Using Instrumental Music to Improve 8th Grade Mathematics Achievement Scores

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A Special Project

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FACULTY APPROVAL

Using Instrumental Music to Improve 8th Grade Mathematics

Achievement Scores

Approved for the Faculty

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ABSTRACT

The purpose of the project was to see if there was a connection between music and mathematics achievement. MAP scores were gathered from fall of 2007 and fall of 2009 from both music and non-music students. These scores were then analyzed using *t*-scores. The results of the study concluded that there was no connection. The recommendation was to redo the study in a suburban school district to test for reliability.

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CHAPTER 1

Introduction

Background for the Project

The first official attempt at reform in Washington State was the 1993 Education Reform Act (ESHB 1209). The Education Reform Act had several parts: one part was to establish a statewide technology plan. Another part of the plan was to shift the education emphasis from seat time to state learning goals. The goals included critical thinking and problem solving, communication, lifelong learning, integration of academic and vocational experiences, school-to-work transition, and performance-based assessment (Washington State Technology Plan for K-12 Common Schools, 2009).

In 2001, The Elementary and Secondary Education Act was reauthorized and renamed the No Child Left Behind Act. The No Child Left Behind Act was the federal government's attempt at standards based education. Standards based education was the idea that students measure their learning to pre-established,

measureable objectives. The writers of the law believed if there were high standards and established measurable goals, individual student's results would improve. Part of the act was for the states to set standards. Each state was authorized to assess student learning on a yearly basis. Schools were required to have students at a level of proficiency by 2014. To do that, each year schools made a percentage growth toward that target. The percentage of growth was called Adequate Yearly Progress.

As a result of the yearly assessment, schools were held accountable for student learning. Each school was held to a proficient standard level of learning. Each year after that, schools were to improve 10% in order to make the Adequate Yearly Progress objective. If the school did not make Adequate Yearly Progress for two consecutive years, then Title I schools could apply to start in the school improvement process.

The school improvement process indicated the school in question was not doing the job of educating students. The first step of school improvement was "a set of structured interventions designed to help a school identify, analyze, and

address issues that prevent student academic success" (LEA and school improvement: non-regulatory guidance, 2006, 15). The school improvement process helped struggling schools design a plan to improve student achievement.

As a result, there was a great deal of emphasis placed on the core subjects of reading, writing and mathematics. Therefore, subjects such as physical education, art, and music were left behind. Since music and other subjects were being de-emphasized, students were in core subjects for longer periods of time and with an intensely focused systematic approach to the core curriculum subjects. For a number of students, this additional time was not a good choice. According to Whelan, "Struggling students would receive double periods of reading and math, sometimes both—sometimes missing certain subjects altogether" (Whelan, 2006, 17). Students tended to excel in the electives, and at times electives such as music, physical education, art, and industrial arts were the key motivational factors for students attending school.

Statement of the Problem

Mathematic test scores in this rural middle school were consistently low. Scores should improve to show that students were learning. Since the scores in this middle school were low, students were not eligible for electives. Because students were not eligible for electives, the smaller numbers of students able to take electives became problematic for the teachers as well for the small number of middle school students in the program, sometimes resulting in the elimination of elective classes.

Purpose of the Project

The purpose of the project was to show a correlation between students studying music and mathematic assessment scores as compared with non-music peers. Therefore, being in music helped improve math scores.

Delimitations

The project was used at a middle-school in a small town in Central Washington. The middle school had 496 students with a 77.8% Hispanic population and a 20.4% Caucasian population.

The free and reduced lunch rate was 77.4%, with 6.3% special education, 23% transitional bilingual, and 16.1% migrant. There were 32 teachers and 40.6% had a Masters degree. The staff had an average of 7.3 years of teaching experience. There were 7.1% teaching with an emergency certificate, and 87% of the teachers were highly qualified by the No Child Left Behind Act (Office of Superintendent of Public Instruction, 2009).

Assumptions

The author made several assumptions during the study. The first assumption was the students had music instruction at the correct cognitive level. The second assumption was the instructor was competent in the subject taught. The final assumption was that the Measures of Academic Progress test was scored in a fair and unbiased manner.

Hypothesis

Eighth grade students in music will make greater than expected progress on the Mathematic Measures of Academic Progress from the 6th grade scores than the 8th grade students

not in music from the 6th grade scores as measured by pre and post tests of the Mathematic Measures of Academic Progress.

Null Hypothesis

Eighth grade students in music will not make greater than expected progress on the Mathematic Measures of Academic Progress from 6th grade scores than the 8th grade students not in music from the 6th grade scores as measured by pre and post tests of the Mathematic Measures of Academic Progress at a .05 level of significance.

Significance of the Project

The project was significant because if music was able to help students improve mathematics scores, then teachers encouraged students to enroll in instrumental music. Students who scored low in mathematics and reading often performed well in elective courses. Occasionally, music electives were the only reasons students stayed in school. The project could help music instructors prove the worth of the music program relative to the curriculum of a school.

The project gave some insight on how to teach mathematics so all learners could achieve in mathematics. Multiple intelligences by Gardner were used so students having a difficult time with mathematics could understand the material by using examples from music.

Procedures

The procedure followed was to arrange a random sample of 8th grade students enrolled in music. The music sample was to be compared with a random sample of 8th grade students not enrolled in music over the time enrolled at the middle school. The researcher pulled 6th grade scores on the Measures of Academic Progress (MAP) mathematics assessment to see if there was greater than expected growth in the music group students as compared with the non-music group students.

Definition of Terms

adequate yearly progress. A measurement defined by the No Child Left Behind Act that allows the federal department of education to determine how every public school is performing academically according to results on standardized tests.

measures of academic progress. A computerized assessment of student learning that is using both status and growth scores.

music student. A student currently enrolled in instrumental music during the academic year of the study.

non-music student. A student not enrolled in any music classes during the academic year of the study.

no child left behind. Federal legislation enacting the theories of standards-based education.

Standards based education. The belief that setting high standards and establishing measurable goals will improve education.

Acronyms

AYP. Adequate Yearly Progress

ESEA. Elementary and Secondary Education Act

MAP. Measures of Academic Progress

NCLB. No Child Left Behind

LAP. Learning Assistance Program

CHAPTER 2

Review of Selected Literature

Introduction

The author chose to review literature about music and the effects on the brain. The literature included the Mozart effect, and how music was perceived in other countries. The author also reviewed the literature about Measures of Academic Progress testing and how the tests were relevant to this project.

No Child Left Behind (NCLB)

No Child Left Behind was the landmark education reform bill sent to Congress by President George W. Bush in 2002. No Child Left Behind changed the law from the idea of seat time toward learning goals. The learning goals included an attempt towards standards based education. No Child Left Behind set into effect a system of student and teacher accountability standards. The federal law had several parts: making sure every classroom had a highly qualified teacher, to test students for

proficiency in reading and mathematics, and to determine accountability in subgroups. The subgroups included special education students, minorities and limited English speakers. The subject standards were not set by Federal law, the states were to set the standards. The rationale behind the legislation was to hold schools accountable by testing for academic proficiency, resulting in an improvement of student achievement (McGlynn, 2006).

The states set standards and tests. Did that make the law less effective? In fact, according to McGlynn, "without a standard definition of 'proficiency' and a national standard for testing, the states' measurements are meaningless" (McGlynn, 2006, p. 12). The question was: were all states expectations equal? In fact, the expectations were different from state to state. States with higher standards saw expectations drop to comply with pressure from No Child Left Behind. The standards took 'a walk to the middle'. The second question: was the tests equal from state to state? Again, that answer was no. And the third question: was the achievement standards equivalent from

grade to grade? Again, the research according to McGlynn said no. Because states set the standards, states were aiming lower for younger children than for older children. Therefore, the states were setting elementary students up to fail as pupils progressed through the students' academic career (McGlynn, 2006). Another fact that supported the idea that the test was not equal from grade level to grade level was that the mathematics tests were more difficult to pass than the reading tests. The more difficult mathematics assessment seemed to show that students were doing poorer in mathematics than in reading, when in fact the students might not be achieving worse in mathematics at all.

How was the nation achieving at bringing student learning to a new level? According to McGlynn, "if the purpose of No Child Left Behind was to create assessment reforms that would bring student learning to a higher level and to be uniform throughout the nation, it has clearly missed the mark"(McGlynn, 2006,p. 13). So how did the law get better? Several groups tried to improve the law. According to Hoff, big business, which

included the Business Roundtable and the US Chamber of Commerce, got together to protect the law from major changes. Big business wanted to improve mathematics and science instruction, expand instruction in foreign languages, and offer preschool to families that wanted preschool for their children. Big business believed in improving schools and assessments. Such achievements would correlate to better and more competitive employees (Hoff, 2006). Another group pushing for reform was school leaders. Leadership pushed for an addition to the act. School leaders wanted to focus on more than just student test scores to measure school quality. School leadership insisted that a better alternative was to measure the growth of students from year to year (Reeves, 2008). That way, "states can create growth models that provide clear insight into how teaching and leadership strategies influence student achievement" (Reeves, 2008, p. 89). The growth model would be especially useful in assessing students with learning disabilities and limited English proficiency. School accountability would measure both assessment and growth to see if the school was on the road to success.

Mozart Effect

The Mozart effect was named for an increase in Spatial-Temporal reasoning after listening to a Mozart sonata for ten minutes. (Rauscher, 2003) Grandin theorizes that the 'effect' might be able to be replicated in young children. (Grandin, 1998) The Mozart effect was to develop the hardware in the brain for spatial and temporal reasoning.

The experiment, while quite valid, has narrow consequences. The Mozart effect seemed to only last for a little while. The consensus was that to see the effect continue, music instruction needed to be instituted at an early age. Only when music was taught from such a young age, would there be a significant increase in spatial and temporal reasoning.

Math and Music Connections

Music and Mathematics were connected in several ways. The basic elements of music such as notes, intervals and scales and harmony, were related to proportion, relations, integers and logarithms. Additionally, the mathematical concepts were

present in melody and rhythm. Plus, musical notation used time concepts such as counting and time signature. Rhythm, pitch and dynamics were related to certain arithmetical operations, trigonometry and geometry. In addition, mathematical patterns have been used in musical compositions by a number of composers within geometrical ideas. Lastly, the mathematical concepts of Fibonacci sequence and the golden section theory were found in musical compositions, especially those by Mozart (Santos-Luiz, 2007). Consequently, music was connected irrevocably to several different areas of mathematics. (Santos-Luiz, 2007)

Music and Spatial-Temporal Reasoning

Early music training had several effects on our brain. The music training seemed to develop the hardware for spatial-temporal reasoning in the child's brain (Grandin, 1998). The musical building blocks of melody, rhythm and harmony were processed in different areas of the brain. The music and motion in early childhood benefits brain development (Foley, 2006). This motion must have the child as an actor, not a spectator for a

relevant significant change in the spatial-temporal development (Wilcox, 2000).

One type of childhood music instruction included learning to play the piano. There were several studies that theorized that learning the piano has lasting benefits. One benefit was that as a result of learning to read and play keyboard music, students acquire vertical and horizontal visual–motor mapping, which helped them beyond the musical context (Santos-Luiz, 2007). This seemed to have long-lasting benefits on the student's spatial-temporal reasoning especially after six months (Wilcox, 2000; Grandin, 1998).

On the long-term, studies have shown that long-term musical instruction to have effects on our brain. One way was that musicians seem to have differently structured brains than do non-musicians (Wilcox, 2000). Musicians tended to have higher spatial test scores in adolescence and adulthood than do non-musicians. Musicians become more confident, more sensitive individuals and were usually better listeners. Often the students were leaders in other academic and athletic areas, and

performance was exemplary. The musicians tended to achieve higher SAT scores (Wilcox, 2000). Finally, the brain of musicians that relate to musical tasks and musical processing were larger, and more energetically activated (Santos-Luiz, 2007).

Music was more than a means to an end in mathematic achievement. Doctors and Dentists have learned that to let patients listen to music reduced anxiety and stress (Wilcox, 2000). Also, there was the emotional connection in the human brain. Music should be attempted for enjoyment, because the music appeals to our soul, makes us relax and enjoy life.

Music Instruction in other countries

Countries consistently outperforming the United States in tests assessing mathematics and science achievement were the countries where music was a primary focus in the school curriculum (Ponter, 1999, Kelstrom 1998). The Japanese required music for two periods a week, the Dutch mandated music and art since 1968, and in Hungary, music education had long been an essential part of the curriculum through the first eight years of schooling (Ponter, 1999). Music has long been

central in the learning of top rated academic countries. Why did that matter? Because the study of music has cognitive benefits that scientists are only now starting to understand.

Cognitive Development of the Brain

Did music make students smarter? The ancient philosophers such as Plato, Socrates, and academics like Horace Mann, Martin Luther and John Dewey knew music was an essential part of learning. From the expert opinions of these and other ancient and modern scholars, the assumption can be made that music positively impacted student learning and intelligence. Researchers discovered how music helped our brain in cognitive ways too. Musical patterns, progression of notes and logical activities were sequential left brain processes. On the other hand, expressive phrasing and interpretation were right-brain skills. Students used fine-motor skills to play specific instruments. Because playing an instrument enabled an individual to use so many different parts of the brain, music developed flexibility in thinking (Ponter, 1999). Musical training was an effective way to enhance the creative thinking process

and also assisted in the merging of the mind's capabilities (Ponter, 1999).

In the 1980's, Howard Gardner proposed the idea of multiple intelligences and one of those intelligences was music. One way to use music was to set algorithms to music. Schoolhouse Rock did this very well in the 1970's and 1980's with Multiplication Rock. Learning a song was much easier for some children then memorizing multiplication tables (Foley, 2006).

Measures of Academic Progress(MAP)

Measures of Academic Progress was a computerized adaptive assessment that reported both status and growth scores. The scores told where the students were achieving, and how much growth students have achieved since the last time the students took the Measures of Academic Progress.

One way that districts assessed student learning was through Measures of Academic Progress testing. Because the Measures of Academic Progress assessment tool was

computerized and accurate, districts have used the assessment in many ways: to measure growth during the year, entrance into classes such as Special Education and Learning Assistance Program to increase mathematic skills and therefore help increase scores. The Measures of Academic Progress helped to assess a student's ability for higher level mathematic classes.

The information that the Measures of Academic Progress gave was very useful for several reasons. The assessment information determined decision making, such as program and teacher effectiveness, adequacy of instructional programs and resources, school staffing and scheduling (Olson, A. 2007). The assessment information helped teachers immensely with instructional decisions. With the information teachers created an instructional plan that supported academic growth for every student (Yeagley, 2007). The tests were used as a formative assessment to determine the students' cognitive abilities. Counselors used the information to put students in the proper instructional class for their cognitive level. Therefore, students learned at the appropriate instructional level thus alleviating

confusion and boredom. The students were challenged, and provided content that met his/her needs (Yeagley, 2007).

Summary

In summary, music can be used as a great force to supplement core academics. In many instances, researchers have found that music can help students learn both by listening to music and by participating in music.

Math and music have much in common. Teachers need to essentially use these commonalities to help students understand mathematics, and to be successful in mathematics.

The MAP Assessment can be a great tool in these endeavors. Using a growth model indicates where student performance was presently, and whether or not students were growing in mathematics, and areas that need to be strengthened.

CHAPTER 3

Methodology and Treatment of Data

Introduction

The author conducted a correlation study. The researcher compared music students to non-music students to see if there was a correlation between the Measures of Academic Progress (MAP) scores and involvement in music. The study was done with MAP scores in a middle school in Central Washington in the fall of 2007, and the fall of 2009.

Methodology

The research method was correlation. The researcher used correlation to determine if involvement in music improved the mathematic achievement scores on the MAP as compared with non-music students.

Participants

The participants were 60 sixth grade students from the 2007 school year at a Central Washington Middle School. Of these 60 participants, 30 were music students and 30 were non-music students.

The middle school had 496 students with a 77.8% Hispanic population and a 20.4% Caucasian population. The free and reduced lunch rate was 77.4%, with 6.3% special education, 23% transitional bilingual, and 16.1% migrant. There were 32 teachers and 40.6% had a Masters degree. The staff had an average of 7.3 years of teaching experience. There were 7.1% teaching with an emergency certificate, and 87% of the teachers were highly qualified by the criteria of the No Child Left Behind Act (Office of Superintendent of Public Instruction, 2009).

Instruments

The author used MAP scores from fall 2007 and fall 2009. The music and non-music students were selected randomly from

this group. The data was then compared using an dependent *t*-test.

The Measures of Academic Progress (MAP) was a computerized assessment instrument used to measure where the students were academically. The assessment enabled counselors to place students in appropriate cognitive levels in a variety of subject areas including mathematics.

Reliability was a measure of an assessment's consistency. Reliability was used to measure whether or not a test administered to the same students twice would result in the same outcomes (Reliability and Validity Estimates, 2004). The reliability for 8^{th} Grade Mathematics was r=0.85. The coefficient was greater than 0.8 and therefore reliable.

Validity was the other measure of the test. Validity was determined as to whether or not the test measured what the test was supposed to measure. Content validity of the MAP was assured by mapping content standards into a test blueprint. The measurement of the validity was measured by a Pearson correlation coefficient. This coefficient answered the question,

"How well do the scores from this test that reference this scale in this subject area correspond to the scores obtained from an established test that references some other scale in the same subject area?"(Reliability and Validity Estimates, 2004, 3).

The validity coefficient for the 8th grade mathematics was r=0.87. This coefficient was above 0.8 and was therefore significant. Thus, the assessment was valid.

Design

A correlation study was used for this group. The author examined the MAP assessment scores in the 2007 and 2009 school years to see if there was a significant difference in the mathematic scores of music and non-music students. The MAP assessment was given in the fall and spring of the school year.

Procedure

Two random samples of MAP scores were gathered from fall of 2007 and fall of 2009. This sample contained the MAP scores of music and non-music students. The sample had the students' sixth grade Mathematics MAP score, and their eighth

grade Mathematics MAP score. This sample was compared using an independent *t*-test which measured the scores of music and non-music students and their success of the mathematics portion of the MAP.

Treatment of the Data

The researcher used the *t*-test correlation to statistically calculate the data. The researcher used the MAP data from the fall 2007 and fall 2009 to assess whether students involved in music did better than students not involved in music on the mathematics portion of the MAP. The researcher used the Stat Pak (Gay, Mills and Airasian, 2009) to conduct the *t*-test correlation.

Summary

MAP scores from the 2007 and 2009 school years were studied to determine if there was a correlation with being involved in music. Students' mathematics scores were examined to see if there was a statistical difference between students in

music and students not involved in music. The data was studied using a *t*-test correlation device.

CHAPTER 4

Analysis of the Data

Introduction

The present study sought to find out if there was a correlation between music and higher mathematics achievement. The data was collected, analyzed using the Stat-Pak statistical software, and the information was used to determine whether the hypothesis was either accepted or rejected.

Description of the Environment

In the middle school in Central Washington where this study was conducted, a total of 496 students were served. Of these students, 77.8% were Hispanic, and 20.4% were of Caucasian descent. There were 77.4% on free and reduced lunch, with 6.3% special education, 23% transitional bilingual, and 16.1% migrant. There were 32 teachers and 40.6% had a Masters degree. In addition, the staff had an average of 7.3 years of teaching experience. Also, there were 7.1% teaching with an emergency certificate, and 87% percent of the teachers

were highly qualified according to the criteria of the No Child Left Behind Act (Office of Superintendent of Public Instruction, 2009).

The MAP assessment was given in a computer lab in complete silence. The students were given as much time as they needed to finish the assessment. The students were observed by their classroom teacher to ensure that individuals worked hard on the assessment, and answered the questions to the best of the individual student's ability.

Hypothesis

Eighth grade students in music will make greater than expected progress on the Mathematic Measures of Academic Progress from the sixth grade scores than the eighth grade students not in music from the sixth grade scores as measured by pre and post tests of the Mathematic Measures of Academic Progress.

Null Hypothesis

Eighth grade students in music will not make greater than expected progress on the Mathematic Measures of Academic

Progress from eighth grade scores than the eighth grade students not in music from the sixth grade scores as measured by pre and post tests of the Mathematic Measures of Academic Progress at a .05 level of significance.

Results of the Study

The data was collected and put into table 1 to determine how the students' scores developed over a period of two years. Of the twenty-seven music students in the study, only one scored worse on the second test. Of the twenty-nine non-music students, one scored worse the second time.

Table 1: Test Scores of Music Students

Sample of Music Students			
Students		6th Grade Map Score	8th Grade Map Score
1	Band	244	253
2	Choir	207	225
3	Choir	213	212
4	Band	213	247
5	Choir	221	239
6	Choir	218	232
7	Choir	230	240
8	Choir	221	241
9	Band	238	248
10	Choir	223	246
11	Choir	237	248
12	Choir	231	243
13	Band	222	229
14	Choir	232	241
15	Choir	228	243
16	Band	230	246
17	Choir	221	240
18	Band	241	255
19	Choir	221	232
20	Choir	232	242
21	Band	216	244
22	Choir	225	252
23	Choir	225	251
24	Band	221	240
25	Band	234	252
26	Choir	213	237
27	Band	237	247

Table 2: Test Scores of Non-Music Students

Sample of Non-Music Students		
Students	6th Grade Map Score	8th Grade Map Score
1	175	200
2	203	230
3	221	233
4	210	229
5	212	221
6	212	231
7	241	259
8	205	224
9	221	233
10	207	218
11	214	234
12	209	227
13	204	218
14	208	205
15	224	232
16	197	210
17	217	225
18	215	234
19	207	231
20	207	234
21	208	226
22	195	202
23	207	222
24	211	226
25	217	224
26	210	217
27	223	245
28	188	202
29	230	246

When the researcher put the data into the Stat-Pak program, the program calculated the mean, standard deviation, degrees of freedom and a t-score for each set of data. Table 2 shows the probability data for each group of scores, both music students and non-music students.

Table 3: Non-Music Students

	N	**Mean**	**Standard Deviation**
Pre	29	210.28	12.5
Post	29	225.45	13.4
	df= 28	t=11.88	p < 0.001

Table 4: Music Students

	N	Mean	Standard Deviation
Pre	27	225.7	9.43
Post	27	241.67	9.47
	df = 26	*t*= 0.72	p > 0.05

Findings

Through the pre/post test on each group of students an interesting conclusion was determined. The music group started with a high mean, and did improve, but unfortunately, not significantly. The p value was greater than .05. The non-music group of students started with a lower mean and made great strides over the past two years. Their growth was significant at the 0.001 level. Therefore the null hypothesis was accepted, and the hypothesis was rejected.

Discussion

The two groups were significantly different to start with; the music groups mean was significantly higher. This could possibly be the result of several factors. That could include social-economic status as well as work ethic, motivation and maturity of the students. Other factors could include the language spoken at home as well as the educational level of the parents.

To see a significant difference in the non-music math scores was encouraging. That means that the school staff was doing something right in helping students improve their math scores. Unfortunately, even though the music students' scores improved, the scores did not improve at a significant level beyond non-music students.

Figure 1: Music Students

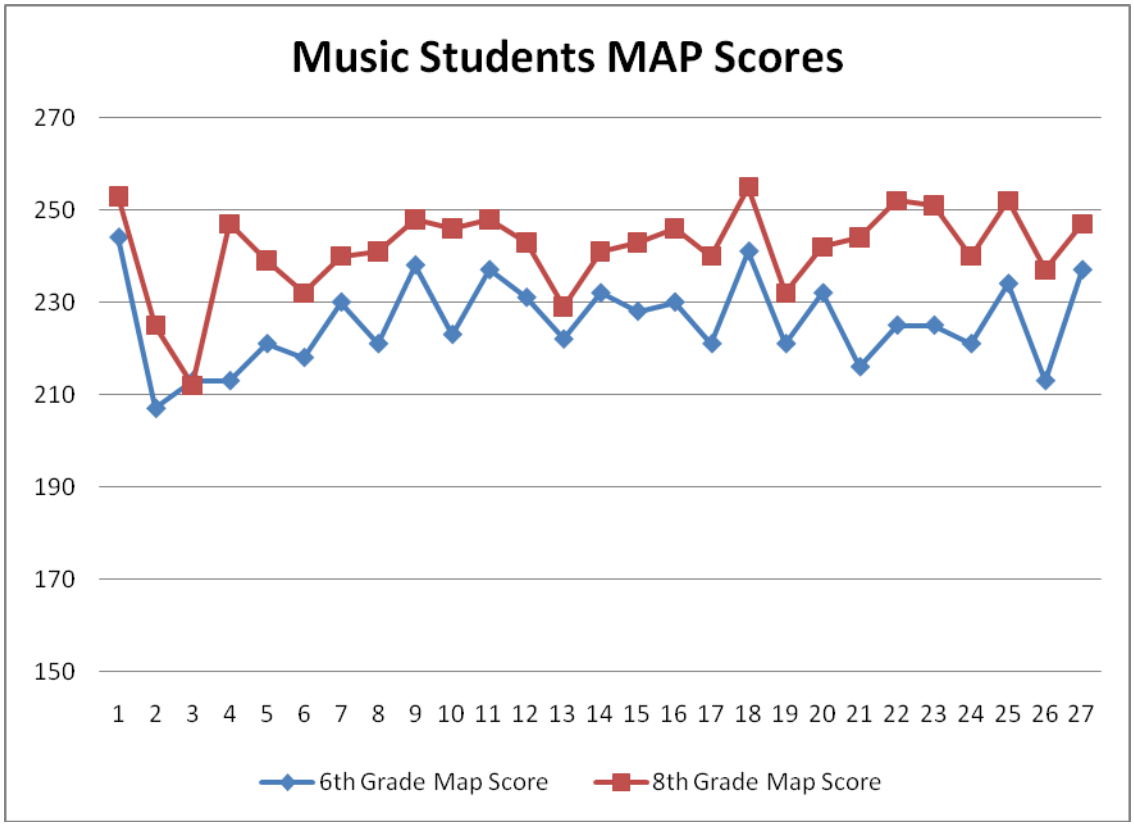
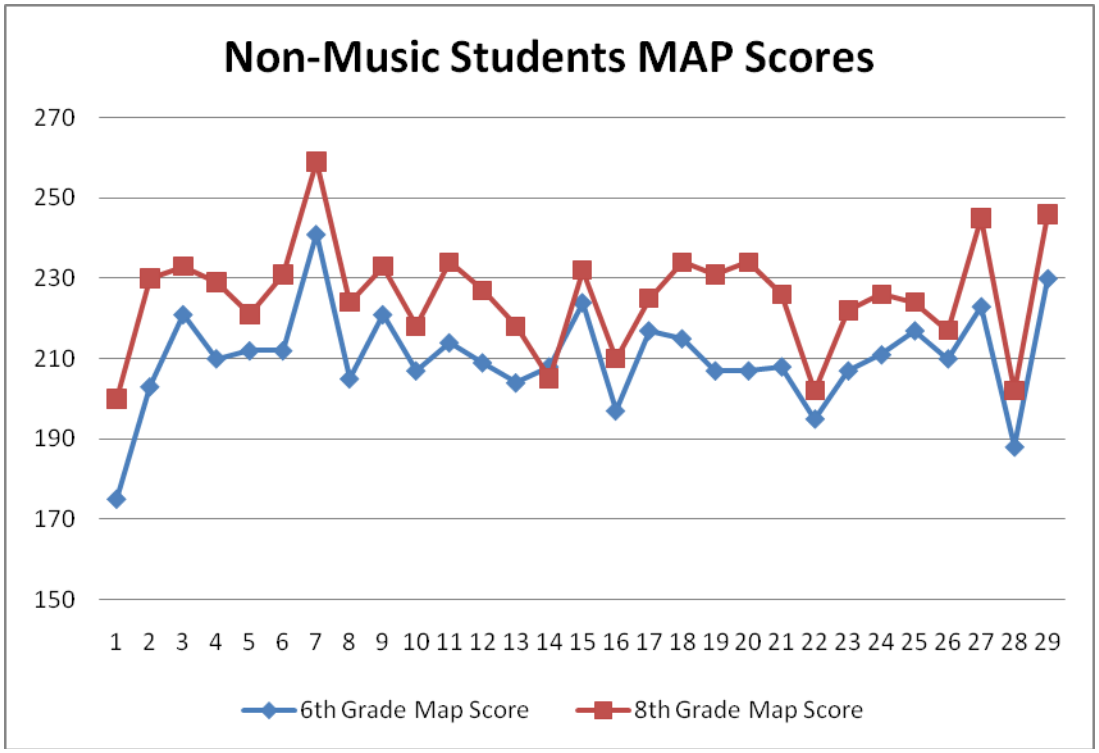


Figure 2: Non-Music Students



Summary

After the students took the Map tests, the results were put into a table and analyzed using STATPAK software. The results were displayed in a table. It is evident that both groups improved, with the non-music group improving significantly, and the music group improving, but at a non-significant level.

CHAPTER 5

Summary, Conclusions and Recommendations

Introduction

As a result of NCLB, school districts are under increased pressure to have children achieve at a high level of academic success. This pressure has compelled some school districts to put an increased emphasis on the core subjects of reading, writing, and mathematics. This has negatively impacted the choices for students to take elective classes. As a result, the elective classes have had lowered enrollment, inadequate funds and consequently, fewer or a lack of teachers.

Summary

With the advent of NCLB and Washington's high stakes test the WASL(Washington Assessment of Student Learning), increasing pressure was being placed on school districts to seek reasonable solutions to alleviate this problem. This pressure caused some school districts to place students in core classes for a longer period of time, and in elective and vocational classes for

a shorter period of time. This affected their enrollment and consequently their budgets. Brain research shows that early music instruction helps form neuron synapses in the brain, and affects development in certain areas of the brain, especially the areas dealing with abstract thinking.

This study investigated the link between music instruction and math achievement. The goal was to see if there was a link between the two. If there was a link, then it would be natural to encourage students to take music to help increase individual math achievement scores as well.

The study compared two sets of MAP scores. The first set was from music students. These scores were mathematic achievement scores from fall 2007 and fall of 2009. The second set of scores was of non-music students. Again these were MAP scores from fall of 2007 and fall of 2009. At the end of the study, the results were statistically analyzed.

Conclusions

Statistical analysis was performed on the students' raw scores in table 1 and table 2. The analysis was done to achieve a t-score to determine significance. The significance of each group is shown in table 3 and table 4. The music students did not have significance, but the non-music students did achieve significance at the $p>0.001$ level. Therefore the null hypothesis was accepted and the hypothesis was rejected.

After analysis, the non-music students achieved significance, and really improved their math scores over the two years. The music students improved as well, but not enough to achieve significance. The music students beginning MAP mean raw score was significantly higher than the non-music students. This made a difference in how the study was conducted.

Recommendations

I would redo the study in another school, one that was not so rural, and low-income. I think that in another setting, the results might be different.

Because the music students beginning MAP score was so much higher than the non-music students, I think there is validity to the research of music making a difference. Therefore, I would recommend that students take music at an earlier age, especially instrumental music. I would also recommend that music be incorporated into the general education program to encourage student achievement. Conducting a study of this nature would hopefully validate the current research of the Mozart Effect as it relates to the improvement of mathematics' achievement scores.

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