12-2015

Instrumental Music Participation and the Differences in Academic Performances for Students in Poverty

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INSTRUMENTAL MUSIC PARTICIPATION AND THE DIFFERENCES IN ACADEMIC PERFORMANCES FOR STUDENTS IN POVERTY

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A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Doctor of Education

Grand Forks, North Dakota
December
2015

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Department	Educational Leadership
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ACKNOWLEDGMENTS

I wish to thank my family for their support and encouragement as I moved through this process. Often times it was not easy, even frustrating, but the words and encouragement of my family kept me grounded and focused. I could not have completed the process without you. Thanks to my wife Kristin and my mother Alice. Thanks to my children Jazmyn, Jalen, and Journey for reminding me of what is really important.

I would like to thank my entire committee for their suggestions and encouragement. I would like to specifically thank Dr. Pauline Stonehouse and Dr. Bill Siders for being professionals and saving the day. They treated me with respect and offered a tremendous amount of support throughout the process.

I would like to thank my cohort. We started with a large group, but when we reached the end we only had a few left. Thanks to Joey, Janelle, Tammy, Shane, and Chad for your wisdom, encouragement, and fun!

ABSTRACT

Because of the emphasis on No Child Left Behind and high stakes testing, school districts and administrators have been limiting or eliminating fine arts courses from an already shrinking curriculum, focusing on the subjects being tested. Students living in poverty are often entering formal schooling behind academically.

The researcher examined longitudinal test data from 2010-2015 from middle school aged students in a large Midwest school district. The researcher focused on test scores from the sixth grade when instrumental music was offered, examined test data from tenth grade, and studied academic growth. All student scores were included, but the independent variables in the study were music participation and poverty status.

Data indicated that participation in an instrumental program produced a higher mean difference with higher academic achievement scores in both math and reading. There was greater growth in the area of math. Poverty FRL, based upon the criteria of students living in poverty, was correlated with lower math scores, but not reading scores. Finally the data indicated no significance when examining both independent variables which included poverty FRL and music participation. The mean differences in instrumental music participation and the increase in test scores applied to all children, indicating no greater benefit to children living in poverty.

Search words: instruments, poverty, math, reading, participation, music

CHAPTER I

INTRODUCTION

Introduction to the Study

With the introduction of No Child Left Behind in 2001, schools closely monitored student academic achievement with high stakes testing (Goldberg, 2005). A heavy emphasis was placed on test scores with many testing districts around the country limiting or eliminating arts programs and instead focusing on core subjects including math and reading (Dee & Jacob, 2010). This narrowing of the curriculum and the elimination of fine arts opportunities for all students results in what Dee and Jacob described as "bubble" kids, those who struggle academically, but do not qualify for special services, or those also living in poverty, that pay the steepest price. These students are not given the choice to take elective courses, including fine arts courses, but instead are placed in math and reading interventions.

According to Dee and Jacob (2010), these at-risk children receive additional instruction in math and reading; however, this time is taken from time previously used for the arts. In other words, if children are struggling in tested subjects, they are often being denied access to art classes and are instead placed in remedial classes addressing math and reading.

Music and many of the arts were historically part of a required curriculum, but that has changed with time. In the late 20th century, the arts became elective subjects, and

since the turn of the century, many are disappearing, along with history, science, and other subjects. Groen (2012) indicated this trend has occurred because many subjects are not tested in high stakes accountability testing; the result, students are denied an opportunity for a broad and enhanced curriculum education.

Another example of dedicating additional time to teaching tested curriculum areas would be in the area of science. Some states have used science results as a requirement of state accountability procedures in accordance with No Child Left Behind. In these states, classroom teachers reported allocating four or more hours of weekly instruction to science. This is twice the rate of teachers from states not using science testing in their state accountability procedures and demonstrating another example of what gets tested gets taught (Judson, 2013).

Statement of the Problem

When school districts deny children access to a fine arts curriculum because of a narrowing of the school curriculum or academic remediation, they might be denying the positive academic impact of participating in these areas to students. Narrowing of a school curriculum resulting from emphasis on tested subjects is not something new. The Center on Education Policy (2015) reported that school districts have been eliminating music electives including vocal and instrumental music and instead focusing resources toward core academic areas assessed in high stakes tests. These findings are disturbing when looking at research that suggests students who participate in music grow in their academic knowledge at a faster rate than students not participating in music (Baker, 2012; Dee & Jacob, 2010; Southgate & Roscigno, 2009).

Dee and Jacob (2010) found that instructional time is being devoted to subjects being tested and classes in the arts are no longer being offered to all students. They found that educators are reallocating valuable instructional time from the arts most frequently to math and reading. Curricula have been narrowed with an emphasis being placed on test preparation, specifically for kids near the proficiency cut score. In other words, schools will focus on students who test very near the proficient level but do not have a proficient score, hoping any additional assistance can help them achieve proficiency and in turn help booster school data. In order for students to be "prepped" for high stakes exams they are not given an opportunity to participate in the arts and instead are required to participate in math and reading interventions. According to Dee and Jacob, these children on or near the line of proficiency are often children living in poverty.

Baker (2012) studied 37,222 eighth grade students in Louisiana and found that students studying or participating in music courses outperformed students not participating in music consistently on high stakes tests. Findings in this research suggest that music has a positive impact on high-stakes testing. The investment of music participation is often an investment unavailable to families living in poverty because of cost. This, in turn, denies poor children a chance to experience positive academic impact created by music participation.

One way music participation is denied to poor children is highlighted in research completed by Southgate and Roscigno (2009) which showed a pattern of resource inequality, such as the inability of poor families to purchase instruments or music, in regard to participation in music. Southgate and Roscigno demonstrated a correlation

between academic achievement and music participation. This relationship really becomes evident when music participation is measured broadly and conceptualized, by examining music participation of a student within a school during a school day, as well as outside music instruction. Southgate and Roscigno correlated resource inequality between the poor and general public with the missed opportunity of music participation providing an advantage to those with money who can participate in music. Results of research by Southgate and Roscigno (2009) found that a child's economic status predicted academic success, as well as a positive relationship between achievement in math and reading and students who participated in music. Southgate and Roscigno also found a correlation between an adolescent's socio-economic status and an adolescent's music participation. It was found that children living in poverty had fewer opportunities for music participation and were therefore denied the positive effects music offers. Students living in poverty often enter school behind their classmates academically, and are therefore often removed from music classes and placed in math and reading interventions. Students living in poverty with fewer resources than their peers do not have an opportunity outside of school to make-up for missed music opportunities during a school day.

Purpose of the Study

The purpose of this multi-cohort, longitudinal investigation was to determine if participation in instrumental music programs is positively associated with academic performance of all students and also to compare students not living in poverty with children living in poverty. Looking at the impact music participation had on students in a

Midwestern school district, including students living in poverty, provided insight into the impact music participation has on students living in poverty.

Research Questions

The following research questions were used to guide this study:

1. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for all students who participated in instrumental music courses versus all students who were not enrolled in instrumental music courses?
2. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students living in poverty versus students not living in poverty?
3. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students when economic status interacts with instrumental music participation?

This research focused on Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) scores for several reasons. First, using MAP allowed access to all students. Second, MAP measured standards and benchmarks set by state and federal governments with the adoption of Common Core State Standards (CCSS). Third, MAP tests were administered at the same time each year.

Researcher Background

The researcher is currently an elementary principal and fine arts coordinator employed by the Midwest district participating in this study. In his job as fine arts

coordinator, he oversees the recruitment of students into all instrumental programs. The researcher has lived in the Midwest his entire life. The researcher participated in an instrumental music program when attending school and is also a working musician in the community.

Assumptions

The researcher used the following assumptions as he began this work.

- The research was conducted with the understanding that all students enrolled in instrumental music participated in the class for the entire calendar year.
- The research was conducted with the assumption that all students would take all of the MAP tests and would do their personal best on all MAP tests.
- The research was conducted with the understanding that building schedules and the education and experience of instructors would vary from building to building.

Delimitations

For this study, only students from one Midwestern school district participated. Five graduating classes of students were studied, and the study included MAP test results in both math and reading. MAP results from the fall of students' sixth grade year were compared to MAP results from the spring when students were in tenth grade. This allowed five entire classes of students to be compared.

- The research was conducted with middle school and high school students participating in a seven-period day lasting 50 minutes each.
- Students would receive 250 minutes of instrumental instruction each week.

- Students would receive the same core instruction in both reading and math.
- NWEA MAP testing was conducted two times each year, once at the beginning of the school year and again at the end.

Definition of Terms

At-risk: Being endangered from a lack of parental guidance ("At-risk," 2011). In this study, it also includes students coming from a family living in poverty.

Common Core State Standards (CCSS): A set of standards developed for math and language arts that articulate the knowledge and skills students should learn by the end of each grade level in order to be on track for academic success.

Center on Education Policy (CEP): A national advocate for public education providing the general public with information.

Fine arts: Any of a number of art forms such as sculpture, painting, or music, used to create such art. In an educational setting, it is visual arts, music, or theatre.

Free and reduced lunch: Students who qualify for the National School Lunch Program. This program is a federally assisted meal program that provides meals to all schools and residential child-care institutions. The reason for this program is to provide nutritional lunches and breakfasts at a reduced rate or free of charge to students each school day (United States Department of Agriculture, 2013). President Harry Truman signed the National School Lunch Act in 1946 (United States Department of Agriculture, 2015).

Instrumental music: Band and orchestra programs.

MAP testing: Measures of Academic Progress (MAP) are common, core-aligned, computerized, adaptive tests that accurately reflect the instructional level of each student

and measure growth over time. As a student responds to questions, the program adjusts to the student, moving up or down in difficulty and providing results to indicate the student's current mastery of educational standards (Northwest Evaluation Association, 2015a).

Music program: Elementary band, secondary band, jazz band, secondary concert choir, and secondary jazz choir.

No Child Left Behind (NCLB): The No Child Left Behind Act of 2001 (Public Law 107-110). A United States federal law that reauthorized a number of federal programs aiming to improve student performance within United States schools by increasing the standards of accountability for states, school districts, and schools, as well as providing parents more flexibility in choosing which schools their children could attend. Additionally, it promoted an increased focus on reading and re-authorized the Elementary and Secondary Education Act (ESEA) of 1965.

Northwest Evaluation Association (NWEA): It is a national non-profit organization founded 40 years ago and dedicated to helping all children learn. NWEA provides research-based assessments, professional training, and consulting services to improve teaching and learning (Northwest Evaluation Association, 2015a).

Poverty: The United States Census Bureau uses a dollar value that varies by family size and income to determine who is living in poverty. If a family unit's total income is less than the dollar value of a given threshold value, then that family and every individual in the family are considered to be in poverty. Similarly, if an individual living alone has a total income less than the appropriate threshold, then that individual is considered to be living in poverty. The poverty thresholds do not vary geographically.

These thresholds are updated annually to recognize inflation using the Consumer Price Index. Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old. These groups were excluded from the equation when calculating poverty rates. In this study poverty refers to all students who qualify for free or reduced lunches (United States Census Bureau, n.d.).

Poverty FRL: In this study, the students identified as living in poverty were students who qualified for free and reduced lunches as identified by federal guidelines; in this study, conditions leading to students qualifying for free and reduces lunches will be referred to as "poverty FRL."

RIT score: RIT stands for Rasch unIT. The RIT scale is a curriculum scale used to score the NWEA MAP test. The test looks at individual item difficulty and values them to estimate student achievement. NWEA has decided to use a specific RIT model that was created by a mathematician named George Rasch. What defines the RIT scale is as follows: (a) achievement scale, (b) accurate, (c) scale with equal intervals, (d) records growth of individual students over time, and (e) student scores are not grade or age equivalent (Northwest Evaluation Association, 2015b).

Socio-economic status (SES): One's resources include financial, social, cultural, and human capital. In a school setting, a student's SES has included parental occupational status and family income. An expanded SES measure could include measures of additional household, neighborhood, and school resources (Cowan et al., 2012).

Students on the bubble: Students identified as being close to the proficient line in regard to passing or failing the state assessment.

Acronyms

ANOVA	Analysis of Variance
CCSS	Common Core State Standards
CEP	Center on Education Policy
ESEA	Elementary and Secondary Education Act
DIBELS	Dynamic Indicators of Basic Literacy Skills
GPA	Grade Point Average
HEARTS	Health, Education, in the Arts, Refining Talented Students
IRB	Institutional Review Board
MAP	Measures of Academic Progress
NCLB	No Child Left Behind
NWEA	Northwest Evaluation Association
RIT	Rausch unIT
SES	Socio-Economic Status

Organization of the Study

This study is organized into five chapters. Chapter I provided an overview and introduction to the proposed research. It contained the problem statement, research questions, limitations, delimitations, and definition of terms. Chapter II includes a discussion of literature and research about student participation in instrumental or general music classes, the intellectual benefits of music participation, poverty and at-risk students, and how music benefits children living in poverty. Chapter III defines the

methodology of the research which includes a description of the subjects, a description of the participating school district, a description of instruments involved in the study, as well as an overview of quantitative research methods and data analysis. Chapter IV provides the findings of the researcher, including the rate of growth for students in math and reading. These findings shared data in regards to students in poverty FRL and their association with the 4-year growth in NWEA MAP reading and math scores. Chapter V summarizes the findings from Chapter IV. Chapter V also reports the importance, meaning, and significance of the study.

CHAPTER II

REVIEW OF LITERATURE

Chapter II presents the review of literature and research related to the effect instrumental music and general music have on the academic performance of children. The information on this topic is organized in this chapter by the following sections. First, the research concerning all students and their participation in instrumental or general music classes or programs will be discussed. Next, the research concerning the intellectual impact participation in instrumental or general music classes or programs has on children at a variety of ages will be discussed. The effects that poverty and the impact of living in poverty have on children's participation will follow. Finally, the current research concerning the impact music participation has on students specifically living in poverty will be presented. These four sections have led to the creation of the research questions for this study. Based on an understanding of research found here in Chapter II, the research will move forward with a focus on two independent variables, poverty FRL and participation in instrumental music programs, alongside the academic impact of these variables.

Introduction

Public education looks and feels different today compared to 15 years ago. This change can be attributed to an increase in high stakes testing in all of our schools. McMurrer (2007) determined that a wide majority of the nation's school districts spend

increased time on math and reading instruction since No Child Left Behind (NCLB) was passed in 2002, and school accountability based on high stakes testing became the norm. As classroom time and school resources have increased our focus on tested subjects, time and resources typically spent on other subjects, such as fine arts, have declined by nearly one-third during this same timeframe. These changes limit accessibility to fine arts programs during a school day. Families and children living in poverty have fewer opportunities outside school, which includes access to art or music activities. If research can show any academic benefit to participating in the arts, children living in poverty will be left behind, not having the same opportunities as other students.

McMurrer (2007) found that time spent on math and reading has been increasing since NCLB became law based upon a survey that was given to nearly 350 school districts. Survey results indicated that 62% of school districts increased time spent on language arts and math in elementary schools since NCLB was passed in 2001. Additionally, 44% of school districts reported a reduction in time for at least one other subject such as art, music, science, or physical education. On average, 30 minutes per day was reduced from subject matter focusing on fine arts in the curriculum (McMurrer, 2007).

Jack Jennings, Center on Education Policy's President and CEO, agreed with McMurrer's findings when he stated:

> What gets tested gets taught. . . . Under No Child Left Behind, there is reading and math and then there is everything else. And because so much is riding on the reading and math included on state tests, many schools have cut back time on

other important subject areas, which means that some students are not receiving a broad curriculum. (as cited in Center on Education Policy, 2007, p. 1)

In addition, the Center on Education Policy (CEP) found that by increasing time spent on subjects tested, many districts appear to be changing their curriculum to provide greater emphasis on skills being tested. One example from the CEP showed that in 84% of elementary schools, the reading program and curriculum has changed since NCLB, placing a greater importance on test preparation and materials. Math at the elementary level reports similar findings with 81% of districts reporting a change in curriculum, test preparation, and materials used since NCLB became law in 2001 (McMurrer, 2007). Additionally, a report from the United States Government Accountability Office (2009), reported that schools with a high percentage of minority or low income students reported a significantly larger decrease in the time spent on arts education when compared to students and schools from other districts.

Educators have continued to look at the impact that NCLB has had on students. According to Dee and Jacob (2010), the most compelling and consistent finding of many studies focused on what teachers do with instructional time. Educators have reallocated valuable instructional time to subjects being assessed, specifically math and reading. This instructional time has come from time previously spent on the arts. Completing research for the RAND Corporation, Dee and Jacob (2010) collected data from educators asking what has changed since the introduction of NCLB. Results indicated a narrowing of the curriculum and an emphasis on preparation for high stakes testing, specifically for at-risk children near the proficiency cut score.

Educators from Texas indicated that students failing their state assessment were removed from fine arts classes for remediation in test taking. These reading and math interventions had such an effect on programs that bands did not have enough musicians to participate in parades (Vasquez Heilig, Cole, & Aguilar, 2010).

It is not only in Texas that districts are feeling the effects of NCLB. Spohn (2008) indicated that NCLB has had negative effects on fine arts programs around the country where research findings indicated that both art and non-art teachers felt that classroom practices and instruction time had been changed to accommodate NCLB, which has resulted in a reduction in music and visual arts for students. Spohn provided an example of one high school that failed to meet annual yearly progress as defined by NCLB. This high school had reduced the number of visual art classes offered as a result of increasing the length of class periods; therefore, exposing students to more reading and math.

Beveridge (2010) continued this conversation when specifically addressing scheduling and enrichment subjects offered in schools. Beveridge's work discovered that many school districts required students who failed in math or reading to enroll in remedial classes in place of "fun" classes such as art. Beveridge indicated that principals and remedial teachers actually use "fun" classes as rewards, explaining to students if they work very hard in math and reading they might get to return to enrichment classes.

It is not only educators who are concerned about shrinking curricula which limits fine arts opportunities for students and puts emphasis on subjects being tested, such as reading and math. In a 2006 Gallup Poll of attitudes toward public schools, the general public made it very clear they have concerns about a single assessment being used to

determine school or student effectiveness and assessments only focused on math and reading (Rose & Gallup, 2006). When asked if determining whether a public school is or is not in need of improvement should be based on a single assessment and if that gives a fair picture, 72% of the sample of the general public responded that it does not. The sample was then asked if these statewide tests should be focused only on reading and math or if assessments should be based on other subjects. Seventy-nine percent of respondents indicated that the test should be based upon other subjects as well. Finally, the sample was asked if they were concerned that by testing and relying only upon reading and math to determine annual yearly progress that this resulted in less emphasis on art, music, history, and other subjects in a curriculum. Eighty-two percent of respondents indicated they have a great or fair amount of concern.

If curricula are shrinking by creation of NCLB, it is the policymakers, according to Scheib (2004), who believes music education does not impact skills students need in the real world. They believe skills taught in school must be useful in the world of work. As a result of this belief, policymakers have passed legislation requiring results that must be able to be tested, quantified, and for which there is accountability for results. Scheib believes that as long as these policymakers have authority over curriculum and educational decisions, music will be viewed as less important when compared to math, reading, and science (Scheib, 2004). In order to educate policymakers, researchers must present evidence showing the importance of all areas of a curriculum, but specifically, fine arts.

Student Participation in Instrumental or General Music Classes

Since 1983, when *A Nation at Risk* was published, political leaders have emphasized their belief that education should focus on core academic areas such as math and reading (National Commission on Excellence in Education, 1983). According to Mishook and Kornhaber (2006), politicians appeared to give little thought to the soft skills and fine arts, and underestimated the impact high stakes testing would have on all areas not assessed. Art advocates often point to a lack of art programs offered around the country and tend to place blame for this on politics, policy, and law.

Schuler (2012) noted that in an era of school reform beginning in 1983 with *A Nation At Risk*, our lawmakers promoted a narrowing of class offerings, an increase of high stakes testing, and the elimination of opportunities for all children, but more so for students living in the highest levels of poverty. Lubbock (1895) stated it best when referring to the narrowing of a curriculum when he said, "Reading and writing, arithmetic and grammar do not constitute education any more than a knife, fork, and spoon constitute a dinner" (p. 103).

Researchers Skoe and Kraus (2012) had a message for lawmakers after studying the effects that a little music training had on an adult brain. Looking at 45 healthy adults with a range of exposure to music instruction, the researchers found that the brainstem response was more robust in adults with musical training compared to adults with no musical training. Skoe and Kraus stated, music education. ". . . even in limited form, may influence the adult brain and the results have implications for education policy makers" (p. 1).

The National Center for Education Statistics (2010) released a report, *Arts Education in Public Elementary and Secondary Schools 1999-2000 and 2009-2010*, which examined art at both the elementary and secondary levels. Both positive and negative trends in art education were shared. The report showed that 91% of children in the United States had received music education from a music specialist and that roughly 57% of high schools require arts credits in order to graduate. The report indicated that the lowest level of socio-economic (SES) students, making up about 25 percent of all students, were less likely to receive a music education than their higher SES level peers.

Looking at students graduating from high school and their exposure to the arts, research completed by Elpus (2013) indicted that over 36% of graduating students had earned a credit by participating in music. In fact, Elpus found that nearly 1 out of 10 high school students earned 4 years worth of music credits in high school. Of all students receiving special education services, only 9.25% participated in music. This would indicate that not all students are receiving the same opportunities to participate in music-making, instrumental music programs.

Louisiana implemented a policy that stated,

> For students in Grades 5-8 who have scored below the Basic level on the Louisiana Educational Assessment Program in English language arts or mathematics, the minimum time requirements in health, music, arts and crafts, or electives are suggested in lieu of required. (Baker, 2012, p. 17)

The state has given permission to schools to remove all electives, including fine arts, from all students falling behind in math and reading. Schools then place these students into remedial classes where they no longer have access to electives. The United States

Secretary of Education, Arne Duncan, recommended that arts programs be made available to all children, but the Louisiana policy directly opposes this idea (Baker, 2012).

Based on Secretary Duncan's comments, it should be asked what opportunities schools are offering to all students. In most school districts around the country, students who are identified for any remediation, special education services, or other outside services are not provided the same opportunities to participate in music and other fine arts classes as their peers (Hoffman, 2013). Johnson (2004) went so far as to imply that unequal access to the arts could create the privatization of the arts. Because of the cost of instruments, uniforms, etc., certain families cannot bear that cost. In these cases, students are restricted from the benefits associated with music education. Johnson stated, "Every child in every school—not just gifted students or students from economically disadvantaged districts—should have access to arts education opportunities in his or her school" (p. 21).

So, the curriculum is narrowing for all students, but Shields (2001) based her research on behavior towards music participation. Shields not only focused on the opinions of music teachers, but also on families and the community. She focused on at-risk urban children who were included in music classrooms where they were met with some resistance from students and parents, meaning the at-risk students were not wanted in the classroom. Some suggestions shared by students and parents included suspending them, throwing them out, or in general doing something about these students. After the decision was made to keep these students in the group, the learning pace slowed, the

culture limited the amount of music covered, and this challenged the patience and stamina of the teacher in the room.

Elpus and Abril (2011) examined high school students and examined the demographics that make up the "music kids." They found that the poorest students living in poverty were missing from music classes. Ultimately, students identified as living in poverty were under-represented when compared to other subgroups in high school music classes.

There are many components of participating in music that affects the performance or skill level of an individual, one is the teamwork factor. Scientists from two Japanese Institutions and the Imperial College in London found that practicing with a partner or others improves performance. With this current information, the experience of practicing with a larger group can have a positive impact on the performance of children (Ganesh et al., 2014).

Merzenich, Nahum, and Van Vleet (2013) wrote in their book, *Changing Brains,* that music should not replace any reading instruction, but they argued it should be included alongside reading, foreign language, math, science, and athletics as part of a well-balanced curriculum. Music, they argued, is a powerful instructional tool because music is inherently rewarding, creates excitement, and pulls at emotions. Music provides skills that will prove helpful both in school and throughout one's lifetime.

In June of 2000, the United States Congress passed a concurrent resolution that expressed the opinions of Congress regarding the benefits of music education. The United States Congress stated that music education "enhances intellectual development and enriches the academic environment for children of all ages" (H. R. Bill 266, 2000,

para. 10). With literature pointing to evidence of students not participating in music programs, we will next look at literature discussing the benefits students could be missing.

The Intellectual Benefits of Music Participation

There is a history of research in regards to intellectual benefits acquired by individuals who participate in music. In the 1980s, research began linking brain activity to music, which is where this section will begin.

In 1985, Gordon Shaw, along with Dennis Silverman and John Pearson, presented the Trion Model of the brain's neuronal structure, which was a new understanding of how the brain's physical layout produces specific firing patterns to form a common neural language (Leng, Shaw, & Wright, 1990). These specific firing patterns were later found to correspond to the patterns commonly found in music. Shaw continued his research in this new concept. Brothers and Shaw (1989) conducted experiments with musicians and their preparations for performances. The experiments where musicians performed mental rehearsals of their music indicated that music and other creative skills, such as math and chess, may involve extremely precise firing patterns by billions of brain neurons.

Leng et al. (1990) integrated technology into the trion firing patterns first discovered by Shaw in 1985. Using computers in their experiments, it showed that trion firing patterns could be displayed or mapped onto pitches and instrument timbres to create music. This indicated to researchers that the Trion Model was a viable model for coding of certain aspects of musical structure in human creation and perception. This provided evidence supporting that the Trion Model was relevant for examining creativity in higher cognitive functions like chess and math that are similar to music. The previous

experiments proposed that music, like mathematics and chess, may be considered a "pre-language" and that early music training could be very useful in preparing or exercising the brain for cognitive functions. This connection to math appears often in research.

According to Cavanaugh (1998), the theory of a connection between math and music has been around for many years. Much of western-based music relied on mathematics even before the Renaissance. Johann Sebastian Bach of the Baroque Era used a highly calculated approach to composition and was famous for his submerged numerical symbolism. Looking at Bach's choral work, *St. John Passion*, five notes to mark the German *toten* (to kill) at the narrative point when Pilate hands over Jesus is found. According to German musicologists, the number "five" symbolized the Fifth Commandment. Bach repeats this theme 10 times to musically evoke the Ten Commandments.

Evident throughout the Hopkins's Peabody Conservatory of Music and many other areas of the United States, connections between math and music are suggested. According to Cavanaugh (1998), music can play an integral role in the cognitive development of children. He made an observation of the senior researcher at Hopkin's Institute for the Academic Advancement of Youth, Wayne Parker, that a high percentage of the math-savvy students had formal instrumental music training. According to a survey of 825 students whose overall school performance was followed from fifth grade through college, nearly 93% of the females and 83% of the males had studied musical instruments.

There is a very strong belief in the academic connection between math and music. Betty Turner, a Baltimore elementary school principal stated:

> Music theory sparks a level of thinking. There is a relationship to tempo and what students later see in fractions and in math. It makes it tangible. They can work it out. It's a piece of the puzzle that will be missing for youngsters who have to put the puzzle together later. If you take it away, you take away their chance to be a literate adult. (as cited in Cavanaugh, 1998, p. 38)

Anita Cooper, a staff member of Peabody Prep's Afterschool Programs also sees the benefits of any musical training, which includes building confidence needed to succeed in all academic areas including math. She stated the following:

> Composing music is like problem solving--you have to put text and rhythm together. Musical rhythms are mathematical equations, like 4/4 or 2/4 time. You use addition and subtraction skills: How many more beats do you need? How many more ways can we divide it? Music also helps children develop language. A musical phrase is like a verbal sentence. It has a beginning, middle, and an end. And the inflection changes in different parts of the sentence. (as cited in Cavanaugh, 1998, p. 39)

Graziano, Peterson, and Shaw (1999) completed a study of second grade students who were given 4 months of piano keyboard training in conjunction with time playing newly designed computer software. Results indicated the students who participated in this program scored 27% higher on proportional math and fractions tests than other children.

An experiment of children from ages four to six who were provided musical training also demonstrated an increase in cognitive processing. Flohr, Miller, and deBeus

(2000) studied these children who received 25 minutes of musical training over a 7 week period of time and measured brain activity. The children produced EEG frequencies associated with an increase in cognitive processing, more proof that music training has an impact on academics.

The effects of music on brain development were the focus of a July, 2001, conference of scientists from the United Kingdom and North America who met in London. Conference researchers presented mounting evidence that music is not merely a cultural phenomenon, but also a biological fact of human life. One presentation focused on information indicating that infants who are too young for informal music training, demonstrated the ability to distinguish consonance from dissonance and recognized tunes even when timing and pitch had been altered. Professor Michael Thaut demonstrated a specific rhythm protocol that assisted stroke patients with severe, uncoordinated, walking abilities. Patients gained immediate benefits to both orientation and gait. Thaut stated, "Through the use of rhythm, we can stimulate the improvement of neurological processing and cortical reorganization in the injured brain. . . . This technique is proving to be more effective than conventional physiotherapy" (as cited in PR Newswire, 2002).

Secondary students have been studied as well. Catterall (1998) completed an analysis of United States Department of Education data on more than 25,000 secondary school students. The researchers found that students who reported consistently high levels of involvement in instrumental music over the middle and high school years showed significantly higher levels of mathematics proficiency by Grade 12. These results were consistent regardless of students' socio-economic status. Additionally, they found that the difference in those who were involved with instrumental music versus

those who were not was more significant over time. Looking at such a large population provides a 30,000 foot view of the data, but does not provide enough specific information for districts to use.

Ho, Cheung, and Chan (2003) from the University of Hong Kong studied 90 boys between the ages of 6 and 15. Participants were divided into two groups. Forty-five had received musical training as members of a school string program as well as private lessons in playing classical music on western instruments for 1 to 5 years. The other 45 participants had not received any musical training. All of the children were given a verbal memory test measuring how many words they could recall from a list. They also did a comparable visual memory test for images. The group who had received musical training recalled significantly more words verbally than the untrained students. The researchers conducted three trials, and the musically trained students remembered more words during each trial. Researchers found that verbal learning performance increased in proportion to the amount of musical training the boys had received. They found no such difference in visual memory. Their conclusion was that visual memory is boosted even with fewer than 6 years of musical training. They added that music training stimulates the left side of the brain, and allows that side of the brain to handle other assigned functions.

One year later Ho et al. (2003) came back to follow up with the boys in the musically trained group and monitored their continued growth. Ho et al. performed the same tests on the 33 still in the program, the new students just in the program for less than a year, and the students no longer in the program. The "experienced" students were ahead of the "new students." The "dropouts" showed no further improvement since

being tested the year before. The researchers concluded that students with musical training had better verbal memory similar to the students studied earlier and would likely find it easier to learn in school.

Of course, showing a link between academics and music through assessment results can make an argument for many to add music to the core curriculum. Kelstrom (1998) and Babo (2004) suggested that instrumental music participation has an impact on academics and should be supported by lawmakers, educators, and educational leaders everywhere. Babo looked at two middle schools in New Jersey serving 8,100 students. The researcher took a sample and divided the group into two groups. In one group were students who participated in an instrumental music program, and in the other group, were those who did not. The results suggested that participation does have a significant relationship to academic achievement; however, IQ was the strongest contributor. This meant smart students, indicated by IQ, gravitated to music programs, but results did not answer the question of whether or not music contributed to that academic growth.

Schellenberg (2004), of the University of Toronto at Mississauga, studied the effects of music on IQ. He offered one group of 6 year old children free weekly voice lessons, and a second group, free weekly piano lessons at the Royal Conservatory of Music, considered by the researcher to be the "most prestigious music conservatory." Schellenberg also offered a third group free drama lessons, to separate the effects of music from the general effects of art. Finally, a fourth group received no training at all. The children all had an IQ test before the training began. The children began the training just before their first grade year began and were asked to come back for another test before beginning second grade. During the retest, all children demonstrated at least a 4.3

point gain in IQ score based on their experiences in first grade. Results of the drama group initially indicated their scores did not differ from the group that had no lessons; however, the drama group did score higher in social aspects, probably due to the cooperation needed for putting on plays. The only added boost to IQ came to children who either received piano or voice training. These two groups averaged a 7 point gain, which is 2.7 points higher than the other groups. Schellenberg concluded that the music groups had larger increases in IQ on these two tests with a pattern that was statistically reliable. Results indicated a relatively modest, but widespread intellectual benefit from participation in music lessons.

Rauscher, a researcher in the area of the connection between music and the brain, commented on this study and shared a theory. She speculated that, "understanding music, particularly learning to translate musical symbols into sound, might be transferring to other abilities because they share similar neuro-pathways" (as cited in Mundell, 2004, p. 2).

The College Board (2006) examined results for students completing their SAT exam for the 2006 school year. Results indicated that students who participated in music performance scored, on average, 57 points higher on critical reading, 43 points higher on math, and 58 points higher on writing sub-tests than students with no arts participation. Again, do the intelligent students participate in music or does music make them intelligent?

Schellenberg (2006) conducted another study examining the duration or length of music lessons, specifically instrument instruction, compared to IQ. He looked at 6 to 11 year old students who received music lessons and the impact it had on IQ.

Schellenberg's work suggested that with more music lessons comes a higher IQ. His findings supported a connection between music instruction and an increase in IQ. The positive impact with IQ and academic achievement has a general and long lasting positive effect on children.

Johnson and Memmott (2006) conducted research that evaluated the impact of the quality of music instruction on academic results in elementary and middle school settings. Their findings paralleled research conducted by Catterall, Capleau, and Iwanaga (1999), who reported that music impacted test scores regardless of a student's socio-economic status, but Johnson and Memmott expanded results. They found a significant difference existed in test scores of students in "excellent" music programs versus "deficient" music programs. This would indicate that not only does music have an impact on student academic performance, but the quality of the music program or the amount of time provided to students in these programs is also an important factor.

Matthew Peterson, an academic prodigy with degrees in such fields as Chinese, biology, and neuroscience, delivered a program to a group of teachers and administrators in Redlands, California, explaining the concept of integrating mathematical instruction and classical music. Peterson worked with Gordon Shaw, who was well known for his "Mozart Effect" study in 1993, but Peterson believed that study was very simple and not entirely accurate. He did, however, feel the study was very important in drawing attention to a very effective technique. Peterson (as cited in Rogers, 2006) stated the following:

> The Mozart thing was one little study that was really latched onto. But the deeper issue, the key, is the mathematics without language and numbers.

> You've got all this terminology that is language-based, but the way most mathematicians and scientists think about math is in terms of pictures and symbols. Also, since it doesn't rely on language skills, those who don't speak English make greater strides in increasing their math proficiency. When a child plays the piano, reading sheet music and working both hands, it helps their ability to see patterns in space and time. (p. 1)

What really excited Peterson and other educators was not that classical music might temporarily boost IQ as Shaw's study suggested, but that it might condition the brain to better handle intricate logical webs of mathematics.

Math, as stated earlier, comes up often when looking at the impact music instruction has on other subjects, and most recently An and Tillman (2015) looked at math instruction with the integration of music. Teachers were trained on this new strategy of math instruction which integrates music. The results showed no statistical significance between music and non-music groups on pretest scores. However, the music group showed statistically significant higher scores in regards to math scores on post-test scores. Researchers also found large practical importance between the pre- and post-tests and the two groups, music and non-music (An & Tillman, 2015).

With several studies pointing in slightly different directions in regard to impact, Standley (2008) completed a meta-analysis of available research in regard to music and the impact it has on reading instruction. The analysis evaluated a number of published and unpublished works from leading experts in music and academic achievement. Overall, the results pointed to a very simple, but important finding: music interventions have a significant, positive impact on the instruction of reading for children. Another

important finding was that the impact of music interventions has a much bigger impact on a child the younger the child. For example, kindergarten students are impacted much more than middle school students. He also concluded that the length of the intervention does not impact reading skills. Students receiving a 4 week intervention were equally affected when compared to students who participated in an entire year of music instruction. This research would be in contrast to Schellenberg's (2006) work. Overall, this meta-analysis pointed to the importance of early music intervention when looking for an impact on reading skills.

In 2008, a group of researchers in the Boston area recruited 95 students to participate in a study intended to investigate a correlation regarding outcomes closely related to music training in previous studies and students receiving instrumental music training. They determined that the children who had received at least 3 years of instrumental music training outperformed the control group in several areas. This included vocabulary use and nonverbal reasoning skills. The students who received instrumental musical training also outperformed the control group in fine motor skills. They did not; however, find the instrumental group outperformed in the areas of phonemic awareness or special skills (Forgeard, Winner, Norton, & Schlaug, 2008).

Schlaug et al. (2009) studied a group of children ages 5 to 7 years old that demonstrated that musical training results in more connections (neurons) forming between the right-brain and the left-brain. The researchers reviewed images of the brains of children before assigning the children to one of three groups: high-rehearsing, low-rehearsing, and no music rehearsal. There was no difference in left-brain and right-brain connections before the musical instruction. After 2 years of musical instruction and

rehearsal, the children with musical instruction had more connections when compared to the children not given any musical instruction. The children assigned to the high practicing group had the most number of connections developed over the 2 year period.

According to Hallam (2010), evidence suggests that involvement in music, through instruction and participation, plays a huge role in development of processing systems that lead to identification of early sounds and patterns. Additionally, Hallam indicated that research results suggested that the earlier the exposure to music occurs and the longer the length of the exposure, the greater the impact on early language development. This, in turn, develops into early literacy skills in children.

Helmrich wrote in 2010 in regard to the impact of music instruction on middle school students. He specifically examined algebra. Helmrich reported that his sample of eighth and ninth grade students showed that formal music instruction encountered in middle school did impact student performance in algebra. More specifically, instrumental music students had the greatest adjusted mean difference and proved to be statistically significant. Although choral music had an impact, he showed that instrumental music had the greatest impact (Helmrich, 2010).

Kokotsaki and Hallam (2011) examined the benefits of music participation, more specifically their making-music activities in regards to instrumental music participation. Participants were placed and organized by the instrument they played, as well as their level of study. They completed a qualitative study of a group of students: some study participants were music students while others were non-music students. Results suggested that making music in a group is beneficial for all. Non-musicians indicated the social elements of music as being the most important, with an emphasis on friendship and

relaxation. Musicians indicated the most benefits in the opportunities to develop musical skills. Additionally, non-music students reported a boost in self-confidence and a better understanding of group dynamics and collaboration. With the musical, personal, and social benefits of playing instrumental music in a group for non-music students evident, Kokotsaki and Hallam encouraged student participation as often as possible.

Gardiner, Fox, Knowles, and Jeffrey (1996) studied the effects that music had on students who were falling behind their classmates, specifically in the area of math. The study took place in Rhode Island where eight public school, first grade classes were examined. Half the classes became "test arts" groups, receiving ongoing music and visual arts training. In kindergarten, this group had lagged behind in scholastic performance. After 7 months, the students were given a standardized test. The "test arts" group had caught up to their fellow students in reading and surpassed their classmates in math by 22%. Results indicated that students receiving specific musical or visual arts training made a difference in their ability in math.

Looking at most research in regard to music's impact, Bugaj and Brenner (2011) stated that the biggest impact is present when children are young, specifically preschool age, and students are receiving other early education opportunities. It makes a strong case for early music instruction; unfortunately, little long-term research has been done and creates a void for parents, art advocates, and music educators.

Hille, Gust, Bitz, and Kammer (2011) raised the question of music's impact on cognitive ability. The group conducted research to compare the cognitive ability of boys who played an instrument versus boys who did not. Results showed that the measured IQ of boys who had played an instrument was higher than those who had not. It also asked

for students who had family members who had played an instrument wanting to control possible unspecific effects, but the effects on intelligence remained intact. Overall, the researchers concluded that there was an association between music education and general cognitive ability as well as a specific language link.

Baker (2012) studied 37,222 eighth grade students and found that students studying or participating in music courses outperformed "non-music" students consistently on high stakes tests. This was the case for both math and reading tests. Baker made some very strong points in the research:

> The evidence supports recommendations that school principals make adequate schedule allocations for students to perform music, and that, for academic achievement to significantly improve, the minimum instructional time in the arts is observed so that all students receive an effective, quality education. Based on the size of this study's population, the significance of the test score differences, and the consistency of the results over both subjects, administrative exclusion may be viewed as a violation of students' constitutional right to enjoy equal opportunity as their peers to develop to their full potential. (p. 20)

Tierney and Kraus (2013) completed a Northwestern University study that provided proof that there is a link between language skills and music or rhythmic abilities. The study showed that beat-keeping works with the part of the brain that controls hearing and movement. Because hearing speech is crucial to reading, the researchers found a positive link between reading and keeping a beat.

When examining the entire high school class participating in SAT exams in the United States in 2004, music students did not outperform non-music students on the SAT, or college entrance exam (Elpus, 2013). In fact, the most consistent predictor of success on the SAT was poverty.

Thornton (2013) did a comparison of state assessment scores. She contacted all school districts in Pennsylvania asking for state assessment data for all fifth, eighth, and eleventh grade students. Thornton compared the scores of students who participated in music versus students who did not. She defined the music students as a student who participated in a voluntary activity such as band, choir, and orchestra or was involved in extra-curricular music activities. Thornton analyzed 7,000 scores, but struggled in getting schools and districts to participate. In fact, only 6% of the districts originally asked to participate did. Using a two-tailed *t* test to compare musicians to non-musicians, results indicated a significant difference between music and non-music students. This data was consistent with results from other states.

Researchers from Northwestern University demonstrated that young children, pre-schoolers, who cannot keep a beat demonstrated poorer pre-reading skills than their peers. Linking synchronized motor-output with the ability to read could assist educators in earlier identification of reading difficulties in children and allow early interventions or strategies to assist those children (Woodruff Carr, White-Schwoch, Tierney, Strait, & Kraus, 2014).

Some of these same researchers also examined brainstem responses in both musicians and non-musicians by examining individuals as young as 3-years-old up to 30-years-old. The results showed that musicians of all ages and of differentiating amounts

of training demonstrated enhanced neural differentiation of stop consonants early in life. The researchers present this as further evidence that music provides an efficient way of improving auditory processing in children. It also impacts the brain in a way that lasts (Strait, O'Connell, Parbery-Clark, & Kraus, 2014).

Kraus & Strait (2015) took a look at two programs already in existence serving children with musical opportunities versus the creation of a new program in the name of science inquiry. The first existing music program was The Harmony Project Collaboration, which was a non-profit organization offering free music lessons to at-risk students living in areas of heavy gang activity. The second was a partnership with the Chicago Public Schools, which included a series of charter schools requiring students to choose between physical activity and music instruction. The researcher stated that students in the Harmony Project started all in the same place, but those instrumentally trained developed faster neural responses to speech syllables which indicated greater growth in these areas. The children that received 2 years of music training demonstrated better speech-to-noise perception and were better at reading (Kraus & Strait, 2015).

With significant work looking at the impact of music participation, Young, Cordes, and Winner (2014) conducted research which yielded results pointing towards the impact of instrumental music on academic achievement. In looking at after-school art programs and the impact on students, their research showed a positive academic association with after-school art programs only when musical instruments were provided to students. Their findings, showing that access to a musical instrument predicts academic achievement regardless of other factors (including poverty), is critical to

determining the type of art education that should be provided to children (Young, Cordes, & Winner, 2014).

Research looking at academic growth in areas of both math and reading for students participating in a school music program appeared to be absent from the literature. The question still remains, do smart students participate in music or does music make students smart?

Poverty/At-Risk Opportunities

Students living in poverty are often examined in regards to academic achievement. As curricula continue to shrink, students not living in poverty may still receive art opportunities outside school walls. The researcher examined participation in art opportunities for students living in poverty, or at-risk students.

A recent report by the Joseph Rowntree Foundation studied poverty and participation in society (Ferragina, Tomlinson, & Walker, 2013). The report indicated that poverty, in the overall sense, is more about participation in society instead of the shortage of money or income. Individuals at the lowest level of poverty often do not have a choice of activities to participate in because their income must instead be spent on meeting their survival needs. This lack of opportunity for children to participate in society has a significant impact on children found in schools. Fourteen thousand, eight-year-old children living in poverty were asked about their feelings on social events, school, and play. When reviewing the data from participants, the highest responses were related to school, both in activities at school and school in general. The study indicated that parents with children struggling in school spend additional time working on reading, writing, and math at home; however, these children struggling in school also

disproportionately lived in low income homes and spent less time on other activities. The data suggested that experiences at school can impact activities, friendships, and participatory networks.

Southgate and Roscigno (2009) pointed out that students coming from higher income families have more resources and have been provided more of an investment into their academic success by their parents. Music can be one such investment that lower-income families are unable to provide, which in turn, could impact academic success in school. Southgate and Roscigno's research showed a pattern of resource inequality in regard to participation in music, but they again stated that more research needs to be completed.

Students living in poverty, as stated by Southgate and Roscigno (2009), are not provided the same resources as students not living in poverty. In Congress, they agreed that these students were not receiving the same quality education when compared to students from other schools in other areas of the country. To begin to address this and other educational factors, the No Child Left Behind (NCLB) Act of 2001 was passed by Congress and became a reality in 2002. The intentions of these rules and regulations were genuine and were to hold schools accountable for student achievement and were meant to reduce the achievement gap. Congress promised that NCLB would focus on low-achieving schools and students by providing both rewards and punishment to school districts. The punishments might include loss of funds, but could extend to entire school takeovers. The rewards included additional money. In reality, children from inner-city schools living in poverty have still needed to overcome second-rate facilities and education since NCLB was passed (Hollingworth, 2009).

Students identified as at-risk as a result of living in poverty often do not have the same opportunities in music programs as students not at-risk. According to Bates (2012), school music programs are often expensive with an array of costs from instruments, clothes, and transportation. He stated, "Without specific interventions, opportunities and access will remain unequal; students in poverty will not be able to participate in school music as successfully or completely as middle class or affluent students" (p. 34). Bates recommended that all school districts provide a free and equal education for all students. This would include all instrument rentals, uniforms, private instruction, transportation, and anything related to the success of students in a music program. According to Alexander and Alexander (2012), charging students for these fees is in direct opposition to a "free" school system where fees cannot be charged as a requirement for students to be admitted into a school or program. If certain items are deemed necessary to accomplish the goals of a school system, they must be provided free to all students with no charge. However, according to Bates, districts continue to charge and limit the opportunities of the poor.

According to Lobo and Winsler (2006), children growing up in poverty also face an uphill trip when entering adulthood. They are at a higher risk for behavior concerns, social concerns, and will fall behind academically when compared to children growing up with a stable household.

According to McAnally (2013), the 2010 census showed that 22% of American children live in poverty. It is difficult to understand what that number represents until we realize that this is the highest percentage of children living in poverty since 1933.

Additionally, half of those living in poverty are making less than half of the defined poverty income.

Skoe, Krizman, and Kraus (2013) completed research that concluded that adolescents coming from low-income families have difficulty processing auditory information because of their lack of exposure to language. The adolescents had a lower "input" level when listening to adults speak and performed lower on reading and working memory tests. Ongoing work at Northwestern University by Skoe et al. has included exploring whether auditory enrichment in the way of music education can offset some of the impact of an impoverished acoustic education.

Music and Poverty

The literature would indicate that there are some associations between intellectual benefits that occur with music participation and opportunity. It would also indicate that students living in poverty or at-risk students do not have the same opportunities for art activities outside school walls as their more affluent peers. Looking deeper at the literature to examine any research that studies whether children living in poverty make greater gains with music participation than without would be the next step.

Catterall et al. (1999) conducted a study of more than 14,000 students and the effect music training has on mathematics by analyzing the California State Test. This study examined math proficiency of students who were considered low socioeconomic (SES) students and played an instrument versus the general population of students. The results of this study included the following information.

1. Of all students who completed the eighth grade math proficiency test, it was found that 19% of the general population scored in the "high-performing"

category. Twenty-one percent of those students who were identified in the low SES category who also participated in the instrumental music program scored in the "high-performing" category.

2. Of all students who completed the twelfth grade math proficiency test, 21.3% of the general population scored in the "high-performing" category. Thirty-three percent of those students who were identified in the low SES category who also participated in the instrumental music program scored in the "high-performing" category.

The results of this study illustrate a connection between sustained instrumental music education, in this case 4-5 years, and higher math test scores.

Fitzpatrick (2006) examined results of the Ohio Proficiency Test and compared results of students who played instruments and students who did not play instruments and also compared results when considering the SES of students. Results indicated that instrumental students, regardless of SES status, outperformed non-instrumental students in every subject and at every grade level. Additionally, results also showed a pattern of increased achievement by lower SES students who played an instrument and who have passed higher SES, non-instrument students in all subjects by the time they reached ninth grade. The study further pointed out something apparent in most research in regard to music and academics: students who participated in music consistently began the study with higher scores.

The Health, Education, in the Arts, Refining Talented Student (HEARTS) Program is an after school fine arts program aimed toward at-risk students. In the spring of 2006, results of a study were published explaining the impact that HEARTS had on at-

risk children (Respress & Lutfi, 2006). The study used a sample population of poor children selected by using baseline data regarding socio-economic status, family problems, and problems in the community. The study compared this sample population of participants with an arts component to a comparison group with no arts component. Results indicated that 57% of the arts participant group increased their grade point averages by .5 points, while only 11% of the comparison group showed the same growth. Seventy-three percent of the arts participants also increased their spelling level by at least one grade level while only 48% of the comparison group increased their spelling to the same level. The difference was seen as statistically significant.

Most research in the area of music's impact on educational growth evaluates only one year of data, and there is little in the way of longitudinal studies in this area. Rose and Magnotta (2012) conducted one of the few longitudinal studies on the impact of music on reading ability on a group of young children over time. The researchers indicated few programs have impacted reading ability in children who struggle and also found that students who struggle are more than likely poor and minority. The study consisted of 57 students receiving arts-based curriculum and 48 students who did not participate in arts-based curriculum. The study used Dynamic Indicators of Basic Literacy Skills (DIBELS) to measure student's growth in reading. Results indicated that the students receiving the arts-based curriculum had significantly greater reading skills when compared to the control group. In their conclusion, the researchers commented that a well built, arts-based curriculum during a child's first 4 years can be successful and engage students in a way that positively impacts all academics.

According to Brown and Sax (2012), the impact of the arts on economically disadvantaged students begins as early as when they enter preschool. Low-income children tend to start preschool with negative emotions stemming from the stress faced at home. Arts enrichment has been used by classroom teachers for many years and can create a way for children to express negative feelings in a positive way. It is also a way for children to create positive emotions as the arts create a common place for all children coming from a wide variety of socio-economic backgrounds.

As referenced previously, Baker (2012) studied 37,222 eighth grade students. He found that those students studying or participating in music courses outperformed "non-music" students consistently on high stakes tests. This study also examined the effects of music participation on low SES students. Results indicated that English scores for low SES students involved in music were seven points higher than SES students not involved in music. This same group scored three points higher in math.

Catterall, Dumais, & Hampden-Thompson (2012) conducted a study looking at the effects of art participation on children who are high-risk. They had three findings which included a more positive outcome in regards to academic achievement, civic engagement, and post high school work outcomes. In regard to academics, students with low SES deeply involved in art scored higher in science and writing when compared to students with low SES and little art experience. These students were also more likely to complete a high school calculus class. Students with low SES but deeply involved in art also had a higher overall GPA, higher GPA in math, and a higher percentage planned on graduating college with a bachelor's degree when compared to students with low SES and little art experience.

As mentioned earlier, not all research shows academic achievement when children participate in music. Rickard, Bambrick, and Gill (2012) studied 10 to 13 year old students where the results showed that music had limited impact on students; however, they made a critical discovery in regard to socio-economically disadvantaged students. They found that a notable exception to their study was the significant increase in immediate recall of verbal information in the low to average SES students, and they indicated this would be a topic for further investigation.

Barrett and Baker (2012) studied a group of Australian, at-risk students who had been identified as having fewer opportunities, including 15 to 17 year olds who had been incarcerated who participated in the Australian Children's Music Foundation program. Having fewer opportunities has been identified as an issue with our poverty population earlier in the study. Results indicated participants developed a sense of worth as well as built skills in self-discipline, communication, and overall quality of life. Teachers provided weekly music instruction in small group or one-on-one settings. Along with specific music outcomes, students identified learning outcomes outside of music such as appropriate social behavior and capacity to engage with others in learning tasks. According to Kay and Greenhill (2013), these acquired skills tied in with 21st century learning skills that emphasize the importance of collaboration in the workforce.

Heyworth (2013) examined the engagement level of young children living in poverty when a classroom teacher used music as the main focus of each lesson. How music was used was determined by the attitude of the students entering the room. Heyworth found that singing engaged all students and that music was a powerful way to provide positive experiences for students coming from an environment that was not

positive. Heyworth stated, “Music is a universal language; it is social in nature, and has the power to engage students from all backgrounds” (p. 241).

Slater, Tierney, and Kraus (2013) studied at-risk children and how well they kept a beat. The research participants were chosen to receive 12 months of free music lessons provided by the Harmony Project. Children entered instrumental training once they attained a level of basic competency. Results indicated that children receiving musical training were superior in maintaining a steady beat when compared to those children not receiving training. Locking onto temporal patterns has proven to be beneficial to attention, communication, and memory. The researchers indicated that realizing the impact music instruction has on temporal processing, along with language and literacy skills, is important to understanding the benefits music instruction has on at-risk children.

Tierney, Krizman, Skoe, Johnston, and Kraus (2013) looked at high school students from Chicago Public Schools, where students from this district were largely poor and understudied. The researchers tested students participating to two types of training: one group participated in music training and the other in fitness-based training. After two years of training, the researchers discovered that neural responses of the fitness-trained students remained the same. The music group’s neural responses had in fact improved since the first testing. According to Tierney et al., this would be the strongest evidence to date demonstrating music instruction positively impacts speech encoding and is consistent with the notion that music is a critical part of a well-rounded education.

Cogo-Moreira, de Avila, Ploubidis, and Mari (2013) examined the impact that music has on poor young readers in Brazil and found mixed results. They examined results for eight 10-year-old students who were struggling in reading and completed a 5

month, randomized clinical trial to determine if a music intervention would positively impact reading performance. The music intervention was carried out by Brazilian music instructors implementing the country's music curriculum. Children receiving the intervention correctly read 2.57 more words per minute when compared to other children not receiving the intervention. Math scores also increased slightly. The growth in scores was not significant enough to support an association between music and reading/math improvement in poor children, but it did show promise and recommended additional research be completed in this area.

Kraus, Slater, et al. (2014) looked at community music training being used by at-risk students. This community music training was in place of expensive, private lessons, and created an opportunity for children to channel their creativity and energy towards something positive versus the negative. The study showed that 2 years of music training had a strong neurophysiological distinction of stop consonants, which links to language and reading skills. The study also showed that 1 year did not make a change and that larger gains in neural processing happened when music training increased. The researchers stated that community music programs can be a powerful tool in reaching at-risk kids.

Another study lead by Kraus, Hornickel, Strait, Slater, and Thompson (2014) again looking at Harmony Project looked at 26 students enrolled at a school where greater than 90% of students qualified for the free and reduced lunches program. The students began with music participation, but moved into musical instruments over a 2 year period of time. Their findings suggested that engagement and participation in music

predicts stronger speech encoding, and they found a greater engagement by low SES students (Kraus, Hornickel, et al., 2014).

The Harmony Project was again studied by Slater et al. (2014), but Slater et al. looked specifically at Spanish-English speaking bilingual students. As stated several times in this chapter, the Harmony Project has focused on low-income children. The research, looking at 1-year of music instruction, demonstrated that students receiving musical training over the course of 1-year maintained typical grade-level growth in reading. The control group showed a modest decline in reading performance. The researchers stated that programs like the Harmony Project, which provides music instruction to low-income families, helps maintain a typical growth in reading (Slater et al., 2014).

Osborne, McPherson, Faulkner, Davidson, & Barrett (2015) looked specifically at two disadvantaged schools in Melbourne, Australia. Many children in the study experienced challenges that included generational poverty. In the study, researchers provided an extra-curricular instrumental music program to students over a 12-month period to measure non-verbal reasoning skills, reading, mental math, general mathematics, as well as their social-emotional state. Overall, all scores were considerably lower than other students of their same age, but the study did provide some outcomes. The music-participation students were more skilled in solving increasingly difficult mathematical problems. Also, a pattern emerged at one school showing the music-participation group outperformed the non-music students in all four academic subgroups (non-verbal reasoning skills, reading, mental math, and general mathematics); however, the pattern did not emerge at the second school. The study indicated strong

visual-spatial reasoning and non-verbal problem solving skills in the lowest SES students (Osborne et al., 2015).

Summary

Research reported in this literature review shared some critical themes. As a result of No Child Left Behind, instructional time in the classroom has been redefined. With emphasis for learning being placed on tested and reported subjects, which are reading and math, all students have fewer opportunities to receive an education in the area of instrumental music. The research suggested that children living in poverty have fewer opportunities outside of school to replace music instruction no longer available to all students. Also, students living in poverty are often academically behind peers when entering school and are being limited in opportunity by being placed in remedial classes again preparing for high stakes testing. The research also indicated music provides a positive impact on academics for all children, specifically children living in poverty. Research pointed to a positive impact on math and brain development, reading, and an overall increase in IQ. The research; however, often focused on one snapshot in time. It focused on comparing scores of music and non-music children. The research did not indicate growth or a rate of growth for children living in poverty.

Description of the Next Chapters

Chapter III defines the methodology of this study, including: a description of the subjects, a description of the participating school district, a description of the instruments, as well as an overview of the proposed quantitative research methods and data analysis. Chapter IV provides the findings of the researcher, including the rate of growth for students in math and reading. These findings are disseminated by instrumental

participation and poverty. Chapter V summarizes the findings from Chapter IV. The chapter will also report the importance, meaning, and significance of the study.

CHAPTER III

METHODOLOGY

Purpose of the Study

The purpose of this multi-cohort, longitudinal investigation was to determine if participation in instrumental music programs is positively associated with the academic performance of all students when comparing students not living in poverty FRL with the children living in poverty FRL. This study examined the impact music participation had on students of a Midwestern school district to academic growth, and also provided insight into the connection of the impact that music participation has on students living in poverty FRL to academic growth.

Research Questions

The following research questions were used to guide the study:

1. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for all students who participated in instrumental music courses versus all students who were not enrolled in instrumental music courses?
2. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students living in poverty FRL versus students not living in poverty FRL?

3. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students when economic status interacts with instrumental music participation?

This research focused on Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) scores for several reasons. First, using MAP allowed the researcher access to all students. Second, MAP measured the same standards and benchmarks set by state and federal governments with the adoption of Common Core State Standards (CCSS). Third, it was administered at the same time each year.

Description of the Subjects/Research Population

Participants in this research study were from a Midwestern school district (BPS) that served 11,417 students at the time of the study and was the largest school district in the state. District staff consisted of 1,823 employees where 44% had at least a master's degree. In order to gain a better understanding of demographics around the region, two additional school districts were compared to the participating school district. The second largest school district in the same state, FPS, showed 53% of their staff with master's degrees (Fargo Public Schools, 2015b). The district in this study included 24 schools including three senior high schools. The average number of students in each class was 21. Also in comparison, SFSD, the largest school district in the next state south, had an average class size of 23 (Sioux Falls School District, 2015a). BPS's average daily attendance at the time of this study was 96.2%, and the district had a 0.9% dropout rate. FPS had a daily attendance of 95%, and SFPS had a daily attendance rate of 96.2%. The operating budget for BPS, the school district participating in this study was $136 million

at the time of the study. FPS operated with a budget of 139 million dollars with the same number of students. SFPS operated with a budget of 141 million dollars (Sioux Falls School District, 2014b). In BPS, the population consisted of 87% Caucasian students with Native American students making up another 8%. The Asian population accounted for the remaining 5%. FPS has a population of 81% Caucasian with Native Americans at 2.5%. The district in this study used the qualification of students into the free and reduced meal program as a basis for determining SES. During the 2012-2013 school year, 2,627 students qualified for the free and reduced lunch program, which was 23% of the total population (Bismarck Public Schools, 2014). During the 2012-2013 school year, Fargo Public Schools reported 29% of their population participated in the free and reduced lunch program (Fargo Public Schools, 2015a).

While the school district and students of this study are similar to other school districts in the immediate geographical area, they do differ from other school districts in that part of the United States. The states that are part of the Midwest are: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. According to the National Center for Education Statistics the percentage of students enrolled in public education by region and race/ethnicity in the fall of 2012 indicated that 68% of students in the Midwest were white. It also indicated that 14% of students in the Midwest were black, 11% were Hispanic, 3% were Asian, and 1% was American Indian. This was the highest concentration of white students in a region compared to the rest of the country (Kena et al., 2015). Additionally, the National Center for Children in Poverty reported, in 2013, that 37% (roughly 2 million; Jiang,

Ekono, & Skinner, 2015) of adolescents (students between the ages of 12-17) in the Midwest were living in low-income families.

Subjects for the research study were the graduating classes of 2013, 2014, 2015, 2016, and 2017 from this school district. The economic status of each student, along with instrumental music participation and NWEA MAP scores were analyzed. All students who were members of the school district during a 4-year period were studied. In this study, only subjects who were enrolled in instrumental music courses for the entire 4-year period studied were used in the music participation sample to provide the most accurate data possible, showing the association of music participation and academic growth of students in the areas of math and reading. In this study, only students who were never in an instrumental music course were used in the non-music group. In this study, students who qualified for the free-and-reduced lunch program at any point during their time in the district were included in the poverty FRL group, which indicates that the family experienced financial hardships during this 4-year period of time, and the researcher determined these students would be in the poverty FRL group. Students who never qualified for the free-and-reduced lunch program during their time in the district were included in the non-poverty FRL group. These students would not have spent any time in financial hardships and would give the most accurate picture on non-poverty FRL students.

Instrument

The NWEA MAP test was used as the study instrument. Students were administered the NWEA MAP twice annually by the school district, once in the fall and once in the spring. There was a specific test for math and reading, providing individual

achievement and growth data, after the first test, interval data scores for each subject. Growth scores being interval data were important for selection of descriptive means and standard deviations (if they sufficiently describe) and inferential statistics. The test scores for all students were stored and tracked by school personnel. This archival data is stored in a data warehouse called Viewpoint. Upon receipt of permission from the school district (Appendix A), access to all data was permitted for use in the study with the assistance of a district employee whose primary responsibility was maintenance of the data warehouse for technical assistance. The researcher also signed a confidentiality agreement with the school district participating in this study (Appendix B).

Before the data were collected, the researcher applied for approval of the research with the Institutional Review Board (IRB) at the University of North Dakota (Appendix C). The researcher completed required forms, submitted necessary narratives describing how data would be stored and how student identities would remain anonymous, and paperwork indicating school district permission. IRB approval was received from the University of North Dakota on June 30, 2015 (IRB-201506-384). The data utilized were NWEA MAP, Rasch unIT (RIT) scores of students of a Midwest school district which were sorted by instrumental music participation, free and reduced lunch, and the entire population. The study included data indicating academic growth scores in the areas of both math and reading.

Data Analysis

This research study was a quantitative study where the mean NWEA MAP growth scores in math and reading were compared. Growth was determined by comparing 6^{th} grade scores to 10^{th} grade scores. The researcher then organized subjects according to

their socio-economic status and their participation in the instrumental music programs offered. The independent variables were socio-economic status and instrumental participation status.

The first independent variable, socio-economic status was determined by whether or not a student participated in the free and reduced lunch program at any point during their 4 year participation in the study. The researcher determined that any student qualifying for free or reduced lunches at any point would clearly indicate a situation where financial hardship was a factor. The second independent variable, instrumental music participation, was determined by whether or not a student participated in an instrumental music program for the entire 4 year period which would produce data most accurately answering the research questions in regards to the association of music participation and growth on the NWEA MAP tests administered in both math and reading.

The dependent variable was the NWEA MAP growth test scores for all students. An NWEA growth score (dependent variable) was determined by taking a student's fall 6^{th} grade score in math and subtracting it from their 10^{th} grade spring score, representing the number of RIT points of change in the 4 year window which represented a student's NWEA MAP growth during the 4 year period. A positive growth score indicated improved test performance while a negative growth score suggested decreased test performance. This growth score was computed for reading and math.

Data were analyzed to characterize the association of NWEA MAP growth scores with the independent variables of socio-economic status and instrumental participation status. Analysis was conducted using IBM SPSS Statistics for Windows software

(Version 23, Armonk, NY: IBM Corp.) available on the University of North Dakota's Citrix webpage.

Description of the Next Chapters

Chapter IV provides the findings of the research, including the rate of growth of students in math and reading. The findings shared were in regards to poverty FRL status and their association with students' 4-year growth in NWEA MAP reading and math scores. Chapter V summarizes the findings from Chapter IV. Chapter V also reports the importance, meaning, and significance of the study.

CHAPTER IV

RESULTS

Purpose of the Study

The purpose of this quantitative study was to determine if participation in instrumental music programs had a positive correlation with the academic performance of all students. The study also compared students not living in poverty FRL with the children living in poverty FRL. The study examined the positive association that music participation had on students of a Midwestern school district who also lived in poverty FRL and might provide insight into the connection music participation has on students living in poverty FRL.

The researcher analyzed NWEA MAP test scores in the areas of reading and math. The research questions included:

1. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for all students who participated in instrumental music courses versus all students who were not enrolled in instrumental music courses?
2. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students living in poverty FRL versus students not living in poverty FRL?

3. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students when economic status interacts with instrumental music participation?

The findings are reported in the summary of the following graphs and tables with recommendations based on the analysis of the data included in Chapter V.

Data

The researcher began by analyzing the number of students in each study group (Table 1). The total population included was 4,328 – 568 (13%) in the musical instrument groups and 1,341 (30%) in the poverty FRL groups. The subgroup with the fewest number of students was the musical instrument, poverty FRL group with only 95 (2.2%) students. The researcher noted a very large sample size, 4,328 students over a 5 year span, and the disproportionate sizes of the subgroups. Field (2013) noted that anything above 2,000 would be considered a very large sample size.

Table 1. Total Number of Students by Subgroup.

Subgroup	Number of Students	% of Total Population
Non-Music, Non-Poverty FRL	2,514	58.1%
Non-Music, Poverty FRL	1,246	28.8%
Music, Non-Poverty FRL	473	10.9%
Music, Poverty FRL	95	2.2%
Total	4,328	100.0%

Looking at a 4,328 total population of students, the researcher discovered that assessment data were available for all students. Tables 2 and 3 show the number of students in each sub group assessed in reading (2,859) and math (2,137).

Table 2 summarizes the total number of students, by subgroup, assessed in reading. When analyzing this sub-group, it was determined that 72.1% of non-music, non-poverty FRL and 53% of the non-music, poverty FRL students participated in the assessment. Additionally, 71.2% of the music, non-poverty FRL and 59% of the music, poverty FRL students participated in the assessment.

Table 2. Total Number of Students by Subgroup Assessed in Reading.

Subgroup	# of Students	# of Students Assessed	% of Total
Non-Music, Non-Poverty FRL	2,514	1,810	72.1%
Non-Music, Poverty FRL	1,246	656	53.0%
Music, Non-Poverty FRL	473	337	71.2%
Music, Poverty FRL	95	56	59.0%
Total	4,328	2,859	66.1%

Table 3 summarizes the total number of students by subgroup assessed in math. When analyzing this sub-group, it was determined that 54.8% of the non-music, non-poverty FRL students and 40% of the non-music, poverty FRL students participated in the assessment. Additionally, 60% of the music, non-poverty FRL and 48.4% of the music, poverty FRL students participated in the assessment.

Table 3. Total Number of Students by Subgroup Assessed in Math.

Subgroup	# of Students	# of Students Assessed	% of Total
Non-Music, Non-Poverty FRL	2,514	1,352	54.8%
Non-Music, Poverty FRL	1,246	499	40.0%
Music, Non-Poverty FRL	473	229	48.4%
Music, Poverty FRL	95	57	60.0%
Total	4,328	2,137	49.4%

Looking at the percentages of students completing the assessment, the researcher noted that in order to compile growth scores, meaning the difference between 6th grade and 10th grade scores, the percentages and figures shared in Tables 2 and 3 are all students enrolled during the 10th grade school year. This means that any student that had moved into the district after 6th grade would not have been assessed twice because they would not have been present in the school district during their 6th grade year; and therefore, students only assessed once appear to have not been assessed at all.

Reading

Assessing the normality of dependent variable distributions began with Figure 1; and then continued with traditional tests of normality. When examining the data, the researcher first looked at frequency distribution in the areas of reading and math, starting here with reading. Figure 1 shows the distribution of NWEA MAP reading growth scores for the entire population of students participating in the study.

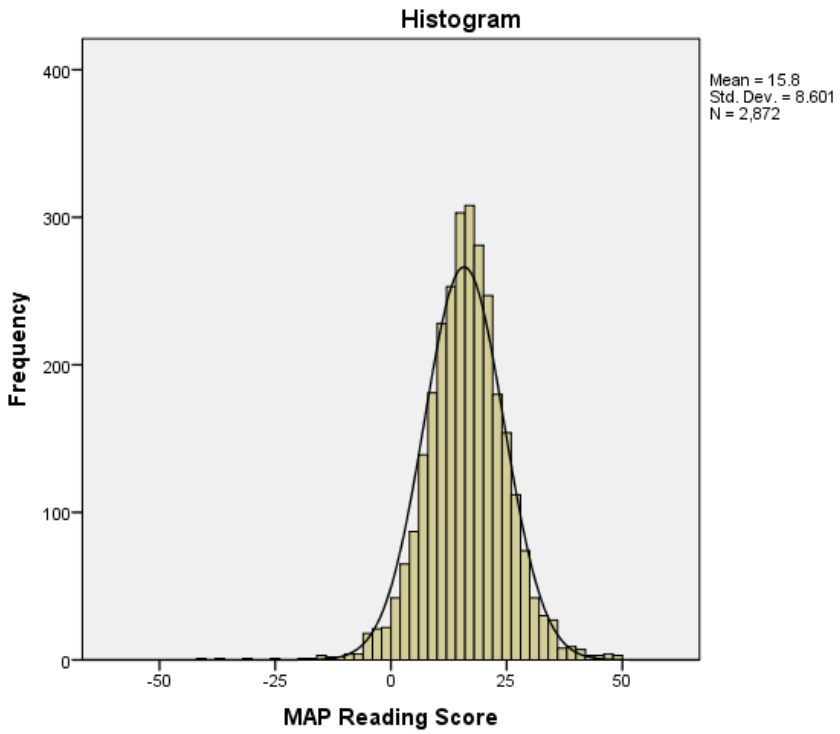

Figure 1. Histogram of MAP Reading Scores.

The data has a rather large range and appears to be symmetric. The mean is 15.8. Table 4 shows actual mean, mode, median, minimum, and maximum values among other values for the distribution of reading scores shown in Figure 1.

Table 4. Means, Mode, Median, Range, Kurtosis, and Skewness for Reading.

Reading MAP Scores	Mean	Mode	Median	Minimum	Maximum	Range	Kurtosis	Skewness
Total	15.80	15.00	16.00	-41.00	49.00	90.00	2.214	-.269

Looking at the four subgroups of participants, the bell curve continues to exist in each subgroup. In Figure 2, the distribution of NWEA MAP reading growth scores are shared for each of the independent variables.

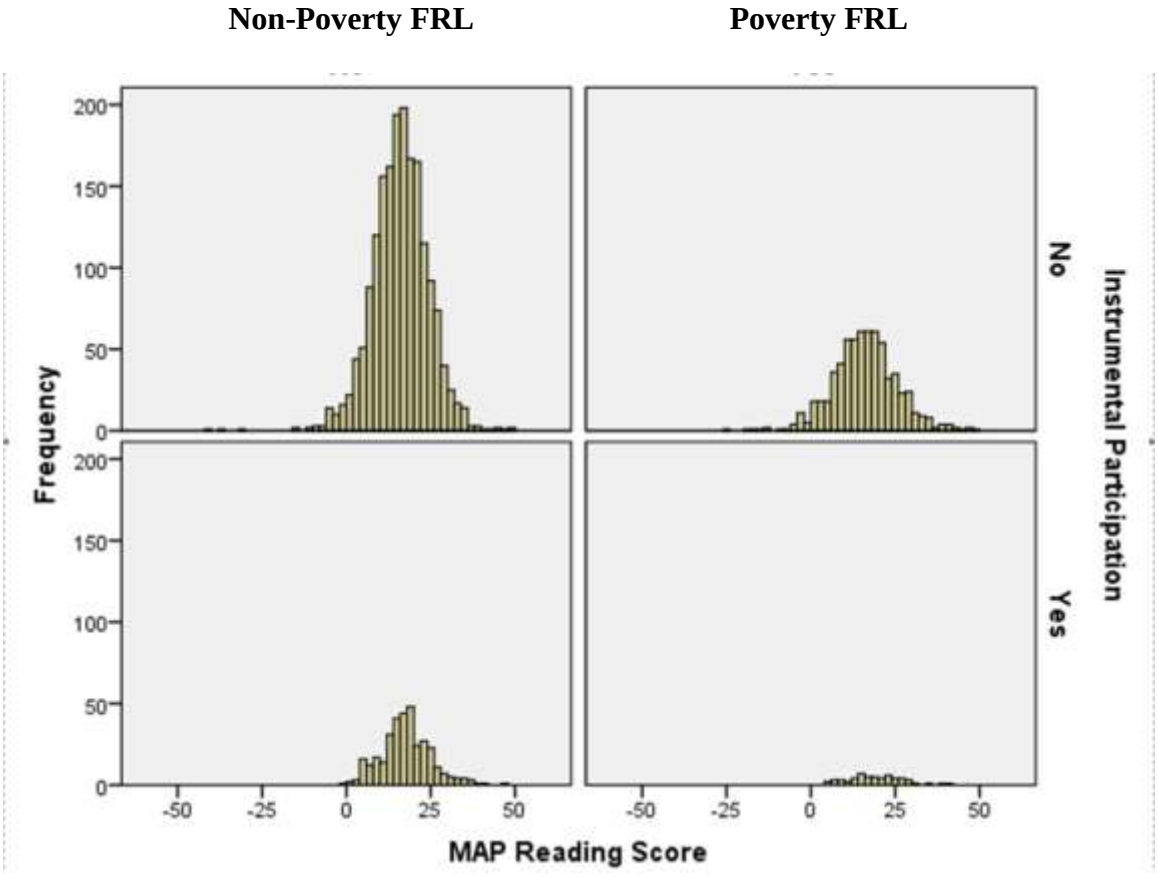

Figure 2. Histogram of Four Independent Variables With MAP Reading.

Next, the researcher investigated the usual tests of normalcy including the Kolmogorov-Smirnov and Shapiro-Wilk. Information presented in Table 5 shows both scores on this test had a significance of $p < .05$, which would be considered statistically significant indicating distributions different than normal.

Table 5. Tests of Normality for MAP Reading Scores.

MAP Score	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Reading	.045	2872	.000	.982	2872	.000

[a] Lilliefors Significance Correction

When applied to very large samples, Kolmogorov-Smirnov and Shipiro-Wilk tests can be significant for even small deviations from normality (Field, 2013). But noting Field, the researcher still considered the indices of skewness and kurtosis and the closeness of mean, median, and mode to be not very different than normally distributed data.

Finally, the researcher examined the frequency distribution by the mean, mode, and median of NWEA MAP reading growth scores: 15.80, 15.00, and 16.00 (respectively). The close values of the mean, mode, and median suggest a symmetric distribution. NWEA MAP reading growth includes the mean which is 15.80. The median is 16.00. The mode is 15.00. The researcher plotted the distributions, noted apparent symmetry, and proceeded with parametric statistical tests. The parametric tests came with assessments of normality that indicated not so - a contradiction to the researcher's observations. It is noted that large sample sizes can yield errant assessments of normality (Field) and the researcher considered the mean, median, and mode differences; those differences were small and thus supported your data distributions being not very different than normal. The researcher noted Field's caution about the usual assessments and went with plotted evidence and comparisons of the mean, mode, and median. After running multiple tests to determine the frequency distribution of the data set and weighing in both the statistical and practical importance, the researcher determined that using the mean would be appropriate to answer research questions. The researcher used an ANOVA to answer the first two research questions.

Math

When examining the data, the researcher first looked at frequency distribution in the areas of reading and math, first reading, and now continuing on with math. Using a

histogram, Figure 3 shows the distribution of NWEA MAP growth scores for math for the entire population of students participating in the study.

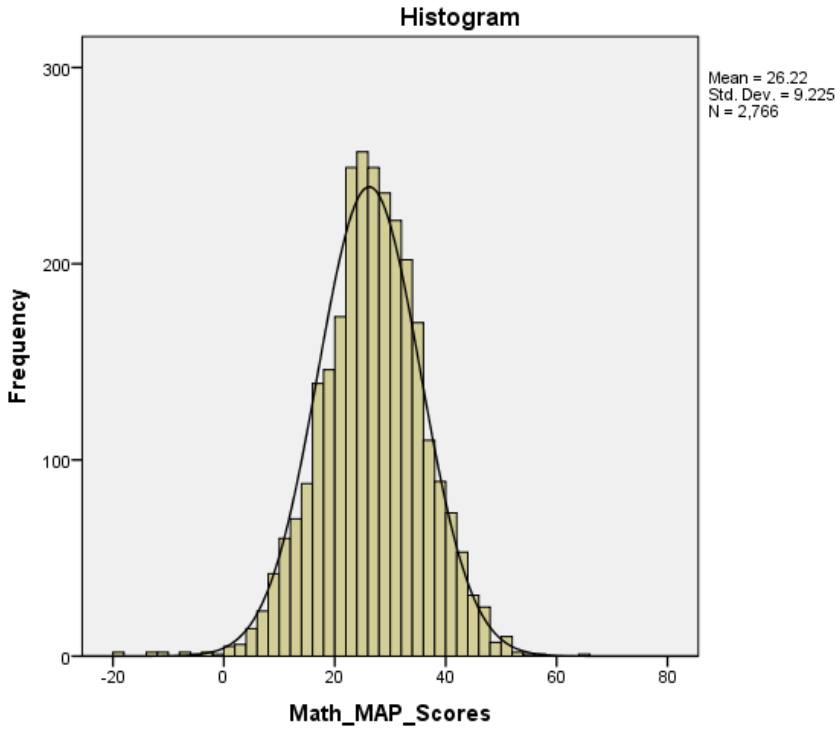

Figure 3. Histogram of MAP Math Scores.

The data had a rather large range, but maintained a bell curve. The mean score was 26.22 in math. Table 6 shows actual mean, mode, median, minimum, and maximum values among other values for the distribution of math scores shown in Figure 3.

Table 6. Means, Mode, Median, Range, Kurtosis, Skewness for Math.

Math MAP Scores	Mean	Mode	Median	Minimum	Maximum	Range	Kurtosis	Skewness
Total	26.22	24.00	26.00	-19.00	64.00	83.00	.774	-.214

Examining the four subgroups of participants, a normal distribution continues to exist in each subgroup. In Figure 4, the distribution of NWEA MAP math growth scores are shared for each of the independent variables.

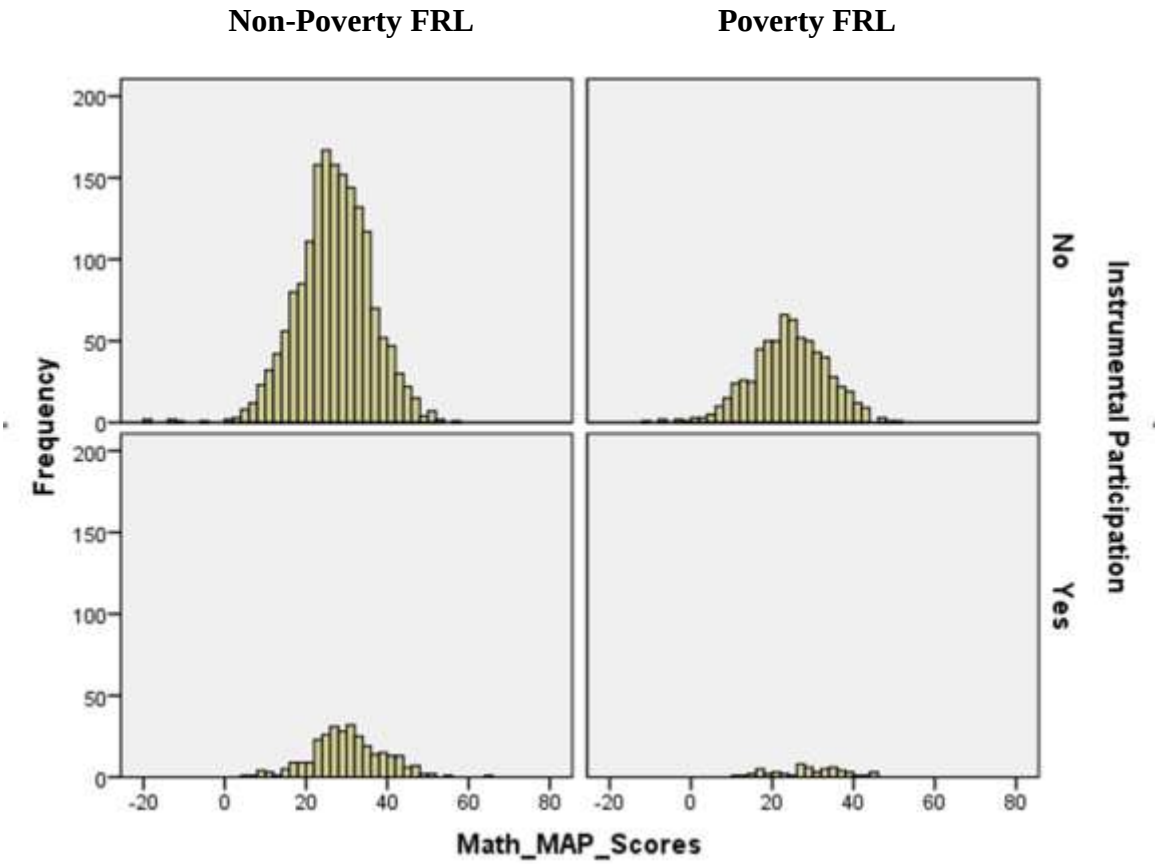

Figure 4. Histogram of Four Independent Variables With MAP Math.

Next, the researcher focused on some tests of normalcy including the Kolmogorov-Smirnov and Shapiro-Wilk. In Table 7, both scores on this test had a significance of $p < .05$, which would be considered statistically significant and indicated distributions different than normal.

Table 7. Tests of Normality for MAP Math Scores.

MAP Scores	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Math	.042	2766	.000	.993	2766	.000

[a] Lilliefors Significance Correction

When applied to very large samples, Kolmogorov-Smirnov and Shipiro-Wilk tests can be significant for even small deviations from normality (Field, 2013). The researcher applied the Kolmogorov-Smirnova and Shapiro-Wilk tests because they are traditional assessments of normality. Based on Field's notes, the researcher considered the indices of skewness and kurtosis and the closeness of mean, median, and mode to indicate mean was not very different than normally distributed data.

Finally, the researcher compared the frequency distribution to MAP math growth scores by examining the mean, mode, and median of NWEA MAP growth scores for math. The data indicated that NWEA MAP math growth scores have a mean of 26.22. The median is 26.00. The mode is 24.00. The researcher plotted the distributions, noted apparent symmetry, and proceeded with parametric statistical tests. The parametric tests came with assessments of normality that indicated not so - a contradiction to the researcher's observations. It is noted that large sample sizes can yield errant assessments of normality (Field) and the researcher considered the mean, median, and mode differences; those differences were small and thus supported your data distributions being not very different than normal. The researcher noted Field's caution about the usual assessments and went with plotted evidence and comparisons of the mean, mode, and

median. After running multiple tests to determine the frequency distribution of the data set and weighing in both the statistical and practical importance, the researcher has determined that using the mean would be appropriate to answer research questions. The researcher used an ANOVA to answer the first two research questions

Research Question 1

The first question in this research study was: What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for all students who participated in instrumental music courses versus all students who were not enrolled in instrumental music courses?

The examination of data in Table 8 indicated a difference in mean score when comparing NWEA MAP reading scores in the Instrumental Participation independent variable. Students who had never participated in instrumental music during their 6th grade to 10th grade years grew in the measure of achievement a mean of 15.54 RIT points in reading. Students who had participated in an instrumental program for their entire 6th grade through 10th grade years grew in the measure of achievement a mean of 17.44 RIT points in reading. The difference in mean score was 1.9 in reading. This represented a greater growth in academic achievement (of 1.9) in reading for students who participated in an instrumental music program compared to students who did not.

The examination of data in Table 9 indicated a difference in mean score when comparing NWEA MAP math scores in the Instrumental Participation independent variable. Students who had never participated in instrumental music during their 6th grade to 10th grade years grew in the measure of achievement a mean of 25.72 RIT points in math. Students who had participated in an instrumental program for their entire 6th

Table 8. Mean Growth Scores in MAP Reading for Independent Variable, Instrumental Participation.

Mean MAP Scores – Reading			
Instrumental Participation	Mean	*N*	Std. Deviation
No Instrumental Participation	15.54	2,476	8.735
Instrumental Participation	17.44	396	7.509
Total	15.80	2,872	8.601

grade through 10th grade years grew in the measure of achievement a mean of 29.61 RIT points in math. The difference in mean score was 3.89 in math. This represented a greater growth in academic achievement (of 3.89) in math for students who participated in an instrumental music program.

Table 9. Mean Growth Scores in MAP Math for Independent Variable, Instrumental Participation.

Mean MAP Scores – Math			
Instrumental Participation	Mean	*N*	Std. Deviation
No Instrumental Participation	25.72	2,409	9.175
Instrumental Participation	29.61	357	8.855
Total	26.22	2,766	9.225

The researcher began with this research question: Participation in instrumental music courses, will there be a mean difference on students reading and math NWEA MAP test scores?

Music Participation—Reading

First the researcher ran a test of homogeneity of variances choosing the Levene test. This test was run using the independent variables of poverty FRL and instrumental music participation and the dependent variable of NWEA MAP reading growth scores.

In Table 10, looking at the independent variable of instrumental music, it was determined there was significance of $p < .005$ indicating the variances in math growth scores for the two independent variables were different.

Table 10. Test of Homogeneity of Variances in Reading Scores and Music Instrumental Participation.

Levene Statistic	*df*1	*df*2	Sig.
7.727	1	2870	.005

A one-way ANOVA was conducted using SPSS 23 examining the mean differences of music participation and reading scores in Table 11. There was a significant effect of music participation on reading growth scores, $F(1, 2870) = 16.804$, $p < .05$. In Table 8, mean growth scores for music instrumental students was 17.44 ± 7.509 (mean ± standard deviation) and for non-music instrumental participation there was 15.54 ± 8.735.

Unequal variances when group sizes are disproportionate will yield a conservative (smaller) *F* ratio (Field, 2013, p. 443); while there are available adjustments to the *F* ratio; for this investigation, they are not necessary.

The results of the ANOVA in Table 11 provided the test for mean differences in reading growth scores when comparing instrumental music students versus the non-instrumental music students.

Table 11. ANOVA of Reading Scores and Instrumental Music.

	Sum of Squares	*df*	Mean Square	*F*	Sig.	R^2
Between Groups	1236.142	1	1236.142	16.804	.000	.00059
Within Groups	211128.493	2870	73.564			
Total	212364.635	2871				

Music Participation—Math

The researcher ran a test of homogeneity of variances choosing the Levene test. This test was run using the independent variables of poverty FRL and instrumental music participation and the dependent variable of NWEA MAP math growth scores. In Table 12, looking at the independent variable of instrumental music, it was determined there was significance with $p < .366$ indicating the variances in math growth scores for the two independent variables were similar.

Table 12. Test of Homogeneity of Variances in Math Scores and Music Instrumental Participation.

Levene Statistic	*df*1	*df*2	Sig.
.819	1	2764	.366

A one-way ANOVA was conducted using SPSS 23 examining the mean differences of music participation and math scores (see Table 13). There was a significant effect of music participation on math growth scores, $F(1, 2764) = 56.375$, $p < .05$. If you recall, you can see in Table 9 that mean growth scores in math for students in instrumental music was 29.61 ± 8.855 (mean ± standard deviation); and for students not participating in instrumental music, 25.72 ± 9.175.

The results of the ANOVA, shown in Table 13, provided a comparison between mean differences in math growth scores when comparing instrumental music students to students not participating in instrumental music.

Table 13. ANOVA of Math Scores and Instrumental Music.

	Sum of Squares	*df*	Mean Square	*F*	Sig.	R^2
Between Groups	4703.448	1	4703.448	56.375	.000	.01842
Within Groups	230605.531	2764	83.432			
Total	235308.979	2765				

The null hypothesis of "participation in instrumental music courses will have no significant effect on student reading and math NWEA MAP test scores," was rejected. Participation in instrumental music courses did have a significant effect on student reading and math NWEA MAP scores.

Research Question 2

The second question to be answered in this research study was: What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students living in poverty FRL versus students not living in poverty FRL?

The examination of data in Table 14 indicated a difference in mean score when comparing NWEA MAP reading scores with the poverty FRL independent variable. Students who *had never* qualified or participated in the free and reduced lunch program during their 6th grade to 10th grade years grew in the measure of achievement a mean of 15.80 RIT points in reading. Students who *had* qualified or participated in the free and reduced lunch program during their 6th grade through 10th grade years grew in the

measure of achievement a mean of 15.83 RIT points in reading. The difference in mean scores is 0.03 in reading. This represents a 0.03 greater academic achievement growth in reading for students who qualified for free and reduced meals.

Table 14. Mean Growth Scores in MAP Reading for Independent Variable, Poverty FRL.

	Mean MAP Scores – Reading		
	Mean	*N*	Std. Deviation
Non-poverty FRL	15.80	2,150	8.223
Poverty FRL	15.83	733	9.643
Total	15.80	2,872	8.601

The examination of data in Table 15 indicated a difference in mean score when comparing NWEA MAP math scores in the poverty FRL independent variable. Students who *had never* qualified or participated in the free and reduced lunch program during their 6th grade to 10th grade years grew in the measure of achievement a mean of 27.00 RIT points in math. Students who *had* qualified or participated in the free and reduced lunch program during their 6th grade through 10th grade years grew in the measure of achievement a mean of 24.04 RIT points in math. The difference in mean scores was 2.96 in math. This represented a 2.96 greater growth in academic achievement in math for students who never qualified for a free and/or reduced price meal program.

Table 15. Mean Growth Scores in MAP Math for Independent Variable, Poverty FRL.

	Mean MAP Scores – Math		
	Mean	*N*	Std. Deviation
Non-poverty FRL	27.00	2,038	9.073
Poverty FRL	24.04	728	9.304
Total	26.22	2,766	9.225

The researcher began by establishing research question: Poverty FRL, will there be a mean difference on students reading and math NWEA MAP test scores?

Poverty FRL—Reading

The researcher chose the Levene test to run a test of homogeneity of variances. This test was run using the independent variables of poverty FRL and instrumental music participation and the dependent variable of NWEA MAP reading growth scores. In Table 16, looking at the independent variable of poverty FRL, it was determined there was significance with $p < .001$ indicating the variances in reading growth scores for the two independent variables were different.

Table 16. Test of Homogeneity of Variances in Reading Scores and Poverty FRL.

Levene Statistic	*df*1	*df*2	Sig.
21.217	1	2870	.000

A one-way ANOVA was conducted using SPSS 23 of poverty FRL and reading scores (see Table 17). There was no significant effect of poverty FRL on reading growth scores, $F(1, 2870) = 0.006$, $p > .05$. Table 14 shows mean reading growth scores for poverty FRL students was 15.83 ± 9.643 (mean ± standard deviation) and for non-poverty FRL students it was 15.80 ± 8.223.

The results of the ANOVA shown in Table 17 provides mean differences in reading growth scores when comparing children in poverty FRL versus non-poverty FRL students.

Table 17. ANOVA of Reading Scores and Poverty FRL.

	Sum of Squares	*df*	Mean Square	*F*	Sig.	R^2
Between Groups	.446	1	.446	.006	.938	.0000021
Within Groups	212364.188	2870	73.994			
Total	212364.635	2871				

Poverty FRL—Math

The researcher ran a test of homogeneity of variances using the Levene test. This test was run using the independent variables of poverty FRL and instrumental music participation and the dependent variable of NWEA MAP math growth scores. In Table 18, examining the independent variable of poverty FRL, it was determined there was significance with $p < .190$ which supports the idea that variances in math growth scores for the two independent variables were similar.

Table 18. Test of Homogeneity of Variances in Math Scores and Poverty FRL.

Levene Statistic	*df*1	*df*2	Sig.
1.716	1	2764	.190

A one-way ANOVA was conducted using SPSS 23 of poverty FRL and math scores (see Table 19). There was a significant effect of poverty FRL on math growth scores, $F(1, 2764) = 56.236$, $p < .001$. Table 15 shows that mean math growth scores for poverty FRL students was 24.04 ± 9.304 (mean ± standard deviation); and for non-poverty FRL students, it was 27.00 ± 9.073.

The ANOVA in Table 19 provides the test for mean differences in math growth scores when comparing children living in poverty FRL to non-poverty FRL students.

Table 19. ANOVA of Math Scores and Poverty FRL.

	Sum of Squares	*df*	Mean Square	*F*	Sig.	R^2
Between Groups	4692.087	1	4692.087	56.236	.000	.01994
Within Groups	230616.892	2764	83.436			
Total	235308.979	2765				

The null hypothesis of "socio-economic status will have no significant effect on student reading and math NWEA MAP test scores" was rejected for the area of math. However, the null hypothesis was not rejected in reading. Poverty FRL had no significant effect on student reading NWEA MAP test scores. Poverty FRL had statistically significant effect on student math NWEA MAP test scores.

Research Question 3

The third question to be answered in this research study was: What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students when economic status interacts with instrumental music participation?

The researcher began by establishing a null hypothesis in relation to this research question: Participation in instrumental music courses and poverty FRL will have no significant effect on student reading and math NWEA MAP test scores.

Music Participation and Poverty FRL—Reading

A two-way ANOVA was conducted using SPSS 23 (see Table 20).

Table 20. Tests of Between-Subjects Effects in Reading.

Tests of Between-Subjects Effects – Dependent Variable, MAP Reading Score					
Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	1357.645[a]	3	452.548	6.151	.000
Intercept	197189.620	1	197189.620	2680.195	.000
Instrumental Music	1059.169	1	1059.169	14.396	.000
Poverty FRL	116.089	1	116.089	1.578	.209
Instrumental Music* Poverty FRL	103.401	1	103.401	1.405	.236
Error	211006.989	2868	73.573		
Total	929691.000	2872			
Corrected Total	212364.635	2871			

[a]R Squared = .006 (adjusted R Squared = .005)

At the $p > .05$ level (.236) there was no significant effect when looking at NWEA MAP reading scores and the interaction of music participation and poverty FRL. But Figure 5 appears to tell a different story.

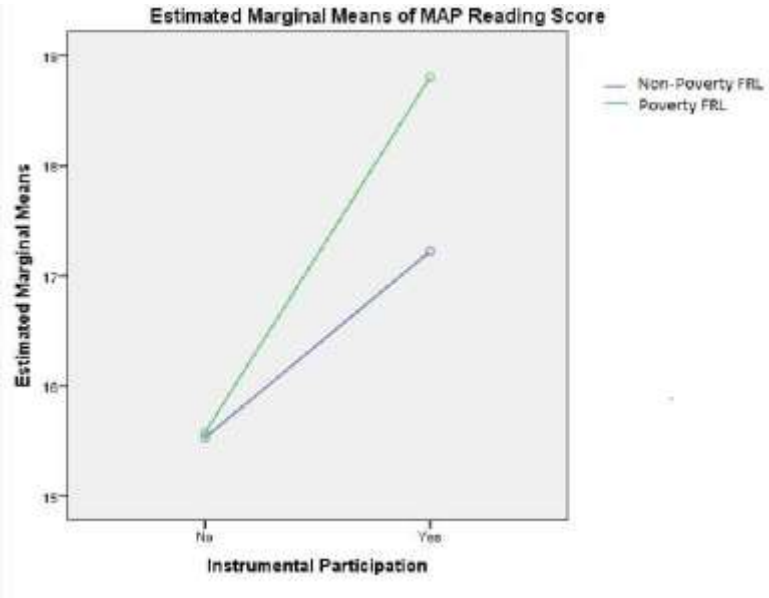

Figure 5. Plot of Estimated Means on Reading.

Estimated means of MAP reading scores for poverty FRL students compared to non-poverty FRL students show higher mean scores for students participating in instrumental music programs than for students not in instrumental programs. Figure 5 does not depict whether or not mean differences are significant, though.

Music Participation and Poverty FRL—Math

A two-way ANOVA was conducted using SPSS 23 (see Table 21). At the $p > .05$ level (.260) there was no significant effect when looking at NWEA MAP reading scores and the interaction of music participation and poverty FRL.

Table 21. Tests of Between-Subjects Effects in Math.

Tests of Between-Subjects Effects – Dependent Variable, MAP Math Score					
Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.
Corrected Model	8720.007[a]	3	2906.669	35.431	.000
Intercept	513022.401	1	513022.401	6253.472	.000
Instrumental Music	2897.687	1	2897.687	35.321	.000
Poverty FRL	752.705	1	752.705	9.175	.002
Instrumental Music* PovertyFRL	104.244	1	104.244	1.271	.260
Error	226588.972	2762	82.038		
Total	2136560.000	2766			
Corrected Total	235308.979	2765			

[a]R Squared + .307 (adjusted R Squared = .036)

The null hypothesis of "participation in instrumental music courses and socioeconomic interaction will have no significant effect on student reading and math NWEA MAP test scores" failed to be rejected. Therefore, participation in instrumental

music courses and socioeconomic interaction had no significant interactive effect on student reading and math NWEA MAP test scores.

Figure 6 shows estimated means of math MAP scores for students in poverty FRL and not in poverty FRL compared to those in music and those not in instrumental music programs.

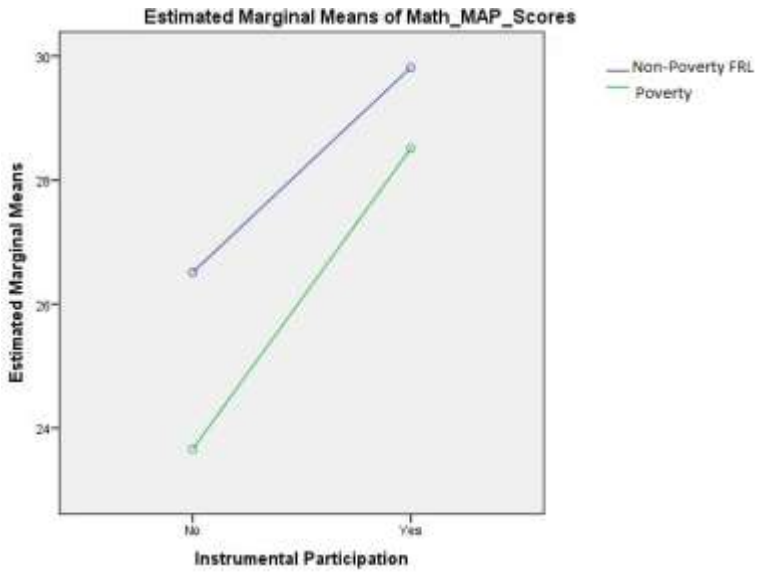

Figure 6. Plot of Estimated Means on Math.

Again, students in both groups – poverty FRL and non-poverty FRL – show higher means on their MAP scores when they participate in instrumental programs than students who do not. But since this is a visual aid with no numbers present, the significance of this difference is not apparent.

Summary

Overall, participation in instrumental music courses had a significant effect on student reading and math NWEA MAP scores. Poverty FRL had no significant effect on student reading NWEA MAP test scores. Poverty FRL had significant effect on student

math NWEA MAP test scores. The interactions of music participation and poverty FRL on reading and math scores were not statistically significant.

Description of the Next Chapter

Chapter V summarizes the findings from Chapter IV. The chapter will also report the importance, meaning, and significance of the study.

CHAPTER V

DISCUSSION

The purpose of this multi-cohort, longitudinal investigation was to determine if participation in instrumental music programs is positively associated with the academic performance of all students when comparing students not living in poverty FRL with the children living in poverty FRL. The study examined the association music participation had on students of a Midwestern school district also living in poverty FRL and provided insight into the connection of the impact that music participation has on students living in poverty FRL.

Research Questions

The following research questions were used to guide the study:

1. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for all students who participated in instrumental music courses versus all students who were not enrolled in instrumental music courses?
2. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students living in poverty FRL versus students not living in poverty FRL?
3. What were the mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for

students when economic status interacts with instrumental music participation?

The research focused on the Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) scores for several reasons. First, using MAP allowed access to all students. Second, it measured the same standards and benchmarks set by the state and federal governments with the adoption of Common Core State Standards (CCSS). Third, it was administered at the same time each year.

One assumption made by the researcher was that academic growth can be measured by one single standardized test. It is understood there are multiple ways academic growth can be measured, and this study looked at one tool.

Chapter V is divided into four sections. These sections include a summary of the findings, conclusions, limitations, and recommendations.

Summary of Findings

The study revealed several important findings. The study focused on students in 6^{th} – 8^{th} grades. In the district used for this study, the students attended middle school where they received several years of instruction in math and reading. The study compared the rate of growth in achievement when instrumental music is taken as a course of study, which is unique when compared to the review of any single academic score which has been done in other research projects. As a practicing educator, the researcher has often heard the continuous debate that exists between music supporters and non-supporters. The debate is similar to the chicken and the egg debate: does music cause academic growth in students or do academically gifted students play music? Again, the

study looks at the academic growth students experienced from sixth through tenth grade in the areas of both reading and math.

Instrumental Music

With the first research question, the researcher sought to determine whether there were mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for all students who participated in instrumental music courses versus all students who were not enrolled in instrumental music courses. The results of the study indicated that students who participated in instrumental music courses did experience more growth in comparative academic achievement during their sixth through tenth grade years when compared to students not participating in music. There was more mean growth in the area of math ($M = 3.89$) when compared to reading ($M = 1.90$), but certainly growth in both areas. This research would reinforce the previous research including Graziano et al. (1999) whose results indicated that students who participated music courses scored 27% higher on proportional math and fractions tests than other children, but again previous research focused on single scores where this work indicated specific academic growth during the years of instrumental music participation.

Statistical Significance

As shared in Chapter IV, there was a statistical significance in the comparative growth in academic achievement of both reading and math when students participated in an instrumental music program.

Practical Importance

When looking at the practical importance of the comparative growth in academic achievement in both reading and math when students participated in an instrumental music program there appears to be less significance. Looking first in the area of math, where students participating in instrumental music programs had a larger mean growth score increase, M = 3.89, with the growth occurring over a 5-year period of time. This translates into students participating in an instrumental music program scored 0.778 points higher as a mean score in math than students not in an instrumental program for each of the 5 years. That can still be recognized as more academic growth in math, but from the perspective of practicing educators, it would not be considered practically significant. NWEA MAP testing indicated average growth, which would be the average of growth for a student in a calendar year, was roughly 2-4 points each year for students scoring like a typical sixth through tenth grade student.

When reviewing the reading data, the study indicated that students participating in instrumental music programs had a larger mean growth score increase, *M* = 1.90, with the growth occurring over a 5-year period of time. This would mean students participating in an instrumental music program scored 0.380 points higher in reading than students not in an instrumental program for each of the 5 years. That can still be recognized as an increase of academic growth in reading and could be considered prtically important with one year of additional academic growth through the participation in an instrumental program

.

Poverty FRL

With the second research question, the researcher sought to determine if there were mean differences in Rausch Unit (RIT) growth rates on Measures of Academic Progress (MAP) test scores in reading and math for students living in poverty FRL versus students not living in poverty FRL. The results of the study produced different outcomes when examining both math and reading data. Students living in poverty FRL had a lower mean growth in the area of math when compared to all other students, with a M = -2.96 growth mean score.

Singh (2015) recently studied the effects of socioeconomic status and academic achievement in Hawaii. Her findings would be similar to the findings in this study and several others, indicating that having a low socioeconomic status has a negative effect on mathematical achievement. Again, this research looks at the opportunity for academic growth for students in Grades 6 - 10.

In the area of reading, the study produced outcomes different than the outcomes in math when comparing the mean scores of students living in poverty FRL and all other students. In fact, the results showed a slightly higher mean growth score (M = .03) for students living in poverty FRL when compared to students not living in poverty FRL. What is important to remember when reviewing these data is the age of the students studied here, which are children in Grades 6 - 10, which in this district would be found at middle school. In middle school and high school, reading is no longer taught in isolation, meaning students are typically not being taught how to read, but rather use reading in other curriculum areas. Math, in comparison, is still taught in isolation with very specific courses offered such as algebra, geometry, etc. These findings would be in contrast to

Skoe et al. (2013) who completed research that concluded that adolescents coming from low-income families have difficulty processing auditory information because of their lack of exposure to language and performed lower on reading and working memory tests. This study examined students in sixth through tenth grades and focused on academic growth indicating the possibility that students living in poverty FRL do not fall further behind in the area of reading during these years and instead start below peers and fall further behind during the elementary years of education.

Statistical Significance

As stated in Chapter IV, there was a statistical significance in the comparative growth of academic achievement in math when students were living in poverty FRL. However, there was no statistical significance in the comparative growth of academic achievement in reading when students were living in poverty FRL.

Practical Importance

Educators at all levels of teaching, along with researchers, believe poverty FRL plays a significant role in learning. When looking at the practical importance of the comparative growth in academic achievement in both reading and math of students living in poverty FRL to students not living in poverty FRL, there is a practical importance. Looking first in the area of math, where students living in poverty FRL had a smaller mean growth score, M = -2.96, with the growth occurring over a 5-year period of time. This would mean students living in poverty FRL scored 0.592 points lower in math than students not living in poverty FRL for each of the 5 years of the study. When reviewing the reading data, we find students living in poverty FRL had roughly the same growth score increase, M = 0.03, as students not living in poverty FRL, with the growth

occurring over a 5-year period of time. This would mean students living in poverty FRL scored almost the same, 0.006 lower in reading, than students not living in poverty FRL for each of the 5 years. Again, educators and research would indicate a different result. These results can be seen as practically important to educators and researchers.

Instrumental Music & Poverty FRL Correlation

Finally, with the third research question the researcher sought to determine if there were mean differences in Rausch Unit (RIT) growth rate on Measures of Academic Progress (MAP) test scores in reading and math for students when economic status interacted with instrumental music participation. Results indicated that participation in instrumental music courses and socioeconomic interaction had no significant interactive effect on student reading and math NWEA MAP test scores.

Conclusions

There was no statistically significant association found when looking at mean differences of poverty FRL students and the participation of students in music programs, which would indicate that students living in poverty FRL do not benefit from music participation more than every student. However, music participation did correlate with academic growth in both math and reading. This proved to be statistically significant, though not practically important, and possibly raises more questions about the impact or association that instrumental music programs have on academic achievement in students. Conducting more research studying the correlation between academic growth and instrumental music participation could raise the question to school districts about increasing total participation in school instrumental programs. The possibility of

conducting a pilot project where students can participate in an instrumental program as a controlled group might provide important insight into this question.

In this study, 86.9% of all students did not participate in an instrumental program during their sixth through tenth grade years. With only 13.1% of the total population participating, the researcher feels the school district, with more research, could be missing out on an effective academic intervention, specifically in math where students in band experienced over twice the growth when compared to reading (3.89 vs. 1.90) as Table 8 and Table 9 showed. Further research could use different tools to measure academic achievement with the understanding that a standardized test is only one measure.

When looking at the second research question in regards to poverty FRL, the researcher noted that poverty FRL had a larger impact on academic achievement growth in math, which was statistically significant as well as practically important. Something noted by the researcher was that the academic growth in reading did not appear impacted by a student's poverty FRL. Understanding the strategies and course offerings in reading and math could provide an opportunity for further research into poverty FRL and reading scores for the middle school student. Both reading and math instruction begins when children enter school. When students begin fourth grade, they typically are no longer learning to read, but instead begin to focus on reading for content and using these skills in all subject areas. In other words, they are reading to understand social studies or science instead of sounding out words and learning the process of reading.

In math, concepts are always building upon one another. In elementary school, students learn basic number relationships, which eventually lead into algebra, geometry, and calculus when entering middle and high school.

This also changes the dynamics of homework assigned to students. Students are not bringing work home to learn how to read; but instead, they might read to understand and complete other work. It is very common for students to bring home specific math homework. So, students are bringing home math homework, not bringing home reading homework. From an educator's experience and the research in Chapter II, students living in poverty FRL will generally experience less parental support in terms of homework. Since reading homework does not exist in its true form, math is the area most affected. From my experience as an educator, students living in poverty FRL do not have parental involvement in math homework or do not have parents with the skills to assist with higher levels of mathematics. This might be something to look at more closely and if studied, might provide more information into the difference in math and reading scores when looking at students living in poverty FRL.

When putting these things together, math being more impacted by music participation and math being more impacted by poverty FRL, school districts would be wise to consider music participation as a math intervention for all children, but specifically students living in poverty FRL.

Implications

The results of the study did indicate a statistical significance on academic achievement in math and reading when students participated in instrumental music programs. Even with no practical importance, the statistical significance would be a

strong indication that more research is needed in this field. The larger question that remains is finding the correct tool to measure the significance of music participation to the growth of the whole child. The finding that a statistical significance exists is enough to cause school districts and parents to strongly consider the academic benefits of music, but it also creates questions concerning the significance of music to students' social and emotional well-being, and growth in other areas not measured on a standardized test. Twenty-first century skills are becoming critical to the success of students and an argument exists that it is these skills most impacted by instrumental music participation and even all the arts and humanities. Also, looking at a standardized test shows some association to academic growth which would be enough for parents to enroll their child in music programs, but consider another layer that might exist. Providing a music education has been linked to growth in soft skills, or 21st century skills such as conflict resolution, communication, and collaboration, and it might be that impact that reflects on a specific area of academic growth that can be measured by standardized tests. Understanding the statistical impact demonstrated in this study coupled with the impact on 21st century soft skills would provide enough reason for parents and school districts to encourage participation in music programs.

Limitations

- The study was conducted in one school district in the Midwestern United States.
- The sample size in regard to students assessed was not large. With a sample of 4,328 students, the research looked at students present for both assessment periods, which was the fall of 6th grade and the spring of 10th

grade. Of those students, the study had a sample size of <50 students who participated in the instrumental program and lived in poverty FRL over the 5 years studied.

- A $p < .05$ value was used to determine statistical significance.

Recommendations

The researcher would like to offer the following recommendations for school districts and educators, as well as for future researchers.

For School Districts and Educators

With a culture of high accountability and the internal desire to do what is best for students, we often fall back on what we know and with which we are comfortable. When looking for reliable math interventions, we tend to fall back to the old standard—more math. Schools are removing electives and replacing them with interventions. This study provides some information indicating the electives being removed, such as band, could actually be used as academic interventions. The study examined a single school district in the Midwest, with a population fairly unique to the region, but as outlined in Chapter III has some similarities to other school districts. The data indicated a slight correlation between math and reading growth and music participation. It also showed a slight correlation between math growth and poverty FRL. When looking at 4,328 students over a 5-year time period, it is important to recognize that 31.0% of the studied population lived in poverty FRL and only 2.2% participated in instrumental music throughout the entire time period. Questions that could be considered by school leaders:

- With an indication that music participation has an impact on academic growth, what opportunities exist in your district for students?

- Could these opportunities include the integration of music in your general education curriculum?
- How many of your students living in poverty FRL are involved in the instrumental music programs?

For Research

Music and all elective courses must continue to be researched. As school districts reduce programs and limit the accessibility to these programs, research must provide evidence to drive school budgets and school leader decisions.

Research must also determine when music and other electives should be offered to students. As indicated in my literature review, there is research discussing the impact music instruction has on young children, but more needs to be done on the impact instrumental music has on students and when music should be offered.

Questions that should be answered through research:

- Should it not be a priority for educators to provide an enjoyable experience for students?
- Can we also offer electives to students because it increases their enjoyment of life?
- Can we determine if quality of life, or joy, will increase a student's academic achievements?

In conclusion, with the correlation between academic growth by comparing mean differences, specifically in math, and participation of students in instrumental music programs, it would beneficial for school districts to reexamine their current academic interventions. Instead of spending additional funds on the latest, greatest academic interventions, it might be best for students and taxpayers to investigate and research the impact programs within the district have on student achievement, including district instrumental music programs and other art opportunities.

This question of quality of life needs to be asked and answered. Educators must also consider their responsibility in offering a well-rounded education. Children of all ages are curious and seek ways in which to express themselves. As educators we want students prepared for our global society, having the skills to communicate and collaborate. It is these skills that are nurtured as they participate in instrumental music programs. Measuring student progress and growth in the areas of communication and collaboration can be challenging and certainly would not be best measured by a standardized test. Recognizing the importance of these skills, finding a reporting system to best share results with policy-makers, and ultimately creating a school system that works for children should be a priority of everyone.

APPENDICES

Appendix A
Permission Letter from School District

Bismarck Public Schools
806 North Washington Street
Bismarck, North Dakota 58501
(701) 323-4000
Fax: (701) 323-4001
www.bismarckschools.org

TAMARA J. USELMAN
SUPERINTENDENT

DR. FRAN A. RODENBURG
ASSISTANT SUPERINTENDENT
ELEMENTARY SCHOOLS

DR. BENJAMIN J. JOHNSON
ASSISTANT SUPERINTENDENT
SECONDARY SCHOOLS

DARIN M. SCHERR, P.E.
BUSINESS AND OPERATIONS MANAGER

LISA J. KUDELKA
HUMAN RESOURCES MANAGER

June 9, 2015

Dear reader:

This letter is written to support Shawn Oban's request for data from Bismarck Public Schools. Mr. Oban is permitted access to the data upon submission of a signed, data confidentiality agreement.

Thank you.

Tamara Uselman, Superintendent

Appendix B
Confidentiality Agreement with School District

Bismarck Public Schools
806 North Washington Street
Bismarck, North Dakota 58501
(701) 323-4000
Fax: (701) 323-4001
www.bismarckschools.org

CONFIDENTIALITY, NON-DISCLOSURE AND NON-USE AGREEMENT

WHEREAS, Bismarck Public School District 08001, Bismarck, ND, USA (hereinafter referred to as "District") owns and/or is responsible for certain "Not Public" school data that it has generated, collected, or otherwise obtained in electronic form, hereafter called "DATA"; and

WHEREAS, the District has agreed to participate in the INSTRUMENTAL MUSIC PARTICIPATION AND THE EFFECTS ON ACADEMIC PERFORMANCE FOR STUDENTS IN POVERTY STUDY (hereinafter referred to as *Music and Poverty Study*); and

WHEREAS, *Shawn Oban (3815 Neptune Circle Bismarck, North Dakota)* (hereinafter referred to as "Vendor") has requested access to data for purposes of conducting the INSTRUMENTAL MUSIC PARTICIPATION AND THE EFFECTS ON ACADEMIC PERFORMANCE FOR STUDENTS IN POVERTY STUDY and

WHEREAS, pursuant to the *INSTRUMENTAL MUSIC PARTICIPATION AND THE EFFECTS ON ACADEMIC PERFORMANCE FOR STUDENTS IN POVERTY STUDY* the District will share private educational data (primary student data); and

NOW, THEREFORE, in consideration of the following promises by Vendor, the District agrees to provide certain data to be used for its testing and evaluation of the *INSTRUMENTAL MUSIC PARTICIPATION AND THE EFFECTS ON ACADEMIC PERFORMANCE FOR STUDENTS IN POVERTY STUDY*

1. Vendor acknowledges that DATA provided by the District are considered "not public" (confidential and/or private) by federal law and/or state statute.

2. The Vendor promises to maintain DATA, received from the District, according to the statutory provisions applicable to the DATA.

   a. The Vendor promises that DATA supplied by the District will not be used in any other way or for any other purpose than expressly stated herein.

   b. The Vendor promises not to convey, copy, transfer, or otherwise disclose in any manner, DATA to any individual or entity without proper prior written authorization from the District.

   c. The Vendor promises that it will be bound by and will follow the terms and conditions of this Agreement after completion of the task for which the Contractor has acquired access to DATA.

d. The Vendor promises that the original and all copies of DATA will be returned to the District or destroyed in such a manner that they cannot be read, executed, viewed or in anyway accessed when 1) the Vendor has completed the task as defined herein for which the Vendor has acquired access to DATA, or 2) at any time upon written request by the District; whichever event occurs first. If the Vendor destroys the DATA, the Vendor promises to promptly provide a written statement certifying to the District the complete and proper destruction of DATA.

e. Vendor agrees to indemnify and hold harmless the District from any and all claims relating to state and federal data practices violations or claims of breach of privacy resulting from Vendors breach of its covenants and promises set forth in this agreement.

3. It is understood and agreed that the entire Agreement of the parties is contained herein (and as amended as provided herein) and this Agreement supersedes all oral agreements and negotiations between the parties relating to the subject matter hereof, as well as any previous agreements presently in effect between the parties or any third parties relating to the subject matter hereof. Any alterations, amendments, deletions or waivers of the provisions of this Agreement shall be valid only when expressed in writing and duly signed by the authorized representatives of the parties.

4. The Vendor and the District acknowledge that they have read this Agreement, understand it and agree to be bound by all of the terms and conditions contained herein; and further agree that this Agreement is the complete and exclusive agreement between the Vendor and District in this matter.

5. By signing this agreement, the signers are representing and warranting to both organizations that they have the authority to enter into this Agreement on behalf of their organizations. Both parties have obtained all authorizations and consents necessary. This signed agreement represents a valid and binding obligation of the Vendor and the District.

By: Shawn Oban

Shawn Oban

Date June 9th, 2015

By:

Bismarck Public School District 08001

Date June 9, 2015

Appendix C
IRB Approval

UNIVERSITY OF NORTH DAKOTA

DIVISION OF RESEARCH & ECONOMIC DEVELOPMENT

UND.edu

Institutional Review Board
Twamley Hall, Room 106
264 Centennial Dr Stop 7134
Grand Forks, ND 58202-7134
Phone: 701.777.4279
Fax: 701.777.6708

June 30, 2015

Principal Investigators:	Shawn Oban
Project Title:	Instrumental Music Participation and the Effects on Academic Performance for Students in Poverty
IRB Project Number:	IRB-201506-384
Project Review Level:	Exempt 4
Date of IRB Approval:	06/30/2015
Expiration Date of This Approval:	06/29/2018

The application form and all included documentation for the above-referenced project have been reviewed and approved via the procedures of the University of North Dakota Institutional Review Board.

If you need to make changes to your research, you must submit a Protocol Change Request Form to the IRB for approval. No changes to approved research may take place without prior IRB approval.

This project has been approved for 3 years, as permitted by UND IRB policies for exempt research. You have approval for this project through the above-listed expiration date. When this research is completed, please submit a Termination Form to the IRB.

The forms to assist you in filing your project termination, adverse event/unanticipated problem, protocol change, etc. may be accessed on the IRB website: http://und.edu/research/resources/human-subjects/

Sincerely,

Michelle L. Bowles, M.P.A., CIP
IRB Coordinator

MLB/jle

Cc: Gary Schnellert, Ph.D.

REFERENCES

Alexander, K., & Alexander, M. D. (2012). *American public school law* (8th ed.). Belmont: Wadsworth.

An, S. A., & Tillman, D. A. (2015). Music activities as a meaningful context for teaching elementary students mathematics: A quasi-experiment time series design with random assigned control group. *European Journal of Science and Mathematics Education*, *3*(1), 45-60. Retrieved from http://scimath.net/articles/31/314.pdf

At-risk. (2011). In the *American Heritage® Dictionary of the English Language* (5th ed.). Published by Houghton Mifflin Harcourt Publishing Company. Retrieved from http://www.thefreedictionary.com/at-risk

Babo, G. D. (2004, June). The relationship between music participation and standardized assessment achievement of middle school students. *Research Studies in Music Education*, *22*(1), 14-27. Retrieved from http://rsm.sagepub.com/content/22/1/14.full.pdf

Baker, R. A. (2012). The effects of high stakes testing policy on arts education. *Art Education Policy Review*, *113*(1), 17-25. Retrieved from http://www.tandfonline.com/doi/pdf/10.1080/10632913.2012.626384#.VcuoeflViko

Barrett, M. S., & Baker, J. S. (2012, August). Developing learning identities in and through music: A case study of the outcomes of a music programme in an Australian juvenile detention centre. *International Journal of Music Education, 30*(3), 244-259. Retrieved from http://ijm.sagepub.com/content/30/3/244.full.pdf

Bates, V. C. (2012, June). Social class and school music. *Music Educators Journal, 98*(4), 33-37. Retrieved from http://mej.sagepub.com/content/98/4/33.full.pdf

Beveridge, T. (2010). No Child Left Behind and fine arts classes. *Arts Education Policy Review, 111*(1), 4-7. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/10632910903228090?journalCode=vaep20#.VcupwvlViko

Bismarck Public Schools. (2014). *About us*. Retrieved from http://www.bismarckschools.org/district/about/

Brothers, L., & Shaw, G. L. (1989). The role of accurate timing in human performance and the code for higher cortical function. In R. M. J. Cotterill (Ed.), *Models of brain function* (pp. 285-292). Cambridge: Cambridge University Press.

Brown, E. D., & Sax, K. L. (2012). Arts enrichment and preschool emotions for low-income children at-risk. *Early Childhood Research Quarterly, 28*(2), 337-346. Retrieved from http://www.sciencedirect.com/science/journal/08852006/28/2

Bugaj, K., & Brenner, B. (2011, Summer). The effects of music instruction on cognitive development and reading skills – An overview. *Bulletin of the Council for Research in Music Education, 189*, 89-104. Retrieved from http://bcrme.press.illinois.edu/189/bugaj.html

Catterall, J. S. (1998). Involvement in the arts and success in secondary school. In R. J. Deasy (Ed.), *Critical links: Learning in the arts and student academic and social development* (pp. 68-69) [Collected works published in 2002]. Washington, DC: Arts Education Partnership.

Catterall, J. S., Chapleau, R., & Iwanaga, J. (1999, September). *Involvement in the arts and human development: General involvement and intensive involvement in music and theater arts.* Los Angeles, CA: The University of California at Los Angeles, The Imagination Project at UCLA Graduate School of Education & Information Studies.

Catterall, J. S., Dumais, S. A., & Hampden-Thompson, G. (2012). *The arts and achievement in at-risk youth: Findings from four longitudinal studies*. Washington, DC: National Endowment for the Arts.

Cavanaugh, J. P. (1998, February). Arithmetic of the soul. *Johns Hopkins Magazine*, *9*, 34-56. Retrieved from http://pages.jh.edu/~jhumag/0298web/math.html

Center on Education Policy. (2007, July 25). *As the majority of school districts spend more time on reading and math, many cut time in other areas* [News release]. Retrieved from www.cep-dc.org/cfcontent_file.cfm?Attachment=PressRelease%5FCurricAndInstruction%5F072407%2Epdf

Center on Education Policy, The. (2015). *About the Center on Education Policy*. Retrieved from http://www.cep-dc.org/page.cfm?FloatingPageID=8

Cogo-Moreira, H., de Ávila, C. R. B., Ploubidis, G. B., & Mari, J. d. J. (2013, March 27). Effectiveness of music education for the improvement of reading skills and academic achievement in young poor readers: A pragmatic cluster-randomized, controlled clinical trial..*PLoS ONE 8*(3), 1-8. Retrieved from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0059984

College Board, The. (2006). *2006 college-bound seniors: Total group profile report.* New York, NY: National Merit Scholarship Corporation. Retrieved from http://www.collegeboard.com/prod_downloads/about/news_info/cbsenior/yr2006/national-report.pdf

Cowan, C., Hauser, R., Kominski, R., Levin, H., Lucas, S., Morgan, S., & Chapman, C. (2012). *Improving the measurement of socioeconomic status for the national assessment of educational progress: A theoretical foundation.* Washington, DC: National Center for Educational Statistics.

Dee, T. S., & Jacob, B. A. (2010, Fall). *The impact of No Child Left Behind on students, teachers, and schools*. Brookings Papers on Economic Activity, 149-194. Retrieved from: http://www.brookings.edu/~/media/projects/bpea/fall%202010/2010b_bpea_dee.pdf

Elpus, K. (2013, July). Is it the music or is it selection bias? A nationwide analysis of music and non-music students' SAT scores. *Journal of Research in Music Education, 61,* 175-194. Retrieved from http://jrm.sagepub.com/content/early/2013/05/17/0022429413485601.full.pdf+html

Elpus, K., & Abril, C. R. (2011, July). High school music ensemble students in the United States: A demographic profile. *Journal of Research in Music Education, 59(2)*, 128-145. Retrieved from http://jrm.sagepub.com/content/59/2/128.short

Fargo Public Schools. (2015a, October 4). *2014-2015 operating budget*. Retrieved from Fargo Public Schools: http://www.fargo.k12.nd.us/education/page/download.php?fileinfo=MjAxNC0xNV9GaW5hbF9CdWRnZXQucGRmOjo6L3d3dzYvc2Nob29scy9uZC9mYXJnby9pbWFnZXMvZG9jbWdyLzM2MTRmaWxlMzU3NTkucGRm&sectiondetailid=4421

Fargo Public Schools (2015b, October 4). *District profile*. Retrieved from Fargo Public Schools: http://www.fargo.k12.nd.us/education/page/download.php?fileinfo=ZnBzX1Byb2ZpbGVfMjAxMS5wZGY6Ojovd3d3Ni9zY2hvb2xzL25kL2ZhcmdvL2ltYWdlcy9kb2NtZ3IvQUxMZmlsZTMyMzQ4LnBkZg==&sectiondetailid=4421

Ferragina, E., Tomlinson, M., & Walker, R. (2013). *Poverty, participation, and choice: The legacy of Peter Townsend.* York, UK: Joseph Rowntree Foundation.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Fitzpatrick, K. R. (2006, Spring). The effect of instrumental music participation and socioeconomic status on Ohio fourth-, sixth-, and ninth-grade proficiency test performance. *Journal of Research in Music Education*, *54*(1), 73-84. Retrieved from http://jrm.sagepub.com/content/54/1/73.abstract

Flohr, J. W., Miller, D. C., & DeBeus, R. (2000). EEG studies with young children. *Music Educators Journal*, *87*(2), 28-32. Retrieved from https://scholar.google.com/citations?view_op=view_citation&hl=en&user=wb7y9sEAAAAJ&citation_for_view=wb7y9sEAAAAJ:2osOgNQ5qMEC

Forgeard, M., Winner, E., Norton, A., & Schlaug, G. (2008, October 29). Practicing a musical instrument in childhood is associated with enhanced verbal ability and nonverbal reasoning. *PLoS ONE*, *3*(10), 1-8. Retrieved from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0003566

Ganesh, G., Takagi, A., Osu, R., Yoshioka, T., Kawato, M., & Burdet, E. (2014, January 23). Two is better than one: Physical interactions improve motor performance in humans. *Scientific Reports*, *4*, 1-8. Retrieved from http://www.cns.atr.jp/~kawato/Ppdf/srep03824.pdf

Gardiner, M. F., Fox, A., Knowles, F., & Jeffrey, D. (1996, May 23). Learning improved by arts training. *Nature*, *381*, 284. doi: 10.1038/381284a0

Goldberg, M. (2005, March). Losing students to high-stakes testing. *Education Digest*, *70*(7), 10-19. Retrieved from http://eric.ed.gov/?id=EJ741274

Graziano, A. B., Peterson, M., & Shaw, G. L. (1999, March). Enhanced learning of proportional math through music training and spatial-temporal training. *Neurological Research*, *21*(2), 139-152. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10100200

Groen, M. (2012). NCLB--The educational accountability paradigm in historical perspective. *American Educational History Journal*, *39*(1&2), 1-14.

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), 270-289. Retrieved from http://ijm.sagepub.com/content/28/3/269.abstract)UK

Helmrich, B. H. (2010). Window of opportunity? Adolescence, music, and algebra. *Journal of Adolescent Research*, *25*(4), 557-577. Retrieved from http://berkscountymusicboosters.wikispaces.com/file/view/Window+of+Opp.pdf

Heyworth, J. (2013). Developing social skills through music: The impact of general classroom music in an Australian lower socio-economic area primary school. *Childhood Education*, *89*(4), 234-242. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/00094056.2013.815553#.VcvDGPlViko

Hille, K., Gust, K., Bitz, U., & Kammer, T. (2011). Associations between music education, intelligence, and spelling ability in elementary school. *Advances in Cognitive Psychology, 7*, 1-6. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/21614212

Ho, Y.-C., Cheung, M.-C., & Chan, A. S. (2003, July). Music training improves verbal but not visual memory: Cross-sectional and longitudinal explorations in children. N*europsychology, 17(3),* 439-450. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12959510

Hoffman, A. R. (2013, September). Compelling questions about music, education, and socioeconomic status. *Music Educators Journal*, *100(*1), 63-68. Retrieved from http://mej.sagepub.com/content/100/1/63.short?rss=1&ssource=mfr

Hollingworth, L. (2009, Winter). Unintended educational and social consequences of the No Child Left Behind Act. *The Journal of Gender, Race, and Justice, 12*, 311-327. Retrieved by https://litigation-essentials.lexisnexis.com/webcd/app?action=DocumentDisplay&crawlid=1&srctype=smi&srcid=3B15&doctype=cite&docid=12+J.+Gender+Race+%26+Just.+311&key=66d1a181159c1d37addea0c882b8bdc7

H. R. 266, 106th Congress (2000). Retrieved from govtrack.us Web site: https://www.govtrack.us/congress/bills/106/hconres266/text#

Jiang, Y., Ekono, M., & Skinner, C. (2015, January). *Basic facts about low-income children: Children 12 through 17 years, 2013*. New York: National Center for Children in Poverty, Mailman School of Public Health, Columbia University. Retrieved from National Center for Children in Poverty Web site: http://www.nccp.org/publications/pdf/text_1099.pdf

Johnson, B. L. (2004, January). A sound education for all: Multicultural issues in music education. *Educational Policy, 18(1),* 116-141. Retrieved from http://epx.sagepub.com/content/18/1/116.abstract

Judson, E. (2013). The relationship between time allocated for science in elementary schools and state accountability policies. *Science Education*, *97*(4), 621-636. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/sce.21058/full

Kay, K., & Greenhill, V. (2013). *The leader's guide to 21st century education.* Upper Saddle River, NJ: Pearson Education.

Kelstrom, J. M. (1998, April). The untapped power of music: Its role in the curriculum and its effect on academic achievement. *NASSP Bulletin*, *82*(597), 34-43. Retrieved from http://bul.sagepub.com/content/82/597/34

Kokotsaki, D., & Hallam, S. (2011). The perceived benefits of participative music making for non-music university students: A comparison with music students. *Music Education Research*, *13*(2), 149-172. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/14613808.2011.577768#.VcvGQflViko

Kraus, N., Hornickel, J., Strait, D. L., Slater, J., & Thompson, E. (2014, December 16). Engagement in community music classes sparks neuroplasticity and language development in children from disadvantaged backgrounds. *Frontiers in Psychology*, *5*(Article 1403), *1-9*. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/25566109

Kraus, N., Slater, J., Thompson, E. C., Hornickel, J., Strait, D. L., Nicol, T., & White-Schwoch, T. (2014). Music enrichment programs improve the neural encoding of speech in at-risk children. *The Journal of Neuroscience, 34(36)*, 11913-11918. Retrieved from http://www.jneurosci.org/content/34/36/11913.full

Kraus, N., & Strait, D. L. (2015, March). Emergence of biological markers of musicianship with school-based music instruction. *The Neurosciences and Music V: Annals of the New York Academy of Sciences, 1337*, 163-169. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/25773631

Leng, X., Shaw, G. L., & Wright, E. (1990). Music composition and model of cortex. *The Journal of the Acoustical Society of America, 87*(1), S19. Retrieved from http://scitation.aip.org/content/asa/journal/jasa/87/S1/10.1121/1.2028113

Lobo, Y. B., & Winsler, A. (2006). The effects of a creative dance and movement program on the social competence of head start preschools. *Social Development, 15*(3), 501-519. Retrieved from http://www.artsedsearch.org/summaries/the-effects-of-a-creative-dance-and-movement-program-on-the-social-competence-of-head-start-preschoolers

Lubbock, S. J. (1895). *The use of life.* London: MacMillan and Co.

McAnally, E. A. (2013, April). General music and children living in poverty. *General Music Today, 26*(3), 25-31. Retrieved from http://gmt.sagepub.com/content/26/3/25.short

McMurrer, J. (2007). *NCLB Year 5: Choices, changes, and challenges: Curriculum and instruction in the NCLB era.* Washington, DC: Center of Educational Policy.

Johnson, C. M., & Memmott, J. E. (2006, Winter). Examination of relationships between participation in school music programs of differing quality and standardized test results. *Journal of Research in Music Education, 54*(4), 293-307. Retrieved from http://jrm.sagepub.com/content/54/4/293.short

Merzenich, M., Nahum, M., & Van Vleet, T. (2013). *Changing brains.* Burlington, MA: Academic Press.

Mishook, J. J., & Kornhaber, M. L. (2006, March/April). Arts integration in an era of accountability. *Arts Integration Policy Review*, *107*(4), 3-11. Retrieved from http://ducktowna.wikispaces.com/file/view/arts+integration+in+an+era+of+accountability.pdf

Mundell, E. J. (2004, July 15). Sorry, kids, piano lessons make you smarter. *Forbes.* Retrieved from http://www.forbes.com/2004/07/15/cx_0715health.html

National Center for Education Statistics. (2010). *Arts education in public elementary and secondary schools 1999-2000 and 2009-2010.* Washington, DC: U.S. Department of Education. Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2012014rev

National Commission on Excellence in Education, The. (1983, April). *A nation at risk: The imperative for educational reform.* Washington, DC: U.S. Government Printing Office. Retrieved from http://www2.ed.gov/pubs/NatAtRisk/index.html

Northwest Evaluation Association. (2015a). *About NWEA.* Retrieved from https://www.nwea.org/about/

Northwest Evaluation Association. (2015b). *The RIT scale*. Retrieved from https://legacysupport.nwea.org/support/article/532

Osborne, M. S., McPherson, G. E., Faulkner, R., Davidson, J. W., & Barrett, M. S. (2015). Exploring the academic and psychosocial impact of El Sistema-inspired music programs within two low socio-economic schools. *Music Education Research*, 1-20. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/14613808.2015.1056130

Rogers, R. (2006, May 29). Music really adds up. *San Bernardino County Sun*. Retrieved from https://www.highbeam.com/doc/1P2-12257254.html

PR Newswire. (2002, July 12). *The Royal Institution presents new research at first public conference on 'The Musical Brain'* [Press release]. Retrieved from http://www.prnewswire.com/news-releases/the-royal-institution-presents-new-research-at-first-public-conference-on-the-musical-brain-76168512.html

Respress, T., & Lutfi, G. (2006, Spring). Whole brain learning: The fine arts with students at-risk. *Reclaiming Children and Youth*, *15*(1), 24-31.

Rickard, N. S., Bambrick, C. J., & Gill, A. (2012, February). Absence of widespread psychosocial and cognitive effects of school based music instruction in 10-13 year old students. *International Journal of Music Education*, *30*(1), 57-78. Retrieved from http://ijm.sagepub.com/content/30/1/57.refs

Rose, L. C., & Gallup, A. M. (2006). The 38th annual Phi Delta Kappa/Gallup poll of the public's attitudes toward the public schools. *Phi Delta Kappan*, *88(1)*, 41-53. Retrieved from https://larrycuban.files.wordpress.com/2012/10/k0609pol.pdf

Rose, D. S., & Magnotta, M. (2012). Succeeding with high-risk k-3 populations using arts-based reading instruction: A longitudinal study. *The Journal of Educational Research*, *105*(6), 416-430. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/00220671.2011.638679#.VcvKJPlViko

Scheib, J. W. (2004). Why band directors leave: From the mouths of maestros. *Music Educators Journal*, *91*(1), 53-57. Retrieved from http://eric.ed.gov/?id=EJ705813

Schellenberg, E. G. (2004). Music lessons enhance IQ. *Psychological Science*, *15*(8), 511-514. Retrieved from https://www.psychologicalscience.org/pdf/ps/musiciq.pdf

Schellenberg, E. G. (2006). Long-term positive associations between music lessons and IQ. *Journal of Educational Psychology*, *98*(2), 457-468. Retrieved from http://psycnet.apa.org/psycinfo/2006-06234-014

Schlaug, G., Forgeard, M., Zhu, L., Norton, A., Norton, A., & Winner, E. (2009, July). Training-induced neuroplasticity in young children. *The Neurosciences and Music III: Disorders and Plasticity: Annals of the New York Academy of Sciences*, *1169*, 205–208. Retrieved from http://www.musicianbrain.com/papers/Schlaug_CorpusCallosum_Children_Music_nyas_04842.pdf

Schuler, S. C. (2012). Music education for life: Core music education—Students' civil rights. *Music Educators Journal*, *98*(4), 7-11. Retrieved from http://eric.ed.gov/?id=EJ971390

Shields, C. (2001). Music education and mentoring as interventions for at-risk urban adolescents: Their self-perceptions, opinions, and attitudes. *Journal of Research in Music Education*, *49*(3), 273-286. Retrieved from http://www.artsedsearch.org/summaries/music-education-and-mentoring-as-intervention-for-at-risk-urban-adolescents-their-self-perceptions-opinions-and-attitudes

Singh, M. (2015). Influence of socioeconomic disadvantages on mathematics achievement: A multilevel cohort analysis. *The Journal of Educational Research, 108*(5), 347-357. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/00220671.2014.899956?journalCode=vjer20#.VcwOI_lViko

Sioux Falls School District. (2015a, October 4). *2013-14 Data Profile*. Retrieved from Sioux Falls School District Web site: https://www.google.com/url?q=https://www.sf.k12.sd.us/index.php%3Foption%3Dcom_rokdownloads%26view%3Dfile%26task%3Ddownload%26id%3D3718&sa=U&ved=0CBcQFjAJahUKEwjtlKvLlKrIAhUD1YAKHd3LA8s&client=internal-uds-cse&usg=AFQjCNHU-Yrms8C1wRDfe2HelcqT8CISPg

Sioux Falls School District. (2015b, October 14). *2014-15 Budget Book*. Retrieved from Sioux Falls School District: http://www.sf.k12.sd.us/index.php?option=com_rokdownloads&view=file&task=download&id=7433

Skoe, E., & Kraus, N. (2012, August 22). A little goes a long way: How the adult brain is shaped by musical training in childhood. *The Journal of Neuroscience, 32*(34), 11507-11510.

Skoe, E., Krizman, J., & Kraus, N. (2013, October 30). The impoverished brain: Disparities in maternal education affect the neural response to sound. *The Journal of Neuroscience, 33*(44), 17221-17231. Retrieved from http://www.brainvolts.northwestern.edu/documents/Skoe_Krizman_Kraus_JoN_2013.pdf

Slater, J., Tierney, A., & Kraus, N. (2013, October 10). At-risk elementary school children with one year of classroom music instruction are better at keeping a beat. *PLoS ONE, 8(10),* 1-9. Retrieved from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0077250

Slater, J., Strait, D. L., Skoe, E., O'Connell, S., Thompson, E., & Kraus, N. (2014, November 19). Longitudinal effects of group music instruction on literacy skills in low-income children. *PLoS ONE*, *9*(11), 1-9. Retrieved from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0113383

Southgate, D. E., & Roscigno, V. J. (2009, March). The impact of music on childhood and adolescent achievement. *Social Science Quarterly, 90(1),* 4-21. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6237.2009.00598.x/abstract

Spohn, C. (2008). Teacher perspectives on No Child Left Behind and arts education: A case study. *Arts Education Policy Review*, *109(4),* 3-11. Retrieved from http://www.tandfonline.com/doi/abs/10.3200/AEPR.109.4.3-12

Standley, J. M. (2008, November). Does music instruction help children learn to read? Evidence of a meta-analysis. *Update: Applications of Research in Music Education*, *27*(1), 17-32. Retrieved from http://upd.sagepub.com/content/27/1/17.short

Kena, G., Musu-Gillette, L., Robinson, J., Wang, X., Rathbun, A., Zhang, J., . . . Dunlop Velez, E.. (2015, May). Racial/ethnic enrollment in public schools. In *The condition of education 2015* (NCES 2015-144; pp. 80-82). Retrieved from National Center for Educational Statistics Web site: http://nces.ed.gov/pubs2015/2015144.pdf

Strait, D. L., O'Connell, S., Parbery-Clark, A., & Kraus, N. (2014, September). Musicians' enhanced neural differentiation of speech sounds arises early in life: Developmental evidence from ages 3 to 30. *Cerebral Cortex*, *24*(9), 2512-2521. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/23599166

Thornton, L. (2013). A comparison of state assessment scores between music and non-music students. *Applications of Research in Music Education*, *32*(1), 5-11.

Tierney, A., & Kraus, N. (2013). The ability to move to a beat is linked to the consistency of neutral responses to sound. *The Journal of Neuroscience*, *33*(38), 14981-14988. Retrieved from http://www.jneurosci.org/content/33/38/14981.short

Tierney, A., Krizman, J., Skoe, E., Johnston, K., & Kraus, N. (2013, December 6). High school music classes enhance the neural processing of speech. *Frontiers in Psychology*, *4*, 1-7. Retrieved from http://journal.frontiersin.org/article/10.3389/fpsyg.2013.00855/abstract

United States Census Bureau. (n.d.). *Poverty definition*. Retrieved from www.census.gov/cps/about/cpsdef.html

United States Department of Agriculture. (2013, September). *National school lunch program.* Retrieved from http://www.fns.usda.gov/sites/default/files/NSLPFactSheet.pdf

United States Department of Agriculture. (2015, September 9). *National school lunch program (NSLP)*. Retrieved from http://www.fns.usda.gov/nslp/national-school-lunch-program-nslp

United States Government Accountability Office. (2009, February). *Access to arts education* (GAO-09-286). Retrieved from http://www.gao.gov/new.items/d09286.pdf

Vasquez Heilig, J., Cole, H., & Aguilar, A. (2010). From Dewey to No Child Left Behind: The evolution and devolution of public arts education. *Arts Education Policy Review, 111(*4), 136-145. Retrieved from http://cloakinginequity.com/2012/07/30/from-dewey-to-no-child-left-behind-the-evolution-and-devolution-of-public-arts-education/

Woodruff Carr, K., White-Schwoch, T., Tierney, A. T., Strait, D. L., & Kraus, N. (2014). Beat synchronization predicts neural speech encoding and reading readiness in preschoolers. *PNAS, 111*(40), 1-6. Retrieved from http://www.brainvolts.northwestern.edu/documents/PNAS-2014-Woodruff%20Carr-1406219111.pdf

Young, L. N., Cordes, S., & Winner, E. (2014). Arts involvement predicts academic achievement only when the child has a musical instrument. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *34*(7), 849-861. doi: 10.1080/01443410.2013.785477