Music Makes You Smarter: A New Paradigm for Music Education? Perceptions and Perspectives from Four Groups of Elementary Education Stakeholders

John L. Vitale

Nipissing University

Abstract

Through 14 years of teaching music in the Greater Toronto Area, the "music makes you smarter" notion has imbued many of the conversations I have had with multiple stakeholders in public education. Such conversations have suggested that the ancillary benefits of teaching music have now become the principal reason why we teach music -- what I refer to as a new paradigm shift in music education. This study attempts to validate my own experiences through a sample size of 100 participants and a multiple methods approach to inquiry. Specifically, this study explores the perceptions and perspectives of the "music makes you smarter" notion by four groups of stakeholders in elementary education, namely; music teachers, students, parents, and non-music teachers. With a few exceptions, both quantitative and qualitative data have generated perceptions and perspectives that validate the "music makes you smarter" notion, suggesting that my own experiences of a paradigm shift within music education in the GTA were indeed authentic and valid. This paper ends with a discussion on the ramifications of this new paradigm shift and ultimately argues that the music itself should be the focus of music education.

Key words: Music Education, Paradigm Shift, Perceptions, Perspectives, & Mixed Methods

Résumé

Au cours des 14 années passées à enseigner la musique dans la région du Grand Toronto, l'idée que « la musique vous rend plus intelligent » a imprégné de nombreuses conversations que j'ai eues avec différents acteurs de l'enseignement public. Ces conversations ont suggéré que les avantages secondaires de l'enseignement de la musique sont maintenant devenus la principale raison de son enseignement - ce que j'appelle un changement de paradigme dans l'éducation musicale. Cette étude tente de corroborer mon expérience à travers un échantillon de 100

CANADIAN JOURNAL OF EDUCATION 34, 3 (2011): 317-343

participants et une approche à plusieurs méthodes d'enquête. Plus précisément, cette étude explore les perceptions et les perspectives de l'idée que « la musique vous rend plus intelligent », de quatre groupes d'intervenants dans l'éducation élémentaire, à savoir : les professeurs de musique, les élèves, les parents, et les professeurs enseignant une autre matière que la musique. À quelques exceptions près, les données quantitatives et qualitatives ont généré des perceptions et des perspectives qui valident l'idée que « la musique vous rend plus intelligent », suggérant que ma propre expérience d'un changement de paradigme dans l'éducation musicale dans la région du Grand Toronto était effectivement véritable et pertinente. Cet article se termine par une analyse sur les ramifications de ce nouveau changement de paradigme et soutient finalement que la musique elle-même devrait être au centre de l'éducation musicale.

Mots-clés : éducation musicale, changement de paradigme, perceptions, perspectives, méthodes mixtes.

Music Makes You Smarter: A New Paradigm for Music Education? Perceptions and Perspectives from Four Groups of Elementary Education Stakeholders

Preamble and Contextual Framework

In my experience, the notion that "music makes you smarter" has been imbued in virtually all of the music education marketing campaigns for both public and private educational institutions in the last decade. Such institutions have cited the results of a wide range of research that corroborate the "music makes you smarter" notion. A visit to the websites of several national and international music education organizations also reveal a surfeit of research corroborating the "music makes you smarter" notion. The USA, for example, has The *National Association for Music Education* (MENC, 2011); Canada has the *Coalition for Music Education* (2011); Australia has the *Music Council of Australia* (2011); and, on a global level, we have the *International Society for Music Education* (2011). All of these aforementioned organizations have a plethora of facts and figures on their websites corroborating the "music makes you smarter" notion.

As a former elementary and secondary school music teacher, the term "music makes you smarter" repeatedly emerged in casual and professional conversations with colleagues, parents, and students. Over the years, it was also readily apparent in approximately two thirds of these conversations that increased intelligence deriving from musical study principally focused on math and science[1] benefits. Hence, more logical-mathematical intelligence rather than other types of intelligence such as linguistic or spatial, for example (Gardner & Hatch, 1989). Ultimately, I have found the sheer emphasis and prominence placed on the term "music makes you smarter" by colleagues, parents, and students deeply troubling. That is, music is worthy of study more for its ancillary benefits than the music itself, which very much sounds like a paradigm shift in terms of how we think and feel about music education. Moreover, this perceived paradigm shift is disdainful and disrespectful to the profession of music education. The inspiration to conduct this study, therefore, principally lies within this perceived paradigm shift, particularly since there are several studies that refute or dubiously question the "music makes you smarter" notion.

Purpose

The purpose of this study, therefore, is to investigate the "music makes you smarter" notion through the perceptions and perspectives of four groups of stakeholders in the educational arena, namely: elementary music teachers, elementary students, parents of elementary students, and non-music elementary teachers. Specifically, this study seeks to explore the following problem: What are the perceptions and perspectives on the "music makes you smarter" notion by all stakeholders? In an attempt to answer this question, this investigation will explore the following five guiding questions with the four groups of stakeholders:

---

[1] The connection between music and math/science has been around for thousands of years, going back to ancient Greek mathematician Pythagoras, a central figure in Western mathematics. For Pythagoras, music was intricately connected within mathematics and science (Weiss & Taruskin, 2008). Moreover, it was Pythagoras who has been credited for developing our understanding of the harmonic (overtone) series (Godwin, 1986). Moreover, 17th century German philosopher Gottfried Wilhelm Leibniz (as cited in Archibald, 1923) also stated that "music is a hidden exercise in arithmetic, of a mind unconscious of dealing with numbers." (p. 1)

1. To what extent does music education enhance performance in math and science?
   Rationale: Many of the conversations that I have had on the "music makes you smarter" notion have heavily focused on the links with math and science, particularly with all of the attention that STEM education (i.e., science, technology, engineering, and math) has been receiving in recent years (Kuenzi, 2008).

2. What effect does music education have on cognitive skills?
   Rationale: Music education has been linked with a number of cognitive benefits in addition to math and science, such as the development of problem-solving skills and out-of-the-box thinking.

3. How does the "music makes you smarter" notion influence the financial support and marketing of music education?
   Rationale: Music education has suffered reduced instructional time and budgetary cutbacks in recent years due to increased numeracy and literacy initiatives. Through my experience wearing the multiple hats of music teacher, teacher educator, and parent over the years, I have noticed that music education advocates have been using the "music makes you smarter" notion to overcome reduced funding and instructional time. That is, they are playing the card that music education can help increase numeracy and literacy scores.

4. What is the knowledge base of participants in music?[2]
   Rationale: This question was necessary in order to separate those participants who had extensive knowledge of music (the ability to fluently read, write, and perform music).

5. How do participants perceive the value of music education towards elementary education and society at large?
   Rationale: This question is intended to have participants look at the big picture in two specific areas, namely; (a) the role the music plays within the entire elementary educational experience and (b) the role that music plays within society at large.

Literature Review

Demorest & Morrison (2000) make an important distinction within the "music makes you smarter" notion that is necessary to understand before I begin with the literature review:

> Music, or at least music education, does make you smarter. We are confident in this answer because there is a wealth of research that demonstrates without a doubt that music instruction makes students smarter in music. Unfortunately, that is not what most people mean when they say, "music makes you smarter." In all the recent press about the

[2] This question is really more of a qualifier or control question and not a guiding question per se. For the purpose of statistical analysis and interpretation, it has been left within the sequence of guiding questions.

> potential benefits of music and music instruction, there is an implicit assumption that smarter means smarter at something else. (p. 33)

Hence, the literature review has been organized into two sections, namely: (a) literature that attempts to prove or support the notion that "music make you smarter" in other subject areas, and (b) literature that opposes or questions the very same notion.

(a) Literature that Supports the "Music Makes You Smarter" Notion

Let me begin by saying that this section of the literature review has been exceedingly difficult to write by virtue of the fact that a Google search on the phrase "music makes you smarter" in August 2011 garnered 7,720,000 results. With limited time and space, the following represents only a fraction of the research available on this important topic. Every effort has been made to address principal and groundbreaking studies over the last two decades from the world of academic discourse.

Many researchers have found that music education positively affects a child's academic achievement. Hallam's (2010) study, for example, demonstrates that musical instruction influences a child's perceptual and literacy skills, numeracy, intellectual development, general attainment, and creativity. Similarly, Schellenberg (2006, 2004) found that IQ can be associated positively with musical instruction. Comparable to these findings, Weinberger (2000) argues that music education, especially in younger children, provides valuable learning skills, which are carried by the individual for a lifetime, including strategies for the gathering, conceptualizing, and dividing of information in the brain. Expanding on Weinberger's ideas, Blasi and Foley (2006) argue that music education helps to stimulate learning and encourages children to become active participants in their own personal learning, which the authors argue is key for students to become successful academically. Paquette and Riege (2008) also found a positive correlation between music and scholastic achievement concerning English language learners. Morrison (1994) and Wallick (1998) reported that music students receive higher grades in math, English, history, and science; higher test scores in reading and citizenship; and more general academic recognition than students who do not participate in school music activities. Altenmü ller, Gruhn, Parlitz, & Kahrs (1996) and Portowitz, Lichtenstein, Egorova, & Brand (2009) found that musical instruction positively effect cognitive development and higher intelligence quotients. Rauscher, Shaw, Levine, Ky & Wright (1994) and Rauscher, Shaw, Levine, Wright, Dennis & Newcomb (1997) found that preschoolers improved on a single test of spatial reasoning with piano instruction. Similarly, Bilhartz, Bruhn, & Olson (2000) and Hetland (2000) suggest a significant correspondence between music instruction and spatial–temporal reasoning abilities. In addition, Schmithorst & Holland (2004) found that musical study helps with mathematical processing. Moreover, Gouzouasis, Guhn, & Kishor (2007) and Cheek & Smith (1999) found that students who had musical instruction tended to score higher on standardized testing, particularly in mathematics. Vaughn (2000) found that musicians tended to score higher on mathematics achievement tests than non-musicians.

Perhaps the most recognized math and science application in both academia and popular media has been The "Mozart Effect"[3] (synonymous with increased spatial-temporal reasoning),

[3] The "Mozart Effect" was first described by French researcher Dr. Alfred A. Tomatis back in the 1950s. During this time, Tomatis (an ear, nose, and throat doctor) maintained that playing Mozart to his patients significantly aided

which refers to the finding that 36 college students who listened to 10 minutes of a Mozart sonata scored higher on a subsequent spatial-temporal task than after they listened to relaxation instructions or silence. This effect lasted approximately 10 minutes (Rauscher, Shaw, & Ky, 1993). Gordon Shaw (the theoretical physicist on the research team) claimed that the effect was created by the complex musical structure of Mozart's music which facilitated intricate neuronal patterns involved with elevated brain activities like math and chess (Witchel, 2010). This effect has been replicated several times (Nantais, 1997; Rideout, Dougherty, & Wernert, 1998; Wilson and Brown, 1997).

Over time, the term "Mozart Effect" has been bandied about by popular culture, featured in education, parenting, and music publications, as well as the mainstream press and television. This mass media coverage has spawned a number of initiatives, including the distribution of a CD of Mozart's music to every baby born in the states of Georgia and Tennessee (Schellenberg, 2005). Even Florida's legislature passed a law requiring that classical music be played daily in state-funded childcare and educational programs (Hauserman, 1998). In sum, there is an entire industry of "Mozart Makes You Smarter" product lines, including popular books, compact discs, and websites claiming that listening to classical music can make children "smarter" (Rauscher, 2003). Ultimately, the "Mozart Effect" has become somewhat of a snake oil for the commercial side of music education.

Lastly, recent technological innovations in brain scanning technology have allowed neuroscientists to explore ideas about the link between music and intelligence, and musicians have been found to have very distinct brains. For example, the region of the brain that controls finger movements is enlarged in keyboard players (Pascual-Leone 2001), and brain scans of 9-to-11 year old children who play instruments have more grey matter volume in both the sensorimotor cortex and the occipital lobes than those children who do not play instruments (Schlaug, Norton, Overy, & Winner 2005).

(b) Literature that Opposes/Questions the "Music Makes You Smarter" Notion

When analyzing the question, "Does music make you smarter?", Demorest & Morrison (2000) state that this question is not an accurate representation of the data presented to the public, and that findings related to the question "Does music make you smarter?" only supports one small area of a tested hypothesis and cannot be said to be true for all active music students across the entirety of the school curriculum. Demorest & Morrison (2000) continue by stating that "we cannot conclude that music has a direct impact on the intellectual abilities of students, however we can conclude that there are specific characteristics attributed to music students which promote them to prosper academically" (p. 33). Cutietta (2001) simply argues that students who are better academically are more likely to study music based on the high level of self-discipline, concentration, and perseverance it takes to musically perform. Thus, the correlation between musical study and intelligence is purely coincidental.

In terms of music listening Pietschnig, Voracek, and Formann (2010) have reviewed 15 years of research into the so-called "Mozart Effect" and found no proof of the phenomenon. "On the whole, there is little evidence left for a specific, performance-enhancing 'Mozart Effect'" (p. 314). Moreover, in 2006 the German Research Ministry analyzed over 300 published articles on music and increased intelligence and concluded that passively listening to any music including

in fixing speech and auditory disorders. In 1991, he published a book on this subject titled *Pourquoi Mozart* where he justified that listening to Mozart helped retrain the ear by providing varying frequencies for the ear to perceive.

Mozart does not increase intelligence. (see Schumacher, 2011). Bridgett and Cuevas (2000) found that listening to music by Bach or Mozart for 10 minutes (when compared to a non-music condition), produced no effect on a subsequent mathematical problem solving performance. Steele, Bass, & Crook (1999) and Chabris (1999) were unable to replicate the so-called "Mozart Effect." Moreover, Bruer (1999) critically attacks the veracity of the "Mozart Effect." Even Dr. Frances Rauscher (cited in Millbower, 2000) one of the pioneers of the "Mozart Effect" has doubts:

> I find that Mozart makes you smarter thing is quite a bit of a leap. This evidence is tentative at best. Listening to music has some effects, but they don't last, as far as we know so far. (p. 58)

Moreover, Flemming (2009) claims that there is no scientific proof that listening to music increases IQ or improves academic performance.

If the "Mozart Effect" is propelled by complex structures within the music, then equally complex music should have the same effect. Thompson, Schellenberg, & Husain (2001) tested this hypothesis and used Albinoni's "Adagio," which is described as a sad, beautiful, and complicated piece of music. Test scores revealed that Albinoni's music actually contributed to participants performing worse on the spatial-temporal exam, which undermines Gordon Shaw's belief about complex music. This suggested that mood and arousal are the basis for change when generally listening to music and has since became known as the "Albinoni Effect." Extending from this study, Husain, Thompson, & Schellenberg (2002) further investigated mood and arousal by manipulating the tempo (fast and slow) and key (major and minor) of a Mozart sonata and found that only those participants that were exposed to a quick tempo in a major key showed increased spatial reasoning. Hence, they concluded that mood arousal was more the basis for the "Mozart Effect."

Even when it comes to studying music, many scholars don't see the connection with increased intelligence. Cutietta (2001) states: "I think the safest conclusion from the research is that any nonmusical benefits from studying music are probably secondary and small. Learning just about anything has some spin-offs" (p. 12).

Data Collection and Methods of Inquiry

Participants

The 100 participants in this study can be equally divided into four groups of stakeholders, namely: 25 elementary music teachers, 25 elementary students, 25 parents of elementary students, and 25 non-music elementary teachers. These four groups of stakeholders encompass a wide range of players in the educational arena and essentially provide a window into the educational process — students, parents, and teachers. The 25 elementary music teachers were concentrated in York Region just north of Toronto and consisted of a mix between beginning and veteran educators who were teaching music in public and Catholic[4] schools at the time of data collection. The 25 elementary students lived in Peel Region (just west of Toronto) during the time of data collection and ranged in age from 9 to 12 years (grades 4 to 7), with the majority of participants being 11 or 12 years of age (grades 6 to 7). These students attended both public and

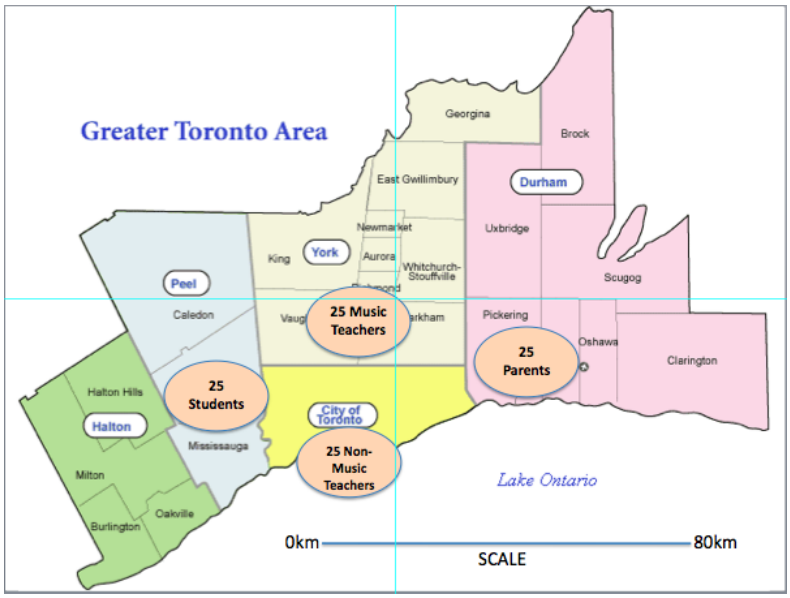
[4] In the province of Ontario, Catholic schools are publicly funded.

Catholic schools during the data collection and had a mix of both music and non-music specialist teachers, although the exact ratio is unknown. The 25 parents of elementary students lived in Durham Region (just east of Toronto) and all had at least one child in either public or Catholic elementary schools (grades 1-8) during the data collection process. The 25 elementary non-music teachers worked in the central core of Toronto and also consisted of a mix between beginning and veteran educators.

The decision to geographically polarize each group within the GTA (north, south, east, and west) was intentionally done to avoid as (much as possible) participants within each group of stakeholders knowing each other, particularly since participants were not solicited through school boards but rather through a large network of former colleagues and acquaintances I have made during my 14 years of experience teaching in the GTA. These locales (see figure #1) closely mirror the geographical locations of the five different schools (in three different school boards) that I have taught music in during this 14-year period. Although different school boards may treat music education differently, curriculum guidelines for all subjects in the province are centrally administered through the Ministry of Education in Toronto. Hence, the guidelines for music are the same for all elementary schools.

All survey and focus group protocol passed ethical conduct for research involving humans as per Canadian tri-council policy[5] (2010) through the institution where I am employed. Moreover, the variable of culture and gender was intentionally not addressed with the participants of this study. Lastly, the decision to separate music teachers and non-music teachers into two different groups was made to determine if the perceptions and perspectives towards the "music makes you smarter" mantra were divergent between both groups of teachers.

Figure 1.
Geographic distribution of participants in GTA.



[5] Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada, Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans, December 2010.

Surveys

All 100 participants in this study were asked to respond to 10 statements based on a five-point Likert scale ranging from "strongly agree" (option 1) to "strongly disagree" (option 5). The Likert Scale was selected for its familiarity and simplistic nature since the sample size represents a wide range of ages and cognitive abilities from elementary students to adults (Blazey, 2008). Moreover, Likert Scale surveys are easily quantifiable and can therefore statistically reveal any major trends and developments.

The survey was designed with the five guiding questions in mind. Hence, the first of these questions ("To what extent does music education enhance performance in math and science?") was represented by statements (1), (2), and (3) on the survey, namely: (1) The primary goal of the elementary music curriculum (K-8) is to help students improve their marks in other subjects, particularly math and science; (2) Elementary music curriculum should incorporate more links with math and science; and (3) The connections between music and math/science have been clearly proven by researchers. The second guiding question ("What effect does music education have on cognitive skills?") was addressed by statements (4) and (7) of the survey, namely: (4) Music education promotes/develops problem-solving skills and out-of-the-box thinking; and (7) Studying music makes you "smarter." The third guiding question ("How does the 'music makes you smarter' notion influence the financial support and marketing of music education?") was addressed by statements (5) and (6), namely: (5) Music Education funding should be increased because of the strong links to math and science; and (6) The marketing and advertising of Music Education should focus on the extra benefits that music students experience (e.g., potential links to math/science). The fourth guiding question ("What is the knowledge base of participants in music?") was answered through statement (8) of the survey, specifically; (8) I have extensive knowledge in music (ability to fluently read, write, and perform music). The last guiding question ("How do participants perceive the value of music education towards elementary education and society at large?") was addressed through statements (9) and (10), namely: (9) Music education is a critical aspect of elementary education; and (10) Music education is critical to the future success of society. The statistical analysis of the survey results will help to answer the five guiding questions of this study.

Focus Groups

In addition to the surveys, a focus group of five participants from each of the four groups of stakeholders was formed (four focus groups in total). These focus groups provided an opportunity for an interactive discussion using the five guiding questions as a launching point for participant dialogue. The focus groups provided an opportunity to hear, see, and interact with 20% of the sample size, revealing specific subtleties and nuances that are not possible to detect through surveys (Morgan, 1997). Another positive outcome of focus groups is known as "the group effect" (Lindlof & Taylor, 2002, p. 182), where participants stimulate one another in a group setting in terms of past experiences and ideas in "a kind of 'chaining' or 'cascading' effect." The findings from all focus group sessions also provide sufficient data to help answer the five guiding questions through a "richly descriptive end product" (Merriam, 2006, p. 06).

In general, focus group participants[6] were randomly chosen based on their willingness to participate (the final question of the survey). Through a research grant, focus group participants were very well remunerated for both time and transportation costs. Focus group sessions were approximately one hour in length, and took place in local community centres that were geographically convenient for each group of participants.

Methodological and Philosophical Framework

This diverse method of acquiring data (questionnaires and focus groups) stems from the belief that academic validity comes from employing multiple methods of inquiry (Bartel & Radocy, 2002). Moreover, Darbyshire, MacDougall, & Schiller (2005) argue that using multiple methods is a "valuable approach that does not merely duplicate data but also offers complementary insights and understandings that may be difficult to access through reliance on a single method of data collection." Hence, this is a multiple methods study rooted in both quantitative and qualitative inquiry (Creswell, 2009).

From a philosophical perspective, the methodology of this study is rooted in Pragmatism, which is considered a viable philosophical foundation for mixed methods research. Creswell (2009), for example, argues: "Pragmatism is not committed to any one system of philosophy and reality. This applies to mixed methods research in that inquirers draw liberally from both quantitative and qualitative assumptions when they engage in their research." (p. 10)

Data Analysis and Findings Presentation

Quantitative Data

From a statistical perspective, the data were analyzed according to the five guiding questions of this study, which were the basis for creating five subscores, namely, S1, S2, S3, S4, and S5. With the exception of S4, which is based on a single question, the other four subscores are based on two or three questions. In order to create four subscores pertaining to these four groups of questions, I used the average response of the two or three questions as the subscore. For example, if a single participant selected "4" for question 5 and "5" for question 6, then that participant's score for S3 would be 4.5—the average of the two answers.

Qualitative Data

The five guiding questions of this study were used as a framework to guide the discussion in the focus groups. Participants had a chance to elaborate on these questions, as well as engage in dialogue with other participants. All focus groups were transcribed, and the transcriptions were coded for common key words and phrases. Ultimately, key words and phrases were linked to larger themes and ideas.

Presentation of Analysis

As a mixed methods study, I have chosen to present both quantitative and qualitative data in a convergent parallel design (Creswell, 2012) where the researcher:

---

[6] One parent accompanied each participant in the student focus group. Although parents were still able to see and hear student and researcher responses, they had no input into the focus group session as they were located in a different part of the meeting room,.

> analyzes both datasets separately, compares the results from analysis of both datasets, and makes an interpretation as to whether the results support or contradict each other . . . the strength of this design is that it combines the advantages of each form of data; that is, quantitative data provide for generalizability, whereas qualitative data offer information about the context or setting. (p. 540-542)

Findings

There were 20 measureable scores to the quantitative analysis (five subscores times four groups of stakeholders). Subscores 1 through 5 are summarized by stakeholder group in Tables 1 through 5. Based on median responses, the subscores generally suggest that music teachers tended to be divergent in opinion from the other three groups of stakeholders except for subscore 2 where students scored lower than the other groups and subscore 5 in which all teachers tended to diverge from parents and students.

The results of statistical tests support these observations. Specifically, I used the Kruskal-Wallis test to compare the median responses between groups of stakeholders (Dalgaard, 2008). The results are summarized in Table 6 and they show that median responses differed by stakeholder group for each subscore (guiding question) with statistically significant probability values. The limitations of this analysis is that the Kruskal-Wallis tests only tell us that at least one of the groups of stakeholders differs from at least one other group of stakeholders. It does not tell us which group of stakeholders differ from each other. In order to do this, additional statistical tests were warranted. Specifically, I used the Wilcoxon Sign Rank Test (Dalgaard, 2008) on the data for each subscore for each group of stakeholders (Table 7). In each case, I tested the null hypothesis that the median for each group of stakeholders was equal to 2.5 (the 2.5 value corresponds to neutrality) against the alternative hypothesis that the median is less than or greater than 2.5.

The data in Table 7 once again show statistically significant probability results for each subscore. Specifically, (a) all stakeholders, except for music teachers, perceive music education as having a positive effect on performance in math and science (S1); all stakeholders believe music education contributes to improved cognitive skills (S2); all stakeholders, except music teachers, were in support of funding and marketing music education because of its value to math and science (S3); only music teachers reported extensive knowledge in music (S4); and all stakeholders, except students, believe that music education is critical to society and education (S5).

Table 1.

Summary Statistics of Subscore 1 by Stakeholder

(Guiding Question #1: To what extent does music education enhance performance in math and science?)

Stakeholder	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Students	1.0	1.0	1.67	1.61	2.0	4.3
Parents	1.0	1.67	2.0	2.12	2.67	4.0
Non-music teachers	1.33	2.0	2.33	2.65	3.33	4.667
Music teachers	1.33	3.67	4.0	3.79	4.33	5.0

Table 2.

Summary Statistics of Subscore 2 by Stakeholder

(Guiding Question #2: What effect does music education have on cognitive skills?)

Stakeholder	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Students	1.0	1.0	1.5	1.6	2.0	4.5
Parents	1.0	1.5	2.0	1.84	2.0	3.5
Non-music teachers	1.5	2.0	2.0	2.2	2.5	4.0
Music teachers	1.0	1.5	2.0	1.84	2.0	2.5

Table 3.

Summary Statistics of Subscore 3 by Stakeholder

(Guiding Question #3: How does the "music makes you smarter" notion influence the financial support and marketing of music education?)

Stakeholder	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Students	1.0	1.0	1.5	1.5	2.0	4.0
Parents	1.0	1.5	2.0	1.84	2.0	4.0
Non-music teachers	1.0	2.0	2.0	2.16	2.5	4.0
Music teachers	1.0	4.0	4.0	3.9	4.5	5.0

Table 4.

Summary Statistics of Subscore 4 by Stakeholder
(Guiding Question #1: What is the knowledge base of participants in music?)

Stakeholder	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Students	1.0	2.0	3.0	2.8	3.0	5.0
Parents	2.0	3.0	3.0	3.2	4.0	5.0
Non-music teachers	1.0	2.0	3.0	3.24	4.0	5.0
Music teachers	1.0	1.0	1.0	1.4	2.0	2.0

Table 5.

Summary Statistics of Subscore 5 by Stakeholder

(Guiding Question #5: How do participants perceive the value of music education towards elementary education and society at large?)

Stakeholder	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Students	1.0	2.0	2.0	2.34	3.0	4.0
Parents	1.0	2.0	2.0	2.12	2.5	3.5
Non-music teachers	1.0	1.0	1.50	1.68	2.0	3.0
Music teachers	1.0	1.0	1.0	1.38	2.0	2.0

Table 6:

Results of Kruskal Wallis Tests Comparing Group Medians for Subscores

Subscore (Guiding question)	P-Value
1	<0.0001
2	0.0052
3	<0.0001
4	<0.0001
5	<0.0001

Table 7:

Results of Wilcoxon Sign Rank Tests for the Alternate Hypothesis that the Group Median is Less Than, or More Than 2.5

Subscore	Students	Parents	Non-music teachers	Music teachers
S1 p-value	< 0.0001	0.0153	0.730	1.0
S2 p-value	< 0.0001	0.0002	0.002	< 0.0001
S3 p-value	< 0.0001	0.0003	0.018	1.0
S4 p-value	0.8451	0.9982	0.997	< 0.0001
S5 p-value	0.1623	0.005793	< 0.0001	< 0.0001

Guiding Question 1: To what extent does music education enhance performance in math and science?

The quantitative data clearly reveal that three of the four groups of stakeholders (parents, students, and non-music elementary teachers) perceive music education as having a positive effect in math and science (see table 1, 6, and 7). This conclusion suggests that the connection between music and math/science has penetrated these three groups of stakeholders, probably through increased marketing and advertising campaigns of music education politicization. Interestingly, the same three groups of stakeholders also agreed that music education should be funded because of its value to math and science (see Guiding Question 3), putting more credence in STEM initiatives that have been heavily adopted in North American educational practices.

Interestingly, however, the quantitative data also reveal that music teachers did not buy into the notion that studying music improves math and science scores, which is also consistent

with the quantitative result that music teachers did not support the funding of music programs that are tied to math and science curriculum. This suggests that this group of stakeholders has not been influenced by the mass amount of research in this area, which is very different from my own personal and professional experience.

The qualitative data revealed an identical trend for all groups, except students, who were noticeably different in the focus group session. In general, students had a difficult time creating links between studying music and improvement in math and science. In fact, the student focus group even exhibited a theme of confusion with the first guiding question with all attempts made to explain the question in very simple and child-friendly language. This theme of confusion is evident in the following quotes (not in sequence):

> *Joey:* We have been playing the recorder for, I think, 2 years now in music class, and this has not helped me with math, especially long division. I always forget the steps in long division.
>
> *Breanna:* I really love music, especially when we sing in class. But I don't see how that can improve your marks in math.
> *Janet:* I just started piano lessons last year and I know that music has some fractions and stuff, like half notes, and I do remember learning about fractions last year in grade 5, but the teacher always talked about fractions and comparing them to the number of pieces in an apple pie. She never made any reference to music.

Ultimately, the links that music has with math and science (e.g., numeracy, patterning, sound frequency, and harmonic structure) were far too abstract for these elementary students to grasp, particularly since their experiences within music education were rooted in simple instrumental programs (the recorder) and classroom singing. Even if music education helps these students with math or science, it was imperceptible to the students themselves. This imperceptibility was also referenced by the qualitative data generated by the music teachers. In general, music teachers felt that musical connections to math and science at the elementary level were minimal at best. The following quotes (out of context) support this claim:

> *Jim:* Music education at the elementary level focuses on basic musical skills that involve very little, if anything at all, connection to what kids are learning in math and science.
>
> *Tracy:* Although students could be indirectly exposed to mathematical patterns and scientific principles from singing and listening, they are inconsequential to the lives of the students.
>
> *Derek:* I would say at the elementary level that music and math go together, go together as much as music and history go together, music and geography, and music and phys ed. All subjects are related to music, not just math.

Guiding Question 2: What effect does music education have on cognitive skills?

Interestingly, the quantitative data clearly indicate that all groups of stakeholders perceive increased cognitive skills (problem-solving skills and out-of-the-box thinking) through musical study (see Tables 2, 6, and 7), thus, validating the paradigm that "studying music makes you

smarter." Music teachers, therefore, did not create a positive correlation between music education and increased scores in math and science (see Guiding Question 1), but did create a positive correlation between music and improved cognitive skills (see Guiding Question 2), which is somewhat paradoxical, since math and science aptitude would be considered a part of general cognitive ability. Perhaps the group of music teachers took umbrage with the math and science angle, perceiving it as a threat to music education for the sake of the music. Music education and improvement in general cognitive abilities, however, show an ancillary benefit that is not limited to one or two subjects, but rather all subjects, making this connection more democratic and equitable.

This results for Guiding Question 2 were corroborated by the qualitative data for all groups except for students. Similar to the theme of confusion in the first guiding question, students had a difficult time creating links between musical study and improvement in cognitive abilities. The following focus group excerpt (in sequence) illustrates this point.

> *Author:* Does music help you improve your marks in any subject, not just math and science?
> *Joey:* I don't know. I am better at the recorder this year compared to last year, I guess, but I still don't see how playing the recorder helps me in other classes.
>
> *Author:* Janet?
>
> *Janet:* Well, I guess I have not played the recorder, but I have done a lot of singing in music class, and I don't see how singing helps me in other subjects.

Once again, the relationship between musical study and increased cognition was far too abstract a concept for students to grasp and perceive in their daily lives. Interestingly, parents and non-music teachers (a total of 10 participants) generated a rather mono-cultural perspective by believing that music education would only enhance cognitive skills when classical music is the focus of study. Although the variable of culture was not addressed in this study, this mono-cultural perspective is not surprising since 7 out of 10 participants from these two focus groups were visibly Caucasian, which is not necessarily indicative of the cosmopolitan nature of the Greater Toronto Area. Moreover, both of these groups agreed that other forms of music (especially popular music) could actually have the reverse effect. That is, cognitive skills could decrease with prolonged exposure to, and learning of, pop music. The following exchange between Pam, Henry, and Betty from the parent focus group illustrates this point:

> *Pam*: There is no doubt that music can help kids with their academics, particularly classical music, which requires a lot of brain activity to process it.
>
> *Henry:* I agree with what Pam said—classical music should be the focus of study for kids, especially if parents want the academic benefits that music can provide. I actually think that forms of pop music such as rock and rap can actually hurt kids . . . Rock is very loud and the sounds are harsh. Kids can damage their hearing, but I also believe their brains cannot process the music because of how loud and harsh it is. Their brains kind of shut down when listening to rock, which means there is not much activity going on.

Pam: Yes, absolutely. Rock is harsh and very loud, and I even wonder if our brain cells can be damaged when listening to this type of music.

Betty: Absolutely, I totally agree. Rock music is not what I think of when I think about the connection between music, and music helping us to excel in other areas.

Author: So, when you hear the expression "music makes you smarter," does that mean classical music?

Betty: Yes, for sure.

Author: Pam? Henry?

Pam: Yes, I agree, classical music.

Henry: Yes, classical music should be the focus.

Interestingly, North, Hargreaves, and O'Neill (2000) reported that listening to and playing pop music has different perceived benefits from classical music, with the latter being more beneficial. Bowman (1998), for example, states that the primary audience for popular music "consists of the lonely and the immature for whom the hits function as 'purveyors of an ersatz for feelings' they think they are supposed to have" (p. 323). Although popular music has made considerable gains within music education in the thirteen years since Bowman's remarks, my own personal experiences as a music student, music education professional, and performer have still led me to believe the notion that popular music plays second fiddle (no pun intended) to classical music. Even Green (2003) — a pioneer and ardent supporter of popular music within the music classroom – recognizes that popular music has a less than stellar reputation: "The case of popular music provides a clear example, insofar as it is understood, by contrast to classical music, as ephemeral, trivial, derivative, or commercial" (p. 264). In sum, there is a sense among many music scholars that classical music is a superior form of music (Shepherd, 2003). Even today, the circle of classical music is often referred to as "high society" or "high culture," indicating it is more advanced than other forms of music. Hence, higher music is naturally and unsurprisingly associated with higher intelligence by many. Bannister (2006) contends that this "high" attitude is an extension of capitalist ideology in Western nations. Similarly, Brown and Theorell (2006) contend that the "Mozart Effect" is "a blatant tactic to promote the musical tastes of the dominant class." (p. 152). Perhaps these attitudes are imbued by the very long and institutionalized past of classical music, which is clearly evident today in both public and private music education forums.

Guiding Question 3: How does the "music makes you smarter" notion influence the financial support and marketing of music education?

The quantitative data revealed that all stakeholders, except elementary music teachers, were in support of funding and marketing music education because of its value to math and science (see Tables 3, 6, and 7). Specifically, this question measured participant attitudes toward the financial support and marketing of music education that was associated with math and science curricula. In sum, music teachers were vehemently opposed to such funding and were

reluctant to exclusively throw their support behind math and science at the expense of other subjects across the elementary curriculum. The qualitative data revealed consistent trends across three of the four groups of stakeholders. Ironically, it was the group of elementary music teachers that was divergent. Focus group discussion reveals that music teachers did, in fact, sense value in the "music makes you smarter" paradigm from a funding and marketing perspective. Here are some quotes from the music teachers (out of sequence) that support this claim.

> *Larry:* If the school board wants to put more funding into music programs for these reasons [improved math and science scores], then all music teachers should be willing to take the funding; otherwise, our programs will die.
>
> *Derek:* Music teachers should take whatever funding they can regardless of what it is for.
>
> *Tracy*: Most music teachers I know, including myself, are always complaining about lack of money, lack of instruments . . . if they [the Board] want to give me more money to teach music because kids will improve in math and English, then so be it, I will take the money.

In sum, the music teacher focus group generally agreed that increased funding of music programs (regardless of the reason) was a good thing for music education.

Even though the student focus group could not make any connection between studying music and improved marks in math and science, they agreed that music education needed more funding, even if funding was linked to math and science education. Janet stated: "We need more instruments at the school, we only have a few. My brother is in grade 8 and he has to rent his instrument. That just does not seem fair." Moreover, there is also evidence to suggest that students from the focus group are echoing remarks made by their teachers. Breanna stated: "Yes, my teacher is always complaining that she does not have enough money to buy music for us." Likewise, Joey stated: "Yeah, my teacher is always complaining about no money for music."

Guiding Question 4: What is the knowledge base of participants in music?

Music teachers were the only group of stakeholders that identified as having significant knowledge in music — the ability to fluently read, write, and perform music (see Tables 4, 6, and 7). The qualitative data were virtually identical. All five elementary teachers reported extensive knowledge of music while 14 of the 15 other participants reported very little or no knowledge of music. Although this is not surprising, it certainly raises the issue of non-music teachers teaching music at the elementary level, since all five of the non-music teachers indicated they had virtually no musical training. In fact, this is the practice of many school boards worldwide, as referenced in studies by Figueiredo (2004) in Brazil; Bartel & Cameron (2002) and McFee (2011) in Canada; and Ashley (2005) in England. Although Russell (1996) argues that generalist teachers with limited musical knowledge can effectively teach music at the elementary level, this issue remains a deep concern for the long term health and viability music education worldwide.

Guiding Question 5: How do participants perceive the value of music education towards elementary education and society at large?

The quantitative data also reveal that all groups of stakeholders, except students, believe that music education is critical to society and education (see Tables 5, 6, and 7). This response is consistent with Gregory (1997) who argues that social uses of music have been ingrained within the human experience for so long that humans have not only developed their own way of extracting meaning from music, but they have also made music an integral part of their culture, whether or not one is a trained musician.

It is surprising that students do not find music education somewhat important to society, given the attitudes of parents, non-music teachers, and music teachers. This result, however, is consistent with Campbell (2010) who argues that music is so ubiquitous in the lives of children, that they do not notice it. This is also consistent with Attali's (1985) paradoxical notion that we are silenced or deafened by music because of its ubiquity. In an age where current elementary students are digital natives and not digital immigrants (Prensky, 2001), it is not surprising that the ubiquity of music through digital mediums has to some extent watered down the musical experience. Simply put, listening to live music in person is uncommon and atypical in the daily lives of youth because access to recorded music is at its highest point in the annals of human history. The key to the previous sentence is the phrase "in person." That is, I classify listening to live music on television and internet streaming such as YouTube a form of recorded music. Although viewers can visibly see and hear the performance, it does not generate the authenticity of attending a performance in person, such as a rock concert, a symphonic exposition, or a jazz trio playing in a local coffee house. Watching and listening to American Idol[7] on television, therefore, does not count as a live music experience unless you are there in person.

Qualitative findings were virtually identical for Guiding Question 5, as students sensed that music education was more for pleasure and enjoyment within the educational experience and a break from harder subjects such as math and language studies. Breanna stated: "I look forward to music class, because it means I am not doing math or another subject that I hate." Similarly, Laura indicated that: "Music is fun and a time to get away from the harder subjects." Likewise, Joey stated: "I like playing the recorder. It is a nice break from all of the books that we use all day long." In fact, there is a paradoxical irony to this perception that music education should stress fun and enjoyment. Jorgensen (1997) states: "Activities, whether songs or musical games, are judges with reference to arousing children's pleasure as an important aspect of the music-learning process as a means to some end and as an end in itself" (p. 88). Ultimately, "it is important that the experiences they [students] encounter both establish a basis for further study and invite and intrigue them to be motivated to pursue further study" (Wiggins, p.114 2001).

Conclusion

Considering the principal problem of this study (what are the perceptions and perspectives on the "music makes you smarter" notion by all stakeholders?), quantitative findings generally indicate that musical study increases general cognitive abilities (problem-solving skills and out-of-the-box thinking), which helps to validate the "music makes you smarter" notion. The same perspectives and perceptions amongst stakeholders (except for the

[7] There has been a noticeable grass roots movement through shows such as American Idol that youth are engaging in more musical performing such as singing. This phenomenon is very beneficial for music education.

group of music teachers) were present for music's connection with math and science, which also helps to validate the "music makes you smarter" notion. The qualitative data also support these findings except for the group of elementary students who found no link between musical study and increased scores in math/science or general cognitive ability, and the group of music teachers who agreed that increased funding for any reason was a good thing for music education. Moreover, there is ardent support for the "music makes you smarter" notion in the marketing of music education programs. This was evident in all groups (except music teachers) in the quantitative data and all groups (including music teachers) in the qualitative data. In sum, these overall findings indeed suggest that my own experiences of a paradigm shift within music education in the Greater Toronto Area were indeed authentic and valid.

What then, are the ramifications of this paradigm shift? With performance on achievement tests driving the political agenda in public schools across Westernized nations, the "music makes you smarter" notion only perpetuates the belief that subjects such as math and science are the most important within the curriculum and that music is only a conduit to help students with these so-called 'important' subjects (Walicki, 2010). This unfortunate circumstance has been echoed many times by music education scholars. Cutietta (2001), for example, eloquently states:

> The problem with these reports [that music makes you smarter] is that they send the wrong message. They say that learning about music, or learning to play music, is not important unless there is some other reason for doing it . . . Music is required to justify itself because of unrelated learning. (p. 13)

Gee (2006) and Hope (2004) also argue that the intrinsic values of music have been obscured by such "unrelated learning." Similarly, Reimer (1999) maintains that there is much risk when the "music makes you smarter" principle (such as the "Mozart Effect") is viewed either as a rationale for music education, or as a general curriculum guide. Moreover, Demorest & Morrison (2000) argue that there is also the danger of cultural imperialism if we put so much emphasis on the "Mozart Effect," which would take away from all of the strides that have been made in recent years to "globalize" the music curriculum. Moreover, there is no evidence whatsoever to show that music education has been elevated into a healthy and prominent status within the curriculum through the marketing of ancillary benefits such as increased numeracy and literacy scores. This phenomenon is indeed ironic since Gerber & Gerrity (2007) argue that the main reason for financial cutbacks and reduced instructional time in music has been the focus on statewide achievement tests and by the punitive provisions of the *No Child Left Behind Act of 2001* in the United States. Reduced instructional time in music is also commonplace in nations such as Canada (Pengelly, 2007) and the United Kingdom (Fisher, 2005).

Music at its core is a universal entity that permeates and imbues the lives of humans on a daily basis. "At this very moment, in homes, offices, cars, restaurants, and clubs around the world, people are listening to music" (Rentfrow & Gosling, 2003, p. 1236). Marketing, advocating, and politicizing music education, therefore, should focus on the universality of music and its contribution to the human experience (Bresler, 1994). For example, Gee (2006) contends that the marketing of such ancillary benefits are not necessary to attract students if authentic musical experiences are at the centre of the curriculum. Similarly, Elliott (1995) contends that music making and listening of all kinds (not just Mozart) should be at the forefront of the music curriculum. Regelski & Gates (2009) and Kratus (2005) argue that current practices

of music education are problematic and major change is necessary. More importantly, multiple intelligence theory (where music is defined as its own type of intelligence) suggests the possibility that each way of knowing the world has its own inherent value and is worthy of study for its own sake (Gardner & Hatch, 1989).

In sum, the primary reason why we teach music should simply be the music itself — the acts of listening, performing, creating, sharing, and appreciating music. This is what Small (1998) refers to as "musicking," which includes all forms of musical activity such as composing, performing, singing in the shower, and casually listening to music on an iPod for example. Whatever ancillary benefits can be extracted from "musicking" are icing on the cake and should remain, at most, secondary. Stewart (2007) echoes these sentiments: "Music is not a means to an end, but an end in itself. Music has value in and of itself. Its fundamental worth is not defined by nonmusical results" (p. 3). I urge all stakeholders in education to challenge the new paradigm and accept music as a fundamental aspect of elementary education worthy of study for its own merit.

References

Altenmü ller, E., Gruhn, W., Parlitz, D., & Kahrs, J. (1996). Music learning produces changes in brain activation patterns: A longitudinal DC-EEG study. *International Journal of Applied Music*, *1*, 28–33.

Ashley, M. (2005, September). *Can one teacher know enough to teach year six everything? Lessons from Steiner-Waldorf pedagogy*. Paper presented at the British Educational Research Association, Annual Conference, University of Glamorgan, Pontypridd, UK. Retrieved from http://www.ecswe.org/wren/documents/Can_One_Teacher_Know.pdf

Archibald, R.C. (1923, September). *Mathematics and music.* Presidential Address to the Mathematical Association of America. Vassar College, Poughkeepsie, NY.

Attali, J. (1985). *Noise: The political economy of music.* (B. Massumi, Trans.). Minneapolis, MN: University of Minnesota Press. (Original work published 1985).

Bannister, M. (2006). *White boys, white noise: Masculinities and 1980s indie guitar rock.* Burlington, VT: Ashgate.

Bartel, L., & Cameron, L. (2002, April). *Self-efficacy in teachers teaching music.* Paper presented at the Conference of the American Education Research Association, Music Education SIG, New Orleans, LA. Retrieved from https://tspace.library.utoronto.ca/bitstream/1807/25694/1/Paper%20-%20AERA%20-%20Self%20Efficacy.pdf

Bartel, L., & Radocy, R. E. (2002). Trends in data acquisition and knowledge development. In R. Colwell & C. Richardson (Eds.), *The new handbook of research in music teaching and learning* (pp.159–175). Oxford, UK: Oxford University Press.

Bilhartz, T., Bruhn, R., & Olson, J. (2000). The effect of early music training on child cognitive development. *Journal of Applied Developmental Psychology, 20*(4), 615-636.

Blasi, M. J., & Foley, M. B. (2006). The music, movement, and learning connection: A review. *Childhood Education, 82*(3), 175–176.

Blazey, M. (2008). *Insights to performance excellence 2008: An inside look at the 2008 baldrige award criteria*. Milwaukee, WI: Quality Press.

Bresler, L. (1994). Music in a double bind: Instruction by non-specialists in elementary schools. *Arts Education Policy Review, 95*(3), 30–46.

Bridgett, D.J., & Cuevas, J. (2000). Effects of listening to Mozart and Bach on the performance of a mathematical test. *Perceptual and Motor Skills*, *90*, 1171–1175.

Brown, S., & Theorell, T. (2006). The social uses of background music for personal enhancement. In S. Brown & U. Volgsten (Eds.), *Music and manipulation: On the social uses and social control of music* (pp. 126-162). New York, NY: Berghahn Books.

Bruer, J.T. (1999). *The myth of the first three years: A new understanding of early brain development and lifelong learning*. New York, NY: The Free Press.

Campbell, P. (2010). *Songs in their heads: Music and its meaning in children's lives* (2nd ed.). New York, NY: Oxford University Press.

Chabris, C.F. (1999). Prelude or requiem for the 'Mozart effect'? *Nature*, 400, 827-828.

Cheek, J.M., & Smith L.R. (1999). Music training and mathematics achievement. *Adolescence,* 34, 759-761

Coalition for Music Education Canada. (2011). Retrieved from http://coalitionformusiced.ca/html/sec1-about/about.php

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed method approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Creswell, J. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research, fourth edition.* Toronto, ON: Pearson Canada.

Cutietta, R. (2001). *Raising musical kids: A guide for parents*. New York, NY: Oxford University Press.

Dalgaard, P. (2008). *Introductory statistics with R* (2nd ed.). New York, NY: Springer.

Darbyshire, P., MacDougall, C., & Schiller, W. (2005). Multiple methods in qualitative research with children: More insight or just more? *Qualitative Research, 5*(4), 417–436.

Demorest, S. M., & Morrison, S. J. (2000). "Does music make you smarter?" *Music Educators Journal, 87*(2), 33–58.

Elliott, D. (1995). *Music matters: A new philosophy of music education*. Toronto, ON: Oxford University Press.

Figueiredo, S. (2004). Teaching music in the preparation of generalist teachers: A Brazilian experience. *Bulletin of the Council for Research in Music Education*, *161*(162)*,* 73-81.

Fisher, N. (2005). Down the tubas: Music is dying in our schools. *Times Online*, February 25, 2005. Retrieved from http://entertainment.timesonline.co.uk/tol/arts_and_entertainment/music/article415127.ece

Flemming, L. (2011). *Reading for Thinking* (11th ed.). Toronto, ON: Nelson Education Ltd.

Gardner, H., & Hatch, T. (1989). Multiple intelligences go to school: Educational implications of the theory of multiple intelligences. *Educational Researcher*, *18*(8), 4-9.

Gee, Constance B. (2006, November). *Future of art music: Advocacy that works*. A Paper presented at the *National Association of Schools of Music Annual Meeting*, Chicago: IL. Retrieved from http://nasm.artsaccredit.org/site/docs/ANNUAL%20MEETING%20PAPERS/NASMAM06-GEE-Future_of_art_music.pdf

Gerber, T., & Gerrity, K. (2007). Principles for principals: Why music remains important in middle schools. *General Music Today, 20*(4), 17–23.

Godwin, J. (1986). *Music, mysticism, and magic: A sourcebook*. New York, NY: Routledge & Kegan Paul Inc.

Green, L. (2003). Music education, cultural capital, and social group identity. In M. Clayton, T. Herbert, & R. Middleton (Eds.), *The cultural study of music: A critical introduction* (pp. 263–273). New York, NY: Routledge.

Gouzouasis, P., Guhn, M., & Kishor, N. (2007). The predicative relationship between achievement and participation in music and achievement in core grade 12 academic subjects. *Music Education Research*, *9*, 81-92.

Gregory, A. H. (1997). The roles of music in society. In D. J. Hargreaves & A. C. North (Eds.), *The social psychology of music* (pp. 123-140). New York, NY: Oxford University Press.

Hallam, S. (2010). The power of music: Its impact on the intellectual, social and personal development of children and young people. *International Journal of Music Education, 28*(3), 269–289.

Hauserman, J. (1998). Chiles okays requiring reading, classical music. *St. Petersburg Times*, published May 22, 1998.

Hetland L. (2000). Listening to music enhances spatial-temporal reasoning: Evidence for the "mozart effect." *The Journal of Aesthetic Education, 34*(3/4), 105-148.

Hope, S. (2004). Art Education in a World of Cross-purposes. In *Handbook of Research and Policy in art Education*, eds. Elliot Eisner and Michael Day, Mahwah, NJ: The National Art Education Association and Lawrence Erlbaum Associates, 93-113.

Husain, G., Thompson, W.F., & Schellenberg, E.G. (2002). Effects of musical tempo and mode on arousal, mood, sand spatial abilities. *Music Perception*, *20*, 151-171.

International Society for Music Education. (2011). Retrieved from http://www.isme.org

Jorgensen, E. (1997). *In search of music education*. Champaign, IL: University of Illinois Press.

Kratus, J. (2005, July). *Music education at the tipping point*. A paper presented at XVI Colloquium University of British Columbia "Discourses and Practices of Hegemony, Power, and Exclusion in Music Education." Retrieved from http://www.maydaygroup.org/php/resources/colloquia/XVI-kratus-tippingpoint.php

Kuenzi, J. (2008). *Science, technology, engineering, and mathematics (stem) education: Background, federal policy, and legislative action*. CRS Report for Congress. Retrieved from http://www.fas.org/sgp/crs/misc/RL33434.pdf

Lindlof, T. R., & Taylor, B. C. (2002). *Qualitative communication research methods* (2nd ed.). Thousand Oaks, CA: Sage.

McFee, J. (2011). Hitting the right note for music. *Coquitlam Now*, April 20. Retrieved from http://www.thenownewspaper.com/story_print.html?id=4646666&sponsor=

Merriam, S. B. (2002). Introduction to qualitative research. In S. B. Merriam (Ed.). *Qualitative research in practice: Examples for discussion and analysis* (pp. 1-17). San Francisco, CA: Jossey-Bass.

Millbower, L. (2000). *Training with a beat: The teaching power of music.* Sterling, VA: Stylus Publishing.

Morrison, S. (1994). Music students and academic growth. *Music Educators Journal*, *81*(2), 33-36.

Morgan, D. L. (1997). Focus groups as qualitative research. In J. Van Maanen, P. K. Manning, & M. L. Miller (Eds.), *Qualitative research method series: Vol. 16.* (2nd ed.). Thousand Oaks, CA: Sage.

Music Council of Australia. (2011). Retrieved from http://www.mca.org.au

Nantais, K.M. (1997). *Spatial-temporal skills and exposure to music: Is there an effect, and if so, why?* Unpublished master's thesis, University of Windsor, Windsor, Canada.

National Association for Music Education (2011). Retrieved from http://www.menc.org

No Child Left Behind Act. (2001). U.S. Department of Education. Retrieved from http://www2.ed.gov/nclb/landing.jhtml

North, A., Hargreaves, D., & O'Neill, S. (2000). The importance of music to adolescents. *British Journal of Educational Psychology, 70*(2), 255–272.

Paquette, K., & Rieg, S. (2008). Using music to support the literacy development of young English language learners. *Early Childhood Education Journal*, *36*(3), 227–232.

Pascual-Leone A. (2001). The brain that plays music and is changed by It. *Annals of the New York Academy of Sciences, 930*(1), 315–329.

Pengelly, J. (2007, May 8). Pupils sing the blues over music education cutbacks. *Peterborough Examiner*. Retrieved from http://musiclchairz.wordpress.com/page/2/

Pietschnig, J., Voracek, M., & Formann, A. (2010). Mozart effect-shmozart effect: A meta-analysis. *Intelligence*, *38*(3), 314-323.

Portowitz, A., Lichtenstein, O., Egorova, L., & Brand, E. (2009). Underlying mechanisms linking music education and cognitive modifiability. *Research Studies in Music Education, 31*(2), 107–128.

Prensky, M. (2001). Digital natives, Digital immigrants. *On the Horizon, 9*(5), 1-6.

Rauscher, F. (2003). *Can music instruction affect children's cognitive development?* Retrieved from http://www.eric.ed.gov:80/PDFS/ED480540.pdf

Rauscher, F. quoted by Debra Viadero in "Music on the mind." Education Week on the Web (April 08, 1998). Retrieved from www.edweek.org

Rauscher, F., Shaw, G., & Ky, K. (1993). Music and spatial task performance. *Nature, 365*, 611.

Rauscher, F., Shaw, G., Levine, L., Ky, K., & Wright, E. (1994, August). *Music and spatial task performance: A causal relationship*. A paper presented at the American Psychological Association annual conference, Los Angeles, CA.

Rauscher, F., Shaw, G., Levine, L., Wright, E., Dennis, W., & Newcomb, R. (1997). Music training causes long-term enhancement of preschool children's spatial-temporal reasoning. *Neurological Research, 19*(1), 2-8.

Regelski, T., & Gates, J.T. (2009). *Music education for changing times: Guiding visions for practice*. New York, NY: Springer.

Reimer, B. (1999). Facing the risks of the mozart effect. *Music Educators Journal*, *86*(1), 37-43.

Rentfrow, P., & Gosling, S. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology, 84*(6), 1236–1256.

Rideout, B.E., Dougherty, S., & Wernert, L. (1998). Effect on spatial performance: A test of generality. *Perceptual and Motor Skills, 86*, 512-514.

Russell, J. (1996). Musical knowledge, musical identity, and the generalist teacher: Vicki's story. *McGill Journal of Education, 31*(3), 247–260.

Schellenberg, E. (2004). Music lessons enhance IQ. *Psychological Science*, *15*, 511–514.

Schellenberg, E. (2005). Music and cognitive abilities. *Current Directions in Psychological Science*, *14*(6), 317–320.

Schellenberg, E. (2006). Long-term positive associations between music lessons and IQ. *Journal of Educational Psychology*, *98*(2), 457–468.

Schlaug, G., Norton, A., Overy K., & Winner, E. (2005). Effects of music training on the child's brain and cognitive development. *Acad. Sci, 1060*, 219-230.

Schmithorst, V., & Holland, S.K. (2004). The effect of musical training on the neural correlates of math processing: A functional magnetic resonance imaging study in humans. *Neurosci Lett, 354*(3), 193-6.

Schumacher, R. (2011). "Macht Mozart schlau?" *Bundesministerium für Bildung und Forschung.* p. 183. Retrieved from http://www.bmbf.de/pub/macht_mozart_schlau.pdf

Sergeant, D., & Gillian, T. (1974). Intelligence, social status and musical abilities. *Psychology of Music*, *2*(2), 32–57.

Shepherd, J. (2003). Music and social categories. In M/ Clayton, T. Herbert, & R. Middleton (Eds.), *The cultural study of music: A critical introduction* (pp. 69–79). New York, NY: Routledge.

Small, C. (1998). *Musicking: the meanings of performing and listening.* Middletown, CT: Wesleyan University Press.

Steele, K., Bass, K., & Crook, M. (1999). The mystery of the Mozart effect: Failure to replicate. *Psychological Science*, *0*(4), 360-369.

Stewart, P. (2007). The true intrinsic value of music study. *American Music Teacher*, April-May.

Thompson, W.F., Schellenberg, E.G. & Husain, G. (2001). Arousal, mood, and the mozart effect. *Psychological Science*, *12*, 248-251.

Tomatis, A. (1991). *Pourquoi Mozart?* Paris: Fixot, Diffusion, Hachette.

Vaughn, K. (2000). Music and mathematics: Modest support for the oft-claimed relationship. *Journal of Aesthetic Education, 34*, 149-166.

Walicki, K. (2010). *The future of our nation depends on science, math, and technology.* Education in the USA. Retrieved from http://en.wordpress.com/tag/e-d-u-c-a-t-i-o-n-in-the-u-s-a/

Wallick, M. (1998). A comparison study of the ohio proficiency test results between fourth-grade string pullout students and those of matched ability. *Journal of Research in Music Education, 46*, 239-47.

Weingberger, N. M. (2008). Music and the brain: A broad perspective. *Music Educators Journal, 87*(2), 8–9.

Weiss, P., & Taruskin, R. (2008). *Music in the western world: A history in documents* (2nd ed.), Belmont, CA: Thomson Higher Education.

Wiggins, J. (2001). *Teaching for musical understanding.* New York, NY: McGraw- Hill.

Wilson, T.T., & Brown, T.L. (1997). Reexamination of the effect of mozart's music on spatial-task performance. *The Journal of Psychology*, *131*, 365-370.

Witchel, H. (2010). *You are what you hear: how music and territory make us who we are*. New York, NY: Algora Publishing.