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### The Powerful Link Between Music, the Brain, and Education

My research on the power of music as a learning tool was motivated by my amazement at how I can still name all fifty states, in alphabetical order, with little to no effort. I learned how to do this in elementary school when we sang “Fifty Nifty United States”, in our music class, and obviously all of that information has remained stored in my brain with relatively easy retrieval. How many of you can recall the words to obscure songs from your past? Have you ever wondered why this was so? Why can we recall information so well when it is in the form of lyrics set to music? These are the questions I set out to answer as I began my research. It soon became very clear that the connection between music and the brain is an extremely powerful one and should not remain an untapped resource in education. Throughout the rest of this paper I hope to explain what I’ve found and present an argument that will inspire all educators to think more strongly about using music in their teaching.

If you were to examine a human’s brain, you would notice that there are certain parts designed to receive and process music. In other words, there are biological structures and areas for music. Listen to any infant and you will hear it babbling and experimenting with its voice. Watch that same infant and you will notice its ability to learn, remember, and respond to a song played on their crib mobile. As that infant grows into a preschooler, you can again witness his/her spontaneous singing, bopping, and moving to music played on the radio or in the background. This all comes naturally, without any necessary prompting from an adult. When you shift focus to the animal world outside the home, there is much musical activity going on as well. For example, in birds and monkeys, music can attract a mate and/or warn of danger. The point of all this is that music is inherent and a part of nature. When we treat it as a “frill” in education, we are depriving children of something that is so naturally rooted in our biology.

Brain research has come a long way. It used to be that the only way to study the brain’s relationship to music was on patients with brain damage. For example, by knowing what area of the brain was damaged and what skills or abilities the patient no longer had, one could deduce that that area of the brain controlled that ability or skill. Now, doctors can use scanners and imaging methods to see what areas “light up”, or receive increased blood flow, during playing,

singing, writing or listening to music. Coming up, in a detailed look at our brain and how it processes music, it's important to note that no one specific area does this job alone. There are many areas and structures involved, which is great news, as will be explained later.

Here is an attempt to trace the path of music in our brains, once it enters our ears. When music enters our ears it is received by a structure called the cochlea. From there, it is sent to the auditory area of the brain via the auditory nerve. This auditory area of the brain exists in both the left and right hemispheres, with each side processing different things. For example, the left hemisphere of our brain processes lyrics, rapidly varying volume, pacing, rapid and accurate pitch trajectories, and harmonies. The right hemisphere of our brain processes melodies, timbre, and long term patterns. The cerebellum, which is located in the back at the base of our brains, is involved in the processing of beats and spatial patterns. The limbic system, which controls emotional states, is also stimulated by music. It is responsible for those emotional associations we have with certain songs. The limbic system can even link those emotions to physical sensations we feel when we hear a particularly memorable, happy, sad, slow, or fast paced song, through the release of hormones. For example, if you've ever experienced the exciting sensation of wanting to get up and move or exercise to a song that has a fast tempo, you're experiencing the stimulation that the fast tempo has on the release of adrenaline/epinephrine (through the production of non-adrenaline) on your amygdala, which is part of your limbic system. So, music stimulates both hemispheres of the brain as well as engages emotions. Now, if the music you hear is in the form of a song that also carries a message, meaning its lyrics are educational, then from a student's perspective this is an ideal situation for learning because when the whole brain is engaged, concentration and memory are increased. Add to that an emotional connection and there's an even greater chance that the brain will encode the educational lyrics/message into long-term memory.

I think it's safe to say that the goal of most educators is to teach their students something of substance that will stay in their long term memory. Another way to classify memory, however, is to use the terms "procedural" and "declarative" memory. These two terms have emerged recently from the current debate over the types of memory that exist and how they should be categorized. Declarative memories are those you can consciously recall and state, such as what you had for dinner and what you did this weekend. If those memories were highly emotional, then they stick faster and easier in your declarative memory. Procedural memories are those that have been built over a period of time and can be recalled without consciously trying to do so, such as riding a bike or tying your shoe. In other words, information in your procedural memory is automatic and a deeper part of you. The goal in education then,

is to make learning more procedural and less declarative. A song that involves actions, versus a lecture, would effectively do this because singing a song would make the learning more active, engage the brain in an emotional experience involving both hemispheres, and thereby activate the learner's procedural memory.

There is another field, besides education, that is highly concerned with the ability to engage a person's long-term memory and communicate messages effectively. The field is advertising. The phenomenon that prompted my writing of this paper (the ease of remembering words set to music) is what advertisers call "sonic branding". Sonic branding is crucial to promoting their television station, product, etc. Advertising companies have found that when they turn their slogan or product information into lyrics set to music, their message is better remembered and recalled. If the music they use happens to be a tune the public is already familiar with, the chances of recall are greatly improved. So if advertisers do it, why can't educators? The next time you have an important message you want your students to remember, try setting it to music they already know and see how easy it is for them to recall it.

This is a good place to note that the brain responds slightly differently when singing, listening to, creating, or sight reading and playing music, which makes sense because each of these actions are slightly different themselves. Many people have heard of the "Mozart Effect" which is the popular idea that listening to a few minutes of Mozart will make one more intelligent. This is not true. Just like a diet, if it sounds too easy and too good to be true, then it probably is. Listening to Mozart apparently does improve one's temporal reasoning (the ability to form mental images from physical objects or see patterns), but only temporarily for a few hours, which is how this myth got started. Permanent improvement in one's temporal reasoning comes from actually creating music. Another interesting piece of information is that during sight reading and playing music, so much of the brain is involved that the only other situation that involves more of it is during an epileptic seizure when storms of electrical activity sweep through the brain. So, music in all its forms gives our brains various levels of activity and intensity.

Students deserve a well-rounded education that approaches learning from various angles. Certainly, the use of music will engage the students that have, what Howard Gardner terms, "musical intelligence"; that is having the acute sensitivity to sound and the ability to create and communicate through tones and rhythms (Gardner p.17). But even without "musical intelligence", students can still excel with the addition of music in the curriculum. Weaving music into the curriculum can be done in so many ways, and does not need to be limited to a once a week music class. For example, Dr. Georgi Lozanov, a Bulgarian educator and founder

of accelerated learning and Suggestology, has created an approach to teaching that transforms the teacher into an orchestra conductor. Knowing that a melody can be a powerful carrier of information to the listener, Dr. Lozanov has the teacher giving his/her lesson to the class with pre-selected music in the background. That music acts as a soundtrack so that the teacher can dramatically present his/her content in a way that matches the highs and lows, exciting and calm moments, of the music. Yes, the teacher is almost like an actor or orchestra conductor in this technique. Dr. Lozanov emphasizes the fact that if done well, a teacher can accomplish 60% of the teaching work in about 5% of the time because the information reaches the students' subconscious, activates long term memory, and creates better understandings (Jensen p.252). There are also many wonderful CD's and educational songs that are easily accessed via the web. For example, [www.songsforteaching.com](http://www.songsforteaching.com) is a wonderful website offering hundreds of educational songs in various subject areas. Steve Van Zandt, with Banana Slug String Band, and Rhymin' Reason are two musical groups whose songs we sing here at IslandWood. Both groups have wonderful, inspiring websites that offer something for everyone and deserve recognition.

So, in my search for an answer to the question "Why can we recall information so well when it is in the form of lyrics set to music?", I came to the following general conclusion: the more pathways that you use when inputting information in your brain, the more pathways you have available to retrieve that information and the easier the retrieval will be. Music engages a large portion of the brain and therefore creates many pathways which makes recall of lyrics in songs, for example, so seemingly easy. This may seem obvious, but sometimes one needs a bit of the science and research to reaffirm what already seemed instinctual. If you would like to access more research on music, the University of California, Irvine, is doing great work in this field and has a highly respected publication "MuSica". Here at IslandWood, the use of educational songs, with actions that go along, can be seen and heard every day. Singing everyday is not only entertaining, but the melodies echo through the trails throughout the rest of the week as students sing them over and over again. As a field instructor and graduate student, it has been rewarding and inspiring to be a part of a team that places music high on its list of teaching strategies. I encourage all educators to re-examine their use of the arts, specifically music, and take the risk of trying something new for the sake of the students.

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