

Music Makes A Difference
Music Education's Effect on Academic Achievement
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The United States has long prided themselves on being the best. Americans love to win, to be ranked number one, to win the most gold medals, to get there first. So, it is not surprising that the end of the nineteen-eighties brought with it some frustration, when we discovered we were not first. "A 1988 test of the International Association for the Evaluation of Educational Achievement ranked the United States fourteenth among 17 countries on an instrument testing science achievement of eighth and ninth graders. The report was among the catalysts for the many reform efforts of the '80's and '90's." (Ponter, 1999) Our children, our most precious resources, were not measuring up.

Who was ahead? "The top-performing students on the 1988 IAEEA Test in science were the eighth and ninth graders from Hungary, followed by those from the Netherlands and Japan." (Ponter, 1999) What were these countries doing differently than the United States? In studying these three countries, the one unifying educational factor that ties them together is their emphasis on music. "Are there parallels between academic achievement and music education when we look at the top three scoring countries? There certainly are. Japan requires two music class periods per week in grades 1-6. At the middle level, students learn to sing in choruses and play instruments. The Dutch have compulsory examinations in music and art. In Hungary, music education in voice and instrumental training are compulsory for the first eight years of school." (Ponter, 1999) "These countries have already discovered the positive contribution music can make to students' aptitude and learning success. These countries have made music a major part of their curriculum. The United States lags far behind." (Kelstrom, 1998)

The United States response to this research was to largely ignore it. Elliot Eisner puts it well when he states;

... the arts frequently take a back seat to “academics” in the budget process. When a nation is at risk, when from virtually all sides we hear of the vast number of functional illiterates leaving our schools, when remedial courses are oversubscribed at even our most selective colleges, the thought of making the case for so seemingly marginal a subject as art and music in our schools is especially daunting. How can we recommend that the school’s most precious resource, time, be directed from what is truly basic education to the luxury of studying the arts? How can one propose that teachers divert their attention from the skills that are fundamental to economic well-being, to an area of study that “properly” comes after the basic educational needs have been met? How can one propose a broad course of study when the schools have, apparently, been failing at their more narrowly defined tasks? (Ponter, 1999)

It was true, Americans saw music education, and the arts in general as a frill. Educational reform had brought with it other stresses that were much more pressing “...budget cuts and financial stress, demands for higher test scores, and proof of student achievement, scheduling conflicts, overcrowding of facilities, and higher technological demands.” (Kelstrom, 1998) As pressure to be accountable to the public increased, so did standardized tests. Somewhere in the process, the knowledge that other countries were increasing their test scores through promoting music and the arts was lost. “Music, one of the medieval Four Pillars of Learning - along with arithmetic, geometry, and astronomy - had, historically, been considered an integral part of learning.” (Ponter, 1999) But, increasingly, Americans were choosing to remove it from the curriculum.

Fortunately, three major studies in the recent years have strengthened the position of music education as a core of the curriculum. The first is an extensive amount of brain research that has been done. Tied to this brain research is Howard Gardner’s theory of Multiple Intelligences. Finally, Frances Rauscher and Gordon Shaw have contributed land breaking studies in showing causal relationships between music education and academic achievement. These studies do not stand alone, many smaller studies have shown strong correlation between music and academic achievement.

The 1990's have been proclaimed the "Decade of the Brain." This is due in large part to the development of non-invasive monitoring devices that allow us to "see" inside the brain as it works. "Brain scanners like Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) gave us new ways to understand and see inside the brain. For the first time in history, we could analyze the brain while its owner was still alive. A new breed of 'inner science' developed: neuroscience, which is an exciting interdisciplinary approach to questions about the brain." (Jensen, 1998)

Donald Hodges, professor of music at the University of Texas at San Antonio - uses magnetic resonance imaging and positron emission tomography to take pictures of peoples' brains while they listen to music. "One widespread misconception is that musicians are exclusively 'right-brained' - that is, that they draw primarily on the right hemisphere of the brain, which dominates functions such as imagination, creativity, and artistic endeavors. But, as Hodges' compelling images show, music is distributed across locally specialized regions on both sides of the brain." (Black, 1997) "Musical experiences are, to use Hodges' term, 'multimodal' - that is, they involve auditory, visual, cognitive, affective, and motor systems." (Black, 1997)

Researchers quickly learned that the brain not only was able to learn, but to rewire itself. "Washington University School of Medicine researchers Hanneke Van Mier and Steve Peterson discovered that while many areas of the brain will "light up" on a PET scan when a new task is initiated, the brain 'lights up' less and is used less the better the task is learned. Novices use more of their brain, but they are less efficient at how they use it. This quality illustrates how quickly our brain adapts and rewires itself. " (Jensen, 1998)

Research on newborns has been especially interesting with regard to music education. "For example, on the basis of observations and experiments with newborns, neuroscientists now know that infants are born with neural mechanisms devoted exclusively to music. And, perhaps most important for music teachers, studies show that early and ongoing musical training helps organize and develop children's brains." (Black, 1997)

Music is beginning to be understood as a form of intelligence, not merely as a manifestation of it. The idea that intelligence takes on any one single characteristic is being challenged. "Led by the provocative work of Howard Gardner, researchers and educators

are moving toward a theory of 'multiple intelligences,' any or all of which can be developed. By 'intelligence,' Gardner means something like a distinguishable ability to solve and create different kinds of problems. His research identifies seven basic, different intelligences: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, intra-personal (intelligence about one's own feeling life), inter-personal (intelligence about human interactions, temperaments, and motivations). Everyone has some capabilities in each of these; some intelligences are more dominant in some individuals than in others." (Growing Up Complete 1991)

In the following quote, Gardner gives an excellent example of all the skills and processes that go into playing the violin.

... musicians follow a progression of notes, a very sequential left-brain process; seeing patterns in the construction of phrases, seeing the whole for expressive phrasing and interpretation, and dealing with rhythmic patterns, on the other hand, are very right-brain skills. Additionally, mathematical abilities involved in timing, counting, and the symbolic encoding of time and sound involve abstract and spatial reasoning.

All this brain activity must be consummated in the form of precise fine motor skills. Beyond all other musical activities, the playing of stringed instruments without keys or frets involves the estimation of decreasing distances down the finger board for accurate intonation. Bowing technique requires the cultivation of an intuitive sense for velocity and acceleration that may later become codified in the symbolic language of the calculus. Because it draws on so many different attributes, music develops flexibility in thinking. Musical training is an effective way, not only to enhance the conceptual-holistic-creative thinking process, but also to assist in the melding and merging of the mind's capabilities. (Ponter, 1999)

Music is given special status in Gardner's theory. He states that "musical intelligence probably carries more emotional, spiritual, and cultural weight than the other intelligences he has described." (Black, 1997) But perhaps most important, "that music helps some people organize the way they think and work by helping them develop in other areas, such

as math, language, and spatial reasoning.” (Harvey, 1997) Gardner is critical of school districts that cut music education, calling administrators “simply arrogant and unmindful of how humans have evolved with music brains and intelligences.” (Harvey, 1997) In light of a growing amount of research that states music education impacts all seven intelligences, Gardner has become a strong supporter of the arts.

Finally, the highly publicized research of Frances Rauscher and Gordon Shaw from the University of California, Irvine produced what skeptics had long asked for, a causal relationship. The following research was dubbed the “Mozart Effect”. In 1993 college students were matched for intelligence and placed in three groups. Group one listened to 10 minutes of Mozart, group two listened to 10 minutes of rhythmically repeating contemporary music, and group three listened to 10 minutes of silence. All three groups were then given the subtest of the Stanford-Binet Intelligence test measuring spatial IQ reasoning. The subtest measures spatial intelligence, the ability to form mental images of physical objects. “Students who listened to music by Mozart for 10 minutes were found to have higher spatial scores than those who did not listen to any music. The students scored 8-9 points higher. Interestingly, rhythmically repeated contemporary musical works did not improve spatial task performance; only the classical music had a significant effect. The conclusion of this study was that music and spatial task performance is causally related.” (Kelstrom, 1998) “While these studies established the existence of a causal relationship between music and spatial-temporal reasoning, the effect lasted only ten minutes.” (Rauscher 1997)

“Although the “Mozart effect” is very intriguing, and holds great promise for further explorations into the transfer of musical processing to other domains of reasoning, the effect’s limitations suggest that merely listening to music is probably not sufficient for lasting enhancement of spatial-temporal intelligence. Listening to music is a passive experience for most people, and does not require the involvement that actively making music does.” (Rauscher, 1996) It was with these conclusions that Rauscher began a pilot study of preschool children to determine if actually performing music was the key.

The pilot study found that “after nine months of weekly individual piano keyboard lessons, a group of three-year-old children, enrolled at a music school, improved on a

spatial-temporal task significantly more than was predicted by age-standardized norms. A second group of three-year-old children from disadvantaged families, enrolled in an inner-city daycare center, received 30 minute group singing lessons daily for nine months. This group also improved on the spatial-temporal task significantly more than was predicted by age-standardized norms.” (Rauscher 1997)

Following the pilot a larger study was undertaken. The study involved 78 children - 42 boys, and 36 girls. The ages of the children ranged from three years, zero months to four years, nine months. The study took place over a two year period and involved three preschools. Students were divided into four groups. A keyboard group, in which each child received a ten minute private piano keyboard lesson once a week and group singing sessions five days a week for 30 minutes. The singing group received the same singing lessons as did the keyboard group. The computer group received private computer lessons matched in number and length to keyboard lessons. Finally, there was the group that received no special lessons. The keyboard group produced a dramatic overall increase in object assembly scores, while none of the other groups showed any appreciable change.

To determine if the enhancement found in this study was long-term, they compared the Object Assembly scores of the children who were tested one day or more after their last keyboard lesson to those of the children who were tested less than one day afterwards. No significant difference was found. This indicates that the enhancement on the Object Assembly spatial-temporal task from piano keyboard training lasted at least one day, and is considered by memory researcher standards to be long-term. “This study suggested that music training, unlike listening, produced long-term modification in underlying neural circuitry in regions not primarily concerned with music. The magnitude of the improvement in spatial-temporal reasoning from music training was greater than one standard deviation, equivalent to an increase from the 50th percentile on the WPPSI-R standardized test to above the 85th percentile. We suggest that an improvement of this magnitude may enhance the learning of standard school curricula that draw heavily upon spatial-temporal reasoning abilities, such as mathematics and science.” (Rauscher 1997)

As this research was published, schools began to see if they could duplicate the study. One such school was Gemini Elementary School in Florida. The school did the

same study using their kindergarten students. “They found the same results of improved achievement in pre- and post-test studies with these children. The results were so dramatic and positive that they have scheduled additional music instruction time for five-, six-, and seven-year-old students.” (Hinckley, 1999)

This research goes a long way to proving something music teachers have known and experienced first hand. Music makes a difference. However, there will be those who will not want to invest the time and budget needed to provide a quality music program based only on three bodies of reference. The following is only a sample of studies and reports that correlate music with academic achievement.

Recently, critical thinking skills have dawned on the agendas of America’s school boards. Teachers are being trained and evaluated based on their ability to impart this crucial skill. The following quote was taken from the The National Commission on Music Education in March of 1991. “Music education also provides a critical introduction to the reinforcement of such academic and personal skills as critical thinking, problem-solving, and learning how to work cooperatively toward shared goals. Critical thinking skills are widely endorsed as a *sin qua non* for our children if they are to make much needed contributions to the work force. This requirement is being significantly affected by massive change in the occupational structure of the work force. Of particular importance are skills acquired through learning how to manipulate symbols; higher order cognitive skills such as the ability to analyze, synthesize, and evaluate information; and the kinds of teamwork abilities and conflict-resolution skills required for success in the modern work place. Such skills are both implicit and explicit in music instruction. The inherent mathematical under-pinnings of music, for example, powerfully reinforce the analytical dimension of higher cognitive skills.” (Growing Up Complete 1991)

In 1988, a study entitled *First Follow-Up to the National Education Longitudinal Study* took statistics on 18,000 American tenth graders from 1500 public and private schools. Two of the areas that are of significance to this report are the number of students who had been recognized or honored by their school or community for any of several specific achievements: Were they elected to be an officer of their school class? Did they receive an academic honor? Did they receive special recognition for good grades or

placement on the honor roll? The second question pertained to the actual grades the students received. 22.3 percent of the students considered identified themselves as participating in a school-based musical activity. “We would expect this number to correlate with the 22.3 percent - however with regard to the first question, 29.5% were class officers, 28.6% had academic honors, and 27.2% were recognized for good grades. In the second area, the percentage of music students reporting A’s, A’s and B’s, and B’s was compared with the percentage of nonparticipants who reported similar grades. Music students demonstrated an even stronger showing here. The largest difference (10.9%) was found among English scores, followed by history (8.9%) and science (8.5%) scores. Even the smallest difference, occurring between participants’ and non participants’ math scores, measures a notable 6.1%.” (Morrison, 1994)

“Researchers have found that music instruction actually enhances student achievement in areas outside music. In a study by Robitaille and O’Neal in 1981, 5,154 fifth graders took the Comprehensive Test of Basic Skills (CTBS) in Albuquerque, N.M. in 1979. In 1980, another 5,299 fifth graders were tested. Of these groups, nearly one-fourth of all participants were enrolled in the instrumental music program during both years. In all areas, music students scored higher on the CTBS than the total group. The research showed that the longer pupils were in the music program, the higher their achievement was in comparison to the non-music students. This study was replicated in 1986 and similar results were found.” (Kelstrom, 1998)

Several studies conducted by the College Board regarding the SAT have shown that music and art students “consistently score significantly higher on both the math and the verbal sections of the SAT. The data were gathered by the Student Descriptive Questionnaire, a component of the SAT that provides information about students’ academic preparation.” (Kelstrom, 1998) “According to The College Board (Profiles of SAT and Achievement Test Takers), there is a direct correlation between improved SAT scores and the length of time spent studying the arts. Those children who studied the arts for four or more years scored 60 points higher on verbal and 41 points higher on math portions of the SAT (for a combined total of 101 points) than students with no course work or experience in the arts.” (Hinckley, 1999)

Arts education can make a difference in the life and death of a school itself. In 1985 St. Augustine's School in the Bronx was about to close because of low enrollment and poor academic achievement. The principal decided to convert the school into an arts school. "Today students spend one-third of the day in music. At fourth grade they learn piano plus one other instrument. All students are taught to sing. This school is open to all, not just the musically talented. Even though it is located in an extremely poor area, it has a waiting list of students who want to attend. Today, the school is one of only three schools in the greater New York area in which 90 percent of the students are reading at the proper grade level." (Kelstrom, 1998)

In another school, in Aiken, South Carolina, a strong arts curriculum was added to Redcliffe Elementary. At Redcliffe, test scores were among the lowest 25 percent in the district. After the arts program was implemented, the school soared to the top 5 percent in 6 years. "This Title I rural school with a 42 percent minority student base showed that a strong arts curriculum is at the creative core of academic excellence - not more discipline, higher standards, or the three R's." (Jensen, 1998)

The Colorado High School Association on band and orchestra students did a study in 1992 of its four-year high schools. Membership in the instrumental music groups was considered the independent variable and the following were the dependent variables: Science Research Associates (SRA) test of reading, language, math, and composite scores; absences from school during the 1990 - 91 school year and cumulative GPA. "The study found that concert band and orchestra members scored significantly higher than non-music students on SRA language, math, and composite scores; that their GPA's were significantly higher than non-music students; and that they had significantly fewer days absent. The conclusion drawn was that music students reached higher academic achievement levels in academic studies than non-music students." (Kelstrom, 1998)

Researchers have found other benefits besides academic achievement for the arts to become a strong program in American schools. After all, teachers cannot educate students who do not attend classes. "In a Florida Department of Education study in 1990 that surveyed at-risk students enrolled in arts classes, a majority of the students indicated that their participation in the arts influenced their decision to stay in school. Researchers

concluded that the arts can be a powerful vehicle for motivating the student at risk to remain in school.” (Woody, 1998)

On a lighter note, it is interesting to see where music students end up. “Grant Venerable, in *The Paradox of the Silicon Savior*, says: “One of the most striking facts in Silicon Valley industry is that the very best engineers and technical designers are, nearly without exception, practicing musicians.” (Ponter, 1999) Would it further surprise us to learn that music training is looked upon by medical schools as excellent training? “Physician and biologist Lewis Thomas studied the undergraduate majors of medical school applicants. He found that 66 percent of music majors who applied to medical school were admitted. This was the highest of any group, while only 44 percent of the biochemistry majors were admitted.” (Ponter, 1999)

But, the concern must be raised, music is time consuming and removes children on a regular basis from the classroom at the elementary level. The system for teaching elementary instrumental music by and large involves the pullout or removal of small groups of students for music lessons. This practice is disliked in the elementary schools nation wide, by music and classroom teachers alike. A large Ohio study on the effects of a pullout string program on student achievement in the writing, reading, mathematics, and citizenship sections of the Ohio Proficiency Test reached the following conclusions. “The evidence is compelling that string students who were pulled out of the regular academic classroom for string instruction did not suffer negative effects in their academic performance, as measured by the OPT. Further more, students who were excused for string instruction scored significantly higher in the reading and citizenship sections of the OPT than students who remained in the classroom.” (Wallick, 1995)

Unfortunately, many classroom teachers have not heard the research and even if they have, they may continue to have concerns regarding the removal of students they consider “their students.” These concerns are typified by the following comments made by sixth grade teacher Ms. Hennessy.

“In the final analysis, students still must know how to read, do math, have attained writing and thinking skills, understand basic scientific concepts, and have an awareness of the world, in order to function in our changing world.

With the current state of the pull-out syndrome, such proficiency is in severe jeopardy as eager classroom teachers wait for students to return to the classroom so that the teaching process can resume.” (Wallick, 1995)

It is unfortunate that Ms. Hennessy’s statement seems to imply that the teaching process stops while pullout students are engaged in their various out-of-classroom activities. Students who are excused from their classrooms for instrumental instruction are not leaving instruction. They are simply receiving a different form of instruction. Hopefully, this information can help to encourage classroom teachers that although the three R’s are not the focus of attention, education is still continuing. Students, by in large, will not suffer academically, but may indeed grow because of this important instruction.

“The future role of music and fine arts in the U.S. schools depend on administrators, who will only make music a part of the curriculum if they are aware of the financial, academic, and aesthetic merits of having a music program.” (Kelstrom, 1998) “If music is to become a basic part of education, administrators and school board members must become convinced of its educational, as well as artistic worth. They must become convinced that music is as basic to a child’s education as is English, Math and Science. It is ironic and perhaps unfortunate that we may be forced to resort to science to show the value of music to education. The point must be made that the data from this research in no way takes away from the value of studying music for the beauty and expression it offers in and of itself. This work does not diminish music as an art, but rather it increases the status of music as an educational tool. Music education is essential for all students, not just the gifted and talented, and therefore all educators must understand that providing music education is a fundamental part of their responsibility.” (Rauscher, 1996)

The programs that exist today in America’s schools are a good start, but we must develop stronger sequential programs taught by qualified teachers. “The research clearly shows that music instruction, taught by qualified teachers, produces measurable enhancements in the development of children’s brains, resulting in significant educational benefits. It is important to note, however, that the cognitive and academic improvements highlighted by the research come about only with sequential instruction in music provided by qualified teachers, not through mere exposure to music.” (Hinckley, 1999) Dr.

Rauscher's research clearly showed that while listening to music and being exposed to music was a good thing, it did not replace formal instruction. Dr. Rauscher emphasized this when she noted that "there is no scientific data indicating that, when provided in isolation from music instruction, enrichment and exposure programs induce long-term cognitive benefits." (Hinckley, 1999)

"For most of the twentieth century, a strong arts program meant you were raising a culturally aware child. But today's biology suggests that it's the arts that lay the foundation for later academic and career success. A strong art foundation builds creativity, concentration, problem solving, self efficacy, coordination, values attention, and self-discipline." (Jensen, 1998) The brain research clearly shows that our brains were designed for music and the arts, and there are positive, measurable, and lasting academic and social benefits. "It is an anomaly that while music is undermined in our public schools as a legitimate subject for serious study, there is a rise in the body of research demonstrating that music is a valuable tool for educators. Those who consider music to be an extra-curricular activity, unworthy of inclusion as a core subject are overlooking the unique qualities that music instruction provides to all children." (Rauscher, 1996) Dr. Rauscher continues this statement, suggesting music improves the intellectual functioning of all children; "we have shown that music education is essential for optimal cognitive development. If we do not provide adequate opportunities for our children to learn and participate in music, we are depriving them of a great resource." (Rauscher, 1996)

The case for music education has been clear to music educators for years. Music does make a difference. Unfortunately, music educators have often been too emotional in their response to questions asking them to justify their programs. It is to them a very emotional issue, it is their lives and their livelihood. More than that, it is the avenue for success for many of the children they see in their classes. Fortunately, now there is scientific evidence. Brain research, Howard Gardner's work on Multiple Intelligences, Frances Rauscher's research, and multiple case studies and testimonials now provide music educators with a powerful case for what they knew all along. Music Education makes a difference.