Use of 3D Game Space in Blended Learning Environments for the Teaching of Music

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This paper discusses approaches to the creation and application of interactive 3D virtual environments in the teaching of key aspects of musical understanding (ear training, theory, form, style, composition). My desire to use virtual space as a vehicle for teaching music results from the following:

1. A need for better andragogical methods for the *facilitation* of student-centered learning in music appreciation, specifically in the areas that require perceptual understanding (musical theory, structure, ear training).
2. A need to address current changes in modes of listening that are the result of our transforming sonic realities and soundscapes, as influenced by technological invention.
3. Use of this technology for educational purposes is a natural outgrowth of my current artistic work with 3D space at the Graduate Center's New Media Lab.

   To create a frame of reference by which one may better understand this educational project, a description of the above-mentioned art project follows:

“ART GAMES”:

Using existing real-time audio processing and 3-D game design software, Art Games will become a collection of virtual 3-D sound environments that, via a network, can be experienced and altered in real-time simultaneously by several users.

To experience the work, a player must move through the virtual space, and in doing so she will be able only to hear the sounds that exist within her local environment (modeled after real-world acoustics). A performer's movement through space will directly affect the unfolding and development in time of the sound in the work. If a performer so desires she can simply move around the space and listen, in effect reordering the musical object in time. However, she will also have the ability at any point in time and space within the work to move beyond her passive role as mobile listener by performing various physical actions on the environment, the result of which, depending on their nature, will range from minute alterations of the musical texture to jarring new moments of invention.

The Project Model:

"*A performer's movement through SPACE will directly affect the unfolding and development in TIME of the sound...*" - This statement, taken from the above excerpt, pinpoints one of the core concepts involved in designing an educational sonic 3D environment – that is – the embedding of time in space. What role can space play in the perception, exploration, and learning of musical structure,

style, history, etc.? How can SPACE facilitate in the understanding of a TIME-BASED art form? If the TIME-aspect of music (i.e. its development/unfolding in time) is treated as a feature of SPACE (i.e. One must move through space to experience the time-aspect of the material), a very different approach to teaching time-bound musical concepts becomes possible. By incorporating the notion of space into our thinking about ideas that are traditionally conceptualized and studied purely in the time-domain, we introduce the possibility for analogies and relationships that give these abstract musical concepts a grounding, possibly facilitating deeper, and more enjoyable acquirement of an experiential knowledge of the concepts. Allow me to give a real-world example of a time-based musical concept – musical form (structure) – first as it might be learned in a traditional setting, followed by a possible (albeit unrefined) virtual world alternative:

Musical form pertains to the organization in sequential time of the various sections and subsections of a work that combine to make up the whole. Form (in some situations referred to as 'structure') can be studied in a piece of music through various microscopic or macroscopic perspectives, depending on the intended emphasis of content. Usually systems of organization on the smaller scale are taught first in a classroom setting, as larger formal structures presuppose an understanding of their smaller building blocks. For this example let us say we are teaching a small-scale structure – that of the classical *'period'*. The *'period'* is a simple, symmetric melodic phrase structure common to composers of the Viennese Classical era (i.e. Mozart, Haydn) consisting of two parts: an antecedent phrase ending with an *incomplete cadence* (an unresolved point of rest) followed by an equal-length consequent phrase ending with a *complete cadence* (a resolved point of rest). I find the classical 'period' well suited to the teaching of the the concept of cadence in music, and usually my students agree. But in music it is one thing to *intellectually* understand a concept, and a completely different thing to understand that concept *perceptually*. Unfortunately (or fortunately, depending...) in music, there are no shortcuts to the development of perceptual understanding. Intellectual understanding of a concept can certainly help to make sense of what one hears, but without repeated listening aural familiarity of a concept is extremely

difficult, if not impossible, to achieve.

In class, I can introduce the students to important concepts and help them, as time allows, through guided listening exercises designed to familiarize their ears with the material, but listening practice on their own is an expected and necessary supplement to our classroom activities. This is traditionally done by repeated listening to recordings, perhaps with the accompaniment of a visual listening guide, and this approach can be quite affective for the more disciplined and determined students. In general though, from my experience, students find the absence of constructive guidance, coupled with the lack of any type of interactivity during the learning experience (i.e. real-time feedback) creates a frustrating learning barrier.

If I were, on the other hand, to supplement my in-class guided listening exercises with out-of-class interactive virtual environments that allowed the students to freely explore (preferably together in a networked space) various musical concepts as they were manifest in a spacial world, not only could this be an exciting and engaging new way to encounter the material, but it would also make possible a pedagogical method of presenting the material and an approach to experiencing the material otherwise virtually impossible in a real-world setting. An example of one such virtual environment follows:

Imagine a virtual space with a prominent walkway running throughout its center (much like the central walkway running the entire length of China's Forbidden City). On each side of the walkway are several feet of empty space, visually divided into long subsections (as indicated by changing text and texture embedded into the ground) that run parallel with the walkway. Mapped onto the entire length of the virtual space would be a musical example of a classical *'period'*, perhaps taken from the start of a Mozart Symphony. As you step onto the very beginning of the central walkway the music begins to play, moving at normal speed from beginning to end. Remember, the time-aspect of the music is embedded into the space, so as the music progresses in time, you are able to see its manifestation in space, say as a vertical sheet of transparently colored light running perpendicular to the walkway. While on the central walkway, the music (and sheet of light) moves forward in time and space,

regardless of whether or not you move with it. If you choose to walk along the walkway, you are able to keep up with the sheet of light as it scrubs across the room to the far wall, but you can also stand still and watch the visual indicator slide ever farther away from you. A quick jump (by pressing the space bar) resets the music and sheet of light to your exact position in space and time after which the music immediately resumes its movement forward through the space at the previous normal rate. On the other hand, stepping off the central walkway causes the music and sheet of light to immediately snap to and remain at your location in time and space. Moving off of the walkway allows you to explore, elongate, and repeat the embedded musical moments based on your movement within the space. You are able to move forwards and backwards in time by walking in either direction parallel to the walkway. Additionally, you can explore the sub-features of a single musical moment by walking perpendicular to the path towards one of the side walls. Walking through the space in this way allows you to focus attention on the individual sound sources that make up the whole. So, for example, as you walk towards one of the side walls, you may first hear music played by the string section of the orchestra (as sounding in that specific moment in time), followed by the woodwinds, brass, and then percussion.

The use of space, however, is not only limited to the teaching of music's time-bound features. Space can be used effectively to teach many other musical concepts. Below is one such example:

One of the first things that students have a hard time with in Music Appreciation classes is identifying and distinguishing between the various sources of musical sound (i.e. instruments). The importance of repeated focused listening as a way of familiarizing one's ears is easy for students to accept, but I've found quite difficult for them to act on. Aside from the use of preexisting interactive websites and software (I plan to do research on these uses of technology, of which Morton Subotnick's series of music appreciation software packages music stands out - www.creatingmusic.com) students have few alternative approaches to learning these sounds aside from repeated listening of recordings (or repeated attendance at concerts). Again, the use of space as a way to frame musical concepts often devoid of space may prove to be useful in facilitating perceptual familiarity with those concepts. If I

were to embed a symphony orchestra (or any other ensemble for that matter) into a virtual space so that each member of the ensemble had its own discrete location within that space (violins in one area, cellos in another, etc.), and then allow the students to walk through that space as the orchestra played some music, this would be an exciting new way to encounter and become familiar with those sound producing objects. How many of us have had the opportunity to leisurely walk through a symphony orchestra in mid-performance?! With virtual space, my students (I hope) will be able to do this as often as they like, and each time to different music!

The Need for New Approaches:

As stated at the the onset of this paper, I feel there is a growing need in music education (at least in relation to the teaching of young adults) to address the profound transformations in modes of listening taking place in our modern, increasingly digital and networked world. These changes that have occurred and are occurring as a result of new technologies for the production, reproduction, dissemination, and experience of sound, reflect our perpetually transforming relationships with the sonic realities and soundscapes that surround us. Walter Benjamin, in his essay on the effects of technology in the arts during the early modern (pre-digital) era states, “To an ever greater degree the work of art reproduced becomes the work of art designed for reproducibility” (Benjamin 1968). Benjamin reflects on the changes in our perception of art as affected by the the possibility of its mechanical reproduction (as first seen in photography), and as an outgrowth the possibility of the creation of art without definitive origin. This paradigm shift in the reproduction of art, along with concomitant shifts in the perception of the art's function, sense of authenticity, and aesthetic content, bears similarity to the transition from the isolated and analog to the increasingly networked and digitized reproduction and dissemination of media that we have experienced in the late 20th century.

Taking Benjamin's statement as a fundamental assumption in today's world of digital art (especially in music), a modern restatement from the consumer's perspective may sound something like

this: “To an ever greater degree the work of art repeated and appropriated becomes the work of art designed for infinite repetition and appropriation.” The transition from analog to digital music, in concert with its transition to networked dissemination, once again fundamentally alters the way we think about and encounter music. Coupled with the increasingly available user-friendly tools of digital media production and editing (Garage Band, Soundforge, Audacity, etc.), and proliferating tools of musical acquisition, conversion, and reorganization (iTunes, Rhapsody, MusicMatch Jukebox, etc.) the average digital music consumer possesses a ***far greater*** sense of empowerment and control over her moment by moment consumption of musical material than was possible in the pre-digital age. Again, rephrasing Benjamin, the distinction between author and public ***IS*** losing its basic character (Benjamin 1968).

In his article on the transformation of listening practices made possible by the advent of the Walkman in the early 1980's (a VERY relevant subject as it relates to our own state of digital portability), Iain Chambers writes, “...the Walkman is both a mask and a masque: a quiet putting into action of localized theatrics. It reveals itself as a significant symbolic gadget for the nomads of modernity, in which music on the move is being continually decontextualized and recontextualized in the inclusive acoustic and symbolic flux of everyday life” (Chambers p.99-100). On Chambers' view, editor Christopher Cox adds, “...The Walkman allows us to shape our audiovisual experience and thus to produce a soundtrack to our everyday lives” (Chambers p.98). Today's listeners find themselves with one foot firmly planted on each side of the production line, and it is incumbent upon the music educator to take this reality into consideration when attempting to design effective and engaging pedagogical tools and approaches. The creation of interactive, learner-centered, 3D virtual environments is but one such attempt at addressing these changing realities in our modern sonic lives.

Cultural Considerations:

Today, more and more students in higher education are what Marc Prensky refers to in his

writing as “Digital Natives”. According to Prensky, it is of great importance that educators consider the changing manner in which the younger generations are encountering, engaging with, and retaining content in their everyday lives. “Digital Immigrant teachers (Prensky's term for non-Digital Natives) assume that learners are the same as they have always been, and that the same methods that worked for the teachers when they were students will work for their students now. But that assumption is no longer valid. Today learners are different” (Prensky p.3). An openness to the validity of a learning behavior fundamentally different from our own, not only supplies the teacher with a deeper collection of critical standards by which to evaluate her own success (i.e. more answers to the question “Why don't they understand?”), but also – if taken seriously – may inspire the design of more effective and appropriate teaching environments and strategies. Prensky states, “As educators we need to be thinking about ways to teach both Legacy and Future content in the language of the Digital Natives” (Prensky p.4). But in order to know Prensky's “language” it is first necessary to examine why such a language is necessary and what forces and behaviors have driven its evolution. How exactly might a Digital Native understand and experience sound differently from her analog Native counterpart?

The Loss of Decay:

The shift from analog to digital media in music has had a deep effect on the way that we as listeners integrate music into our everyday lives – on the way we relate to the material itself. Digital information takes us one *large* step away from Benjamin's mechanically reproduced art – from art, such as analog photography, that although made for reproducibility still holds its very identity by physical substance. And although Benjamin in his own time saw the film negative not as much a point of origin as a means to reproduction, today its function as origin is clear. The “original” in analog media can only truly exist at its point of origination – the “master” recording. All other reproductions, that too must reside within a physical shell, are unavoidably derivative and modified (i.e. loss or change of quality). In other words, the authentic point of origin *is* physical substance in the world of analog

media. Not so in the realm of the digital. In a world of digitized information the notion of physical origin for the first time becomes obsolete. Digital media (unlike tape) has no physical body that defines it. It *does* require as a condition of its existence a physical environment (hard drive, CD-ROM, iPod, etc.), but that environment is no more a part of the media's content than the Earth is a feature of a human being's personality.

Digital media, being fundamentally a collection of zeros and ones, can be duplicated countless times, stored in countless different locations without *any* modification or loss of content. A work of digital art can simultaneously exist in as many different locations as there are digital storage devices, and undergo no alterations in the material that defines it as itself. It is only in the digital-to-analog conversion process, when the zeros and ones are translated back into smooth-ramping signals, that content is lost/changed (based on the quality of devices at the analog end: audio outputs, speakers, room acoustics, etc.) - but the "original" information, safely stored away in a world free from natural decay, remains in tact and unaltered. Digital media, barring destruction of the containers that store it, has no mortality – is immune to the effects of time and decay to which all physical-world objects succumb. This is the reality within which Prensky's Digital Natives live. Add to this scenario the tendency for vast amounts of digital media to interface with the world primarily via highly stable network systems and we have the environment by which Digital Natives have grown up accessing and consuming the vast majority of their information. *How does our learning process fundamentally change when we are allowed nearly infinite asynchronous access to and repetition of information – when we assume,* ***as we encounter it****, that the information can be reexamined and/or reused at almost any other time and place?* James J. Duderstadt, in his 1997 article "The Future of the University in an Age of Knowledge" discusses the changing learning tendencies of the "digital generation" and the possible necessary pedagogical adjustments that this shift may demand:

> "The classroom itself may soon be replace by more appropriate and efficient learning experiences.

> Indeed, such a paradigm shift may be forced upon the faculty by the students themselves. Today's students are members of the "digital generation". They have spent their early lives surrounded by robust, visual, electronic media... They approach learning as a "plug-and-play" experience. They are unaccustomed and unwilling to learn sequentially – to read the manual – and are inclined to plunge in and learn through participation and experimentation... It could well be that faculty members of the 21st Century university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments" (Duderstadt p.80).

Student – Media Relationships:

As discussed earlier, proliferating technologies in the creation, dissemination, and consumption of digital music have effectively transformed the passive listener into active co-creator - what author and New Media scholar Mackenzie Wark refers to as a "DJ of other people's thoughts and ideas" (Wark interview with *This Spartan Life*). Today, this DJ behavior, this tendency to sculpt, cut, and paste one's own life-soundtrack is not only the result of self-motivated creativity, but can also be seen as an adaptive coping strategy in a world of inundated commercial sound artifacts. John Oswald, in his essay "Plunderphonics" (his term for the creative practice of undermining the foundations of the art music paradigm: *originality, individuality, and copyright*) speaks to this adaptation:

> "All popular music is (as is all folk music by definition) essentially, if not legally, existing in a public domain. Listening to pop music isn't a matter of choice. Asked for or not, it seeps through apartment walls and out of the heads of Walkpeople. Although people in general are making more noise than ever before, fewer people are making more of the total noise; specifically, in music, those with megawatt PA's, triple-platinum sales, and heavy rotation. Difficult to ignore, pointlessly redundant to imitate: how does one not become passive recipient?" (Oswald p.137)

The answer to that question has become more obvious since the pre-Internet, pre-wireless, and pre-digital portability of the early 90's when Oswald wrote these thoughts. Today, listeners experience

large amounts of content daily in an asynchronous fashion. With the click of a button the layman music appreciator can transition from the beginning of one song to the end of another song written and recorded 40 years earlier. For better or worse, listening to an entire album of music (let alone an entire song) in one sequential block of time is fast becoming odd behavior. I have recently seen proof of this tendency in my own Music Appreciation class. When asked how many students regularly listen to an entire piece of music in one sitting (and it is safe to assume that most interpreted "piece of music" to mean a song written in a popular music genre and of a duration most likely five minutes or less – as opposed to a fifteen minute movement of a Beethoven symphony), I was surprised to see less than ten hands raised – in a class of fifty-five! Asynchronous access seems to have become quite commonplace even for my older-than-average night class-attending undergraduate students. Considering these different cultures of learning and interaction will be a necessity in the successful teaching of time-bound musical content – especially Legacy content (Prensky's use of the word), such as Beethoven, Bach (even Parker!), with its embedded sense of the unfolding of time quite different from that of the digital generation.

The Need for New Approaches, continued:

Eduard C. Lindeman writes in his 1926 book "The Meaning of Adult Education" on predicting future approaches to adult education:

> "...the approach to adult education will be via the route of situations, not subjects. Our academic system has grown in reverse order: subjects and teachers constitute the starting point, students are secondary... In adult education the curriculum is built around the student's needs and interests... Texts and teachers play a new and secondary role in this type of education; they must give way to the primary importance of the learners" (Lindeman as cited in Knowles p.8-9).
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> "...the resource of highest value in adult education is the learner's experience. If education is life, then life is also education... Experience is the adult learner's living textbook" (Lindeman in Knowles p.9-10).

Nowhere is the consideration of the learner's experiences more essential than in the effective teaching of perceptual musical understanding. Music, of whatever kind, permeates our lives. From my experience as a teacher of all ages (four years to seventy-five years), music is new to no one. None of us – regardless of profession, nationality, ethnicity, etc. - come to a musical situation with a blank slate. We all possess a depth of musical experience unique and valuable to the formation of a communal educational environment, whether our experiences fall under what famous American composer Aaron Copland labeled the "expressive", "sensual", or "intellectual" planes of experience. Whereas it is quite difficult, in fact, to *avoid* fundamentally integrating the knowledge and experience of the student in a one-on-one setting (where barriers to learner-centered approaches are virtually nonexistent), in a classroom setting this pedagogical approach tends to be the first to go. And for this reason more than any other, technological extensions of the classroom (synchronous and asynchronous) hold much potential. Although classroom education is (and should be) unique in its approaches from other settings, the core learner-centered mentality that is so common in private teaching must find a way into this scenario. Again, Lindeman on learner-centered education (which could easily be descriptive of a private music lesson!):

"In this process the teacher finds a new function. He is no longer the oracle who speaks from the platform of authority, but rather the guide, the pointer-out who also participates in learning in proportion to the vitality and relevance of his facts and experiences: a cooperative venture in non-authoritarian, informal learning, the chief purpose of which is to discover the meaning of experience" (Lindeman in Knowles p.39).

Malcolm Knowles, in his book on adult education entitled "The Adult Learner" lists six core components to the andragogical model in education. They are as follows:

1. the learner's need to know
2. the learner's self-concept
3. the role of the learner's experience
4. the learner's readiness to learn
5. the learner's orientation to learn

6. the learner's motivation to learn

Technological extensions in the music classroom, such as the incorporation of networked 3D educational environments, can have influence in all six of these categories; I would like, however, to focus on the significant impact in two of these areas (2nd and 6th) that such new approaches can have. Knowles states, in reference to the second area, "Adults have a self-concept of being responsible for their own decisions, for their own lives" (Knowles p.65). As music is, in the vast majority of cases with adult learners, intimately intertwined with the learner's larger experiential life – and therefore one of many integral influences that informs the self-concept of the learner – it is important as an educator to try as much as possible to capitalize on the natural tendency of the student to personalize (to find significance/resonance) general concepts learned (or at least not to dissuade such personalization!). Music, similar to other areas of study that combine the perceptual with the intellectual (visual art, architecture, urban design, computer game design, etc.) ***must***, at least in part, be experientially self-acquired in order for the learned material to be perceptually grasped. In other words, sometimes actions (virtual or real) on a subject can be better than one thousand well-articulated words. The combination of these, however, is far greater than the sum of the two parts. In the end, a music student must find a way to personalize abstract concepts (as in the case of ear training, for example), to wring the abstraction out by finding relevance in her own musical life. All musicians search for ways and tools to accomplish this end.

3D multi-user environments can, if designed well and used effectively, play a significant role in a student's continued motivation to learn important course material. Particularly in the case of large groups of primarily non-trained music students, as is the case for the majority of Music Appreciation classes, a broadening of environmental and social contexts in which students can practice, experiment, and play with learned concepts is sorely missing. Considering the fact that the vast majority of such students have no *active* method by which they can repeatedly practice music (i.e. no formal training on an instrument, no instrument to play, etc.), 3D space would be a powerful and convenient way for

students to engage their desire to apply knowledge learned in class. Such technological extensions can empower the student to take an *active* role (as a musician always does) in the learning process – while hopefully maintaining the experience as an enjoyable one.

Advantages to Online Learning Environments:

Networked, online learning environments (both synchronous and asynchronous) offer interesting new possibilities for the creative reframing of class material. However, as Anthony Picciano points out in his Spring 2006 article on online learning in the Journal of Thought, online scenarios may not necessarily be appropriate for all types of instruction and with all areas of study.

> "There are areas of study that by their nature almost require physical presence of the teacher and student such as the arts, physical education, and speech. While some of the course work in these subjects can be simulated online, most of these activities will continue to be done in traditional face-to-face environments" (Picciano p.79).

For the teaching of music in group settings, the blended approach referred to above is, in my opinion, more effective than either of the extremes (fully face-to-face or fully online). But the areas taught on and offline vary considerably based on the subject matter and setting. In other words, online environments can prove useful as an extension to face-to-face teaching in all areas of music, from advanced music theory to performance practice and criticism, but what in one setting may be optimally encountered online, in the other may work better face-to-face. Whereas teaching musical form to a class of music-major undergraduates via 3D world could be engaging and fun, it only replaces other methods by which they can experience the concept at hand; their performance, score-reading, and listening abilities are more than enough to allow for independent self-directed exploration. For non-musicians though (again, the vast majority of music appreciation and basic music theory students) 3D environments create possibility in the learning process where non previously existed.

Another significant advantage to the use of 3D game space in education (specifically in music) is that while most modern 3D game engines allow for sophisticated world design with ever-more realistic physics, lighting, and texturing behavior – that all-combined make use of the virtual space a compelling and easily-grasped metaphor to real-world experience – ***3D engines also make possible the extension, breaking, and redesign of these real-world "laws" for the more effective delivery of class material***. These built environments serve not merely as solutions to problems of classroom logistics (i.e. limited one-on-one time, difficulties in implementing in-class learner-centered activities, etc.), but in some instances make possible a new way of coming to the material that would be unachievable in the "real" physical world (what gamers refer to as "meat space"). The design models discussed earlier in this paper (in the "Project Design" section) are two such examples of educational scenarios that would be virtually impossible to recreate in "meat space". To reiterate, I see 3D space as a ***virtual laboratory*** (or second classroom) where the simulated laws of physics (including acoustics) can be readily broken for pedagogical purposes, where students can interact and explore together, where concepts learned in "meat space" can be tested through various in-world games, competitions, joint exercises, rehearsed performances, and spontaneous improvisations – in short, where emergent gameplay can become part of the educational process.

The Project Model, continued (and ambitious):

In designing virtual 3D educational spaces, I plan *eventually* to minimize the real-world/game-world dichotomy by designing methods and tools that make possible the simultaneous use of both. Here's one example, as an additional element to my earlier-mentioned environment for learning to identify sources of musical sound (i.e. instruments):

As an alternative to real-world in-class presentation using videos and recordings of various instruments and instrument types, the entire class lesson could be taught synchronously in game space. Embedded in-game, perhaps as a separate auditorium-type room, would be an area where I present to

the class real-world rich media such as Quicktime movies (on a virtual projection screen) that introduce the students to the subjects of the class lesson. Additionally, there could be smaller TV-like stations interspersed throughout the space that individuals or small groups would use to view and hear other examples. This media would be accessible at any time while visiting the virtual space, so students would be compelled to use the space while outside of class as a review tool or simply as a way to deepen their mastery of the subject. In the next class I would use the game space to hold group activities that would both allow me to observe the students' progress and allow the students to interact and learn from each other in real-time. After allowing them previous in-class and out-of-class time to explore the virtual instruments positioned throughout the world (in my earlier example I suggested a virtual symphony orchestra setup), I could scramble the placement of the instruments into an unorganized mass located in the center of the room. For the first round of the exercise, a small group of students (perhaps five) would be elected to sort the cacophonous mass of instruments into the four families of the orchestra (strings, woodwinds, brass, and percussion), each family of instrument to be moved into one of the four far corners of the virtual room. After the students complete their sorting, we as a class would walk to the four corners and assess the correctness of the groupings. Following this I would call on the entire class to transport the instruments back into the middle of the room, and another small group again re-sorts the instruments by family. Variations on this activity can follow – for instance, once the instruments are grouped by family into the four corners, a small group can work together to construct another ensemble type in the center of the room such as the string quartet (two violins, one viola, one cello).

As an extension of an extension, asynchronous learning environments such as the Discussion Board tool in the Blackboard course management system can effectively take the in-class and in-game learned concepts out of real-time and allow for more reflective approaches to the material. In his discussion on the strengths of asynchronous learning networks Picciano states, “The threaded discussion which is the mainstay of the asynchronous learning network (ALN) model, can provide a

communications vehicle for each student to participate at his or her convenience... A class discussion, for example, can go on for days without being constrained by a bell schedule" (Picciano p.80). The Discussion Board could serve as a place where, in addition to teacher-instigated threads, students can post thoughts, reactions, problems, etc. on their in-game experiences. This asynchronous space would also be ideal for the formation and scheduling of in-game study groups, for example. Asynchronous online extensions, very notably, allow those students who for whatever reason don't verbally participate in-class to contribute to the class discourse in another valid manner. Again, Picciano on the advantages of non-realtime environments: "There is never a reason not to post a message to a discussion board because of competition for time, because it takes more time for some students to process a thought or comment, or because oral communication is slower for a student whose first language is not English" (Picciano p.81).

Conclusion:

In this paper I have outlined several advantages to the use of networked 3D game space as a teaching tool and powerful extension to in-class real-world educational activities. I discuss the necessity for new andragogical approaches to the teaching of music in group settings that take into consideration the changes in learning process and information acquisition as experienced by current and future digital-savvy college students. And finally, I argue that the intelligent design of 3D educational space, to be used in combination with traditional in-class activities and reflective asynchronous online activities, makes possible a more well-rounded, engaging, social, and effective learner-centered educational experience.

References

Chambers, Iain. "The Aural Walk." Audio Culture: Readings in Modern Music. Ed. Christopher Cox and Daniel Warner. New York: The Continuum International Group Inc, 2004. 98-101.

Benjamin, Walter. “The Work of Art in the Age of Mechanical Reproduction.” In Illuminations. New York, 1968.

Duderstadt, James J. (1997). The future of the university in an age of knowledge. *Journal of Asynchronous Learning Networks, 1*(1), 78-88. http://www.aln.org/publications/jaln/v1n2/v1n2_duderstadt.asp

Knowles, M. Holton, E.F., & Swanson, R. (1998). *The adult learner.* Woburn, MA: Butterworth-Heinemann.

Oswald, John. “Bettered by the Borrower: The Ethics of Musical Debt.” Audio Culture: Readings in Modern Music. Ed. Christopher Cox and Daniel Warner. New York: The Continuum International Group Inc, 2004. 131-137.

Picciano, A.G. (2006). Online learning: Implications for pedagogy and policy. *Journal of Thought, 41*(1), pp. 75-94.

Prensky, M. (2001). Digital natives, digital immigrants (Parts I and II). *On the Horizon, NCB University Press, 9*(1), 2001. http://www.marcprensky.com

Wark, Mackenzie. “Interview with Mackenzie Wark.” This Spartan Life. 2006. http://www.futureofthebook.org/blog/archives/2006/09/mckenzie_wark_interview_in_hal.html http://www.thisspartanlife.com -from video recording of Wark being interviewed in the Halo 2 multiplayer online game world