is that to which Kelly (1955) refers in his *Psychology of Personal Constructs* and is more recently described by Schema Theory. In schema theory, a person develops a mental structure that encompasses the links and relationships between basic constructs. This connection can be seen as a hypothesis or, with development, a theory. Schemas act as means of making predictions about the world. As a person experiences a stream of sensory data from any or all the bodily senses, these hypothesis-constructs offer “explanations” of the data by allocating them to existing constructs and relationships among constructs previously experienced or introduce “modifications” to existing constructs.

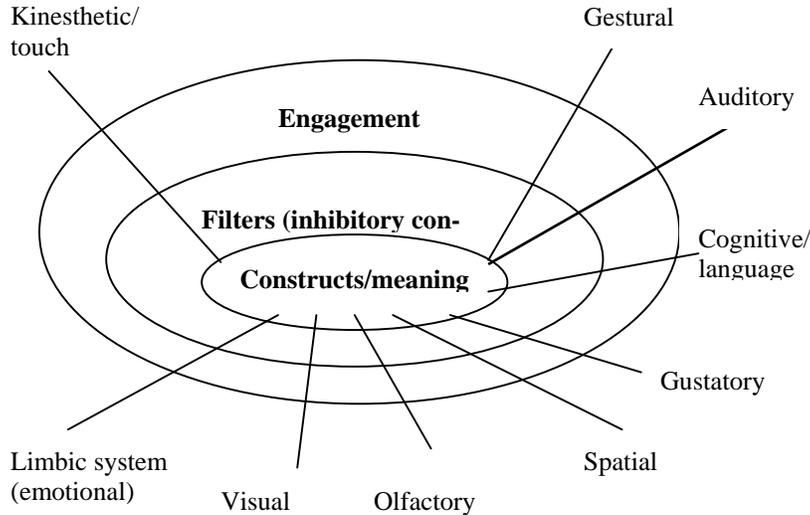
Every level is Complex. Complexity, a property of an object, idea, phenomenon, organism, or system, stems from “compoundness” —multiple parts, layers, or dimensions. In addition, complexity lies not only in an entity as multiple components but also in the interconnectedness or interwovenness of the parts, each of which may depend on or influence the other, neither of which is in a fixed relationship or quantity nor is related to a fixed behavior. Knowledge constructs are complex in their interconnectedness. One construct influences another, and neither is fixed—their meanings continue to change. Complexity, as a quality of being differentiated yet integrated, is commonly regarded as “the direction in which evolution proceeds” (Csikszentmihalyi, 1993, p. 157). Understanding related to particular constructs develops in this “direction”—meaning becomes more differentiated yet integrated into a larger framework of knowledge.

Back to constructs and the website analogy. A construct can be seen as a website. For example, Melanie's cat construct is a mental "website." This site might be structured with a page that has representations of the cat's appearance, a page of words associated with the cat, a page of emotions, a page of sounds, a page of smells, a page of touch, pain, and pleasure, a page of stories and poems of cats, and a page of other cats. Each of these pages has links to other sites. The story page links to many other places, animals, words, pictures, videos, and so on. The page of emotions may have links to parent emotions, sibling emotions, emotion labels, emotion valuing sites and so on. As the person develops the amount of material on each page, the number of pages, and the linking to other sites increases. The cat site may be accessed on any page and through other linked sites. To resemble human processing, the web and computer would have to function at a speed making links and pages accessible at fractions of seconds and in multiple channels simultaneously.

Sources of Construct Content

Figure 1 illustrates the possible sources of content for our construct structure. This illustration was adapted from one created by Pandora Bryce, Ph.D. student at the University of Toronto, to capture a variety of mental representations. Important to note is that constructs hold important knowledge from many sources other than the evident linguistic form.

Figure 1. Sources of Construct Content



Emotional/Feeling content of constructs

Emotion is a problem for each of the theorists mentioned. We are afraid of emotion—it does not appear to be rationale; it pops up at the oddest times. I would argue that emotion adheres to constructs (it is right there on the web page—as the colour or photo or dancing commercial). It can also be a link to a separate emotional site—sort of an abstraction and objectified emotion—the form of emotion remembered (“cognitive emotions,” as Elliott calls them). The biggest lack in the theories of musical understanding, however, is the absence of a thorough integration of emotional tone into every construct. The “playing the violin” construct has emotion on the site. Many “song constructs” have emotion on site. Many specific musical patterns have emotion on their site. Specific sounds have such links—for example a strained, near screaming “sonic event” carries a connection to an emotional site even when the connection does not become specifically conscious. I, of course, focus on this dimension as specifically as possible in designing relaxation music. Specific sonic effects as well as “musical gestures” have links. A person does not always consciously access each component or button or link. Often it seems that brains do matching iterations. They encounter a stimulus (say a set of oral vocables spoken rather quietly), and the brain does a search for a possible match. Some brains settle for the first match. Others make more iterations and test these possible matches against other context clues.

Inhibitory Constructs

One of the features of brain function is the firing of pyramidal cortical cells—the electrical charge build up starts around the center of the brain, builds up and fires upward, builds up, fires, etc. There are, however, not only excitatory forces. There are also inhibitory forces that resist firing (see Figure 1). Similarly, (not saying this is a function of these forces) there are barrier constructs or filters—inhibitors to the reaching of the web site. So certain meanings or associations may not become conscious or it may be difficult to reshape an explanatory construct.¹ One of the primary creators of these inhibitory constructs is the emotional reaction. “Belief” or judgments from previous experience can be inhibiting. These inhibitory functions are the opposite of engagement that I will explain in conditions of learning.

Understanding

Having explained the complex construct and its role in knowledge and understanding, I now finally return to look at what is entailed in the development of understanding. The development of understanding is concerned with: (1) increasing the complexity of constructs (adding pages with more on them to the web site), (2) increasing the associations among constructs (creating more links between sites), (3) increasing the complexity of explanatory constructs, (4) increasing the extent of construct consciousness or clarity, (5) making associations more readily accessible, and (6) increasing facility at accessing and using the links, thereby (7) increasing the accuracy of explanatory constructs to anticipate and predict the future.

Developing Understanding

Jackie Wiggins has already captured many aspects of the pedagogical implication of the constructivist approach I have developed here in her presentation and past writing (Wiggins, 2001; see also chapter X in this book). I do not have the space and time to expand that but a full consideration might start with John Dewey’s explanation of “an experience,” it would include Vygotsky’s activity theory, mediation, and the zone of proximal development. It would include Howard Gardner’s thoughts on apprenticeship and the

¹ Gardner refers to obstacles to understanding. Kelly refers to the permeability of constructs—the capacity of a construct to allow new elements of experience to be admitted.

“museum” model of learning, and so on. What I will do instead is to focus mainly on one of the principal concerns of pedagogy and one that is very directly related to the feeling tone that is inherent in every construct – the phenomenon of engagement.

But first one short consideration. From the perspective of complex constructs I must emphasize that knowledge exists in multiple forms of representation—each contributing a different form of understanding. One must always assume that knowledge or a meaning construct is linked, for example, to linguistic labels, visual images, musical ideas, feeling tone, and so on. As quoted earlier, Gardner (1999dm) says, “...one may believe that this “mental representation” offers the optimal way to convey that particular topic. In contrast, I argue that the best representations are multiple. And so our search should be for the family of representations that can convey the core ideas in a multiplicity of ways at once accurate and complementary (p 202).

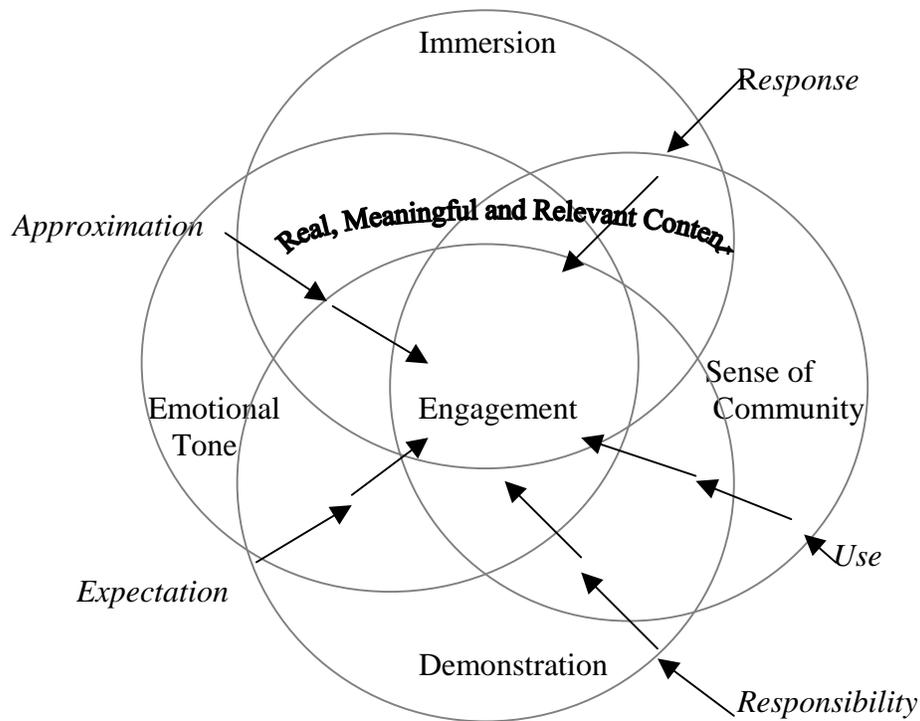
Facilitating Engagement. Given that understanding will develop in complex relationship constructs, a critical pedagogical element is the facilitation of emotional engagement and the elimination of inhibitory forces. As Gardner (1999b) observes (quoted fully above),

if one wants some things to be attended to, mastered, and subsequently used, one must be sure to wrap it in a context that engages the emotions. Conversely, experiences devoid of emotional impact are likely to be weakly engaging and soon forgotten, leaving nary a mental representation behind. (p. 77)

The factors that contribute positively to engagement (and their absence to the inhibition of positive learning) are captured in Figure 2 (Cameron & Bartel, 2000).

Foundational to learning is *immersion* in what is to be learned with many *demonstrations* of what is to be learned by trusted and esteemed individuals. The context of this immersion and demonstration is positively or negatively coloured by the *emotional tone* and the presence or absence of a *sense of community*. The central factor is engagement with the *content* of what is to be learned. To enhance engagement, the content must be *real, meaningful, and relevant* to the student.

Figure 2. Conditions of learning



Engagement is facilitated by:

- (1) Expectation. If students expect to achieve they achieve; if they expect to fail they fail. But, the teacher's expectation of the student is particularly influential.
- (2) Responsibility. To engage effectively in learning, students need to be allowed responsibility "to make their own decisions about when, how, and what 'bits' to learn in any learning task."
- (3) Use. Engagement increases when learners have time and opportunity to employ their developing control in functional, realistic, non-artificial ways.

- (4) Approximation. Especially important in music learning is the need for the learner to be free to approximate the desired model—“mistakes” are essential for learning to occur.
- (5) Response. For engagement to be sustained, the learner “must receive ‘feedback’ that is relevant, appropriate, timely, readily available, non-threatening, and with no strings attached.” [Source of quotations in 1 to 5?]

Conclusion

Musical meaning and understanding lies in construct complexity—the construct content and construct connections to which it relates. Musical construct complexity includes emotional content and feeling links. To develop musical understanding, music education must foster engagement, engage students in a constructivist manner with musical materials and problems, and encourage links with multiple intelligences and multiple representations through metaphor, cross-modality, inter-disciplinary and integrated art experiences.

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Synergetics reveals the creative role of chaos in the process of origin of complex structures and their evolution. Chaos and fluctuations on the micro-level play an essential role in determining processes at the macro-level. Complexity is closely connected with the speed (tempo) of evolution. A complex structure is an integration of structures of "different ages", i.e. structures at different evolutionary stages of development.