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Evaluation of the Impact of Music Program Participation on Students' Musical and Academic Success, and School Engagement in the Metropolitan Nashville Public Schools: A Comprehensive Test of Pathways and Contextual Factors

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Abstract

The purpose of this project was to examine the effect of participating in music on student school engagement and academic achievement in a Metropolitan Nashville Public School district. Student records for the class of 2012 (N = 6,006) in a major urban school district were collected and examined for student personal characteristics, music participation, their indicated level of school engagement, and their academic achievements. These variables were examined using Structural Equation Modeling techniques. Results indicated that the quantity of Music Participation had an important effect on both the level of School Engagement and Academic Achievement. Conclusions indicate that more music involvement was advantageous to the school system's overall performance, and that steps being taken to engage a wider cross-section of students might well have a significant impact on the students' academic lives.

Evaluation of the Impact of Music Program Participation on Students' Musical and Academic Success, and School Engagement in the Metropolitan Nashville Public Schools: A Comprehensive Test of Pathways and Contextual Factors

The extant literature is replete with investigations examining the effects of music study on the academic success of students. Researchers have paired music participation with various academic outcomes, including math and reading skills, as well as overall grade point averages. Most of these studies look at students in the elementary and middle grades. Several researchers have reasoned that, in the primary grades, student participation in music class is compulsory and therefore consistent across students in the same school. In high school, however, students have more degrees of freedom in selecting their classes, so any given student might take no music throughout high school, or might have many music credits. This variability makes the high school population more challenging to study. Therefore, though there are some investigations that look at secondary students and academic progress, those are far fewer.

Most studies investigating connections between participation in music and general academic achievement have demonstrated that participation in music parallels increased academic achievement (Johnson & Memmott, 2006; Kinney, 2013; Perry, 1993). This relationship has been demonstrated with standardized tests in reading (Butzlaff, 2000; Neuharth, 2000), mathematics (Neuharth, 2000; Whitehead, 2001), grade point averages (Miranda, 2001; Zanutto, 1997), SAT scores (Butzlaff, 2000; Cobb, 1997; Miranda, 2001), and ACT scores (Cobb, 1997; Miranda, 2001). Some studies have shown that music participation did not affect academic achievement more than other variables investigated, but consequential academic gains were still noted (Andrews, 1997; Elpus, 2011; Perry, 1993). None of the studies found that participation in music negatively influenced academic progress.

Studies of elementary students have typically focused on those in third and/or fourth grade (when state assessments are regularly administered). Fitzpatrick (2006), Kinney and Forsythe (2005), and Wallick (1998) all looked at relationships between music participation and fourth grade assessment scores, and found that music participation, even when it required being pulled out of traditional instruction, was positively associated with test scores (or at least did not negatively affect them.) Gregory (1988) found that third-grade students receiving music instruction though the "Leap Into Music" curriculum made significant academic progress in mathematics. Similarly, Smithrim and Uptis (2005) found that participation in an arts-integrated curriculum led to modest but statistically significant gains in mathematics scores, but only after three years.

Not every study showed consistent academic gains for young children who participate in music education. For example, a longitudinal study by Costa-Giomi (1999) showed that private piano lessons increased several measures of intelligence in the short term. However, those gains, as well as any academic gains, were not maintained through the entire three-year span of the study. By the end, both the experimental and control groups were relatively equivalent on both measures—academic and intelligence scores. In another study, Kemmerer (2003) found that the number of hours spent in a general music class had no effect on reading skill scores. However, closer examination showed that the difference of time actually spent in music instruction between the groups was less than 18 minutes per week, so the case for differing amounts of instructional time did not appear to be strong enough to be significant. Further, the famous "Mozart effect" studies by Rauscher et al. (1993, 1995) were later found not to stand up to additional researcher scrutiny and replication (e.g., Schellenberg, 2005; Winner & Cooper,

2000). However, enough studies have found connections between music and academics that the topic merits further research.

Rather than examining the effect of music on academics, some researchers have examined the converse relationship—that of academics on music participation. Fitzpatrick (2006), Klinedinst (1991), and Miksza (2007) all found a predilection for high achieving students to choose to participate and to persist in music classes. Kinney (2008, 2010, 2013) determined that this relationship persisted into Middle School, but moreso for instrumental music participants than choral music participants, echoing the findings of Johnson and Memmott (2006) regarding statistically significant differences between instrumental and choral music participants.

Scant research exists on the relationship between music participation and academics in the middle and high school years, but those studies that have been conducted reinforce the findings concerning elementary students. Research shows a relationship between statistically significantly higher academic achievement for students who participate in music education than for those who do not (Babo, 2004; Catterall, Chapleau & Iwanga, 1999; Cobb, 1997; Kinney, 2008; Miksza, 2007). Many of these researchers readily acknowledge that the evidence is unclear at best regarding which came first—the academic achievement or the music participation—but the relationship is undeniable.

Perhaps the three most compelling reports on the relationship between music participation and academic achievement are by Cobb (1997), Catterall, Chapleau and Iwanaga (1999) and Butzlaff (2000). Cobb (1997) examined the ACT registration forms of 17,099 test takers and compared those who indicated that they had two or more classes or activities in music to those who had not. Findings indicated that individuals with a musical background had

significantly higher ACT scores on the English, reading, and science subtests. Scores for math were also higher for all subgroups, but not significantly so for African American students. Catterall, Chapleau and Iwanaga's 1999 investigation tracked approximately 25,000 students over the course of ten years. Results indicated that, regardless of socioeconomic background, secondary school students involved in music had significantly higher standardized test scores—specifically mathematics proficiency—than students not involved in music. This study examined several standardized tests, including the SAT. Similarly, Butzlaff (2000) completed a meta-analysis of all studies wherein a reading standardized test followed music instruction. He documented a consistent correlation between reading ability and music instruction.

Though many claim that involvement in a variety of school activities aids academic progress, several studies have shown that not to be the case. In four investigations, music participation was the only activity shown to correlate significantly with academic progress (Miranda, 2001; Schneider, 2000; Trent, 1996; Underwood, 2000). Athletics and all other extracurricular activities did not show similar results.

While clear trends arise in a study of music participation and academic achievement, the extant research on potential relationships between student engagement and activity participation (to include music participation) is far less focused. This lack of focus stems from the related difficulties of 1) defining "engagement" in a school setting, and 2) determining effective ways to measure engagement, once a definition has been selected. Qualitative studies (Bartolome, 2013; Smithrim & Uptis, 2005) tend to examine engagement via student self-reports and teacher observations regarding a sense of belonging, feelings of empowerment and commitment, and motivation for success. These studies have found that participation in music fosters a strong

sense of belonging and activity commitment (Bartolome, 2013), as well as a commitment to academic achievement (Smithrim & Uptis, 2005).

Quantitative studies tend to define engagement in terms of future-predicting behaviors, such as motivational beliefs (Simpkins, Vest & Becnel, 2010) and aspirations (Darling, 2005), or the predictive power of present participation on future activity engagement (Mahoney, Cairns & Farmer, 2003). For these studies, "participation" was generally defined as level and intensity of activity participation (Brown & Evans, 2002; Darling, 2005; Mahoney, Cairns & Farmer, 2003). In general, all of these studies found positive effects resulting from activity participation, however positive effect was defined—high aspirations for the future, greater engagement in activities over time, and evidence of interpersonal competence. However, the lack of a concise, agreed-upon definition for "student engagement" between the various studies makes it difficult to draw any definitive conclusions about relationships between music participation and student engagement. A further complication is that, in many of these studies, all arts offerings or "extracurricular" activities (to include music instruction offered during the school day) are lumped together into one activity variable (Brown & Evans, 2002; Darling, 2005; Mahoney, Cairns & Farmer, 2003; Smithrin & Uptis, 2005). While these studies undoubtedly have value of their own, they do not provide much clarity into the specific relationship between music participation and student engagement.

In sum, the research indicates a somewhat reliable relationship, and some could even contend an association, between the study of music and academic performance –on standardized reading and mathematics tests, on grade point averages, and on college entrance exams. Researchers have attempted to show how music may have had some causal effect on academic advancement; however, the furthest current research it can probably support is a concept of a

two-way interactionist position, such that music might catalyze or deepen learning in other academic areas, rather than to cause change. In the field of student engagement, the picture is less distinct. While there appears to be a relationship between activity participation and student engagement, more research is needed that separates the types of activities (sports, clubs, music, theatre) to tease out any differences in engagement that might exist between the various types of activity.

The tools most researchers (who have examined data in this area) have most often used is ANOVA, often looking at differences between students who have studied music versus those who have not in a particular context – categorical predictor variables. This is definitely a tried and true method, of which the results are usually very clear. It does, however, have the weakness of examining somewhat pervasive situations in an isolated manner (Mertler & Vannatta, 2010). In contrast, Structural Equation Modeling (SEM) is considered the second generation of multivariate statistical methods, and allows for continuous outcomes using continuous variables. Further, SEM allows those predictor variables to create continuous unobserved latent variables that can be compared (Lani, 2009). Though far from a perfect tool, SEM is an evolving instrument that can show substantially more than its predecessors. In the case of this project, we used SEM to test hypothetical latent constructs based on the input from several observed indicators.

One key component of SEM is the construction of latent variables. Latent variables are hypothetical constructs (or factors), which are explanatory for some presumed reality that is not directly observable (Kline, 2011). An example of this type of variable could be the construct of *musical talent*. There is no single definitive measure of talent; however, researchers have used many different indicators (i.e. tests, audition results, and possibly other evaluations) that

together, might assess various facets of musical talent. The observed variables used as indirect measures of aspects of latent variables (or constructs) are referred to as indicators (Kline, 2011). In most cases of SEM, indicators are thought to be reflections of, or caused by, factors. However, in cases where indicators have temporal precedence over factors, or in cases where an indicator is thought to be covariate for a particular factor, the directional effects are reversed in the model.

While at first, it might seem that SEM is dependent on many assumptions and allows the researcher to manipulate the numbers until they find the result they want, this is not actually the case. However, more classic analysis procedures of analysis of variance, multiple regression, t-Tests and the like, are also based on many assumptions regarding the properties of the data. SEM allows the researcher to specify, estimate, and evaluate the nature and veridicality of most assumptions inherent in his model. While not without assumptions, SEM actually allows the researcher to have many fewer assumptions than classic analyses, and then to test them (Little, 2013).

The purpose of this project was to examine the effect of music participation on student school engagement and academic achievement in a Metropolitan Nashville Public School district. The value of this study is threefold. First, the analysis procedures of this study are different than any used prior study. Second, the data set used for this study was more comprehensive than any used in prior studies. Finally, this study has defined variables differently – in many cases where variables have been defined using one measure in the past, this study has taken those single measures and combined them to create more comprehensive latent variables that are defined by the alliance of those multiple indicators.

Method

Data Set

The Metropolitan Nashville Public Schools (MNPS) is a large urban district in the center of the United States. The District has approximately 80,000 total students from more than 100 different countries, speaking more than 135 different native languages. There are more than 150 schools in the system, including more than 20 high schools. This district provided the researchers with de-identified student data for all students who were enrolled in MNPS in 9th grade in 2008. The total *N* for the students was 6,006. In obtaining data for 9th grade students 4 years ago, we were able to obtain graduation, delayed graduation, and drop out data. The student data provided were extensive, but the most cogent aspects of the data that were used from these central records are shown on Table 1. These observed categories of data were then placed into where the researchers hypothesized they most closely interacted to create a complete variable picture – Latent Variable.

Measures

The first Latent Variable examined was that of **Student Characteristics**. Each student's sex was an observed variable that contributed to the student characteristics. Ethnicity was also a categorical variable that was theorized to influence student characteristics. SES as determined by free and reduced lunch was considered to be the 3rd variable that contributed to student characteristics. The elementary school environment, where that student went to school, and that school's characteristics, are theorized to be additional indicators for that latent variable. Finally, previous research has indicated that the type of student who takes up music when it becomes an elective is the one doing well in school. To control for the possible effect of this predilection, fourth-grade standardized test scores were included as covariates in this latent variable.

Table 1 – ***Latent*** *and Observed Variable List*

Student Characteristics
- Sex
- Ethnicity
- SES
- Elementary School characteristics the student attended
- 4th grade basic skills Test Scores (pretest data)

School or Site Characteristics
- Size
- SES (Free/Reduced Rate %)
- ESL Rate

Music Participation
- Types (band, choir, orchestra, and each of the others)
- Total Semesters (number)

Measures of School Engagement
- School Attendance
- Graduation Rates
- Disciplinary Reports

Academic Gains
- Last Standardized Test Scores (State Assessments /ACT)
- GPA

The second latent variable is that of **School Characteristics** for each high school student. The school characteristics examined included size of the school, percentage of ESL students, and the percentage of students on free and reduced lunch. These three indicators are theorized to be reflections of overall school characteristics.

The third latent variable in the model is **Music Participation**. The indicators of music participation used in this study are how many semesters of the type of music in which the student was enrolled, and how many total semesters of music the student took. An attempt was made to determine a musical dose indicator, which assessed the quality of the musical education inherent

in each class and how many semesters of each class each student experienced, but this measure was determined to be too subjective for this stage of the research.

The fourth latent variable is **School Engagement**. Many studies in the past have looked at school engagement, but most of them have done so by having students fill out a questionnaire. This study is determining the level of school engagement based on each student's attendance at school, the number and severity of discipline reports each student has in their record, and whether or not the student would graduate from high school on time, graduate late, transfer out of the system, or drop out.

The final latent variable is that of **Academic Achievement**. This study examines three indicators of academic success. The first two are the English and Math scores from the standardized tests taken in the 12th grade, which in MNPS is the ACT. The third indicator of academic success is the student's high school grade point average.

Resulting Model

The theoretical construct that drives this study's model is based on research conducted by George Kuh and his associates on student engagement in higher education. Simply put, Kuh posits that students who are engaged and who make connections with their academic institution experience more academic success (Kuh, 2001, 2003, 2005; Kuh, Kinzie, Schuh, Whitt & Associates, 2005). Otherwise stated, "The more students study or practice a subject, the more they tend to learn about it" (Carini, Kuh, & Klein, 2006). A study by Carini, Kuh, and Klein (2006) confirmed these linkages between student engagement and learning, particularly regarding the key skill of critical thinking. Further, they found that students who might be considered low ability (in this case, as defined by having low SAT scores) benefitted the most from being engaged in their institution. While Kuh's research has focused on students in higher

education, their cogency for this study is evident. Participation in a music class, particularly at the secondary level where students often elect to participate, requires institutional engagement. Like Kuh's work, this study seeks to elucidate some of the subtleties of the relationships surrounding student engagement, in this instance between the students, their participation in music, their engagement in their school, and their academic achievement.

The hypothetical construct that drives this model is based on the relationship of the five latent variables. Student Characteristics are hypothesized to have a causal effect on School Characteristics, Music Participation, School Engagement, and Academic Achievement. School Characteristics, while hypothesized to be influenced by Student Characteristics, do not cause changes in Student Characteristics. They do, however, have theoretical affects on Music Participation, Student Engagement, and student Academic Achievements. Music Participation is thought to affect the way students engage in their school and have an effect on students' Academic Achievement. Is also theorized that if students are engaged in their school experience, engagement will have a substantial impact on the student's Academic Achievement. The theoretical model resulting from the aforementioned arguments is presented in Figure 1.

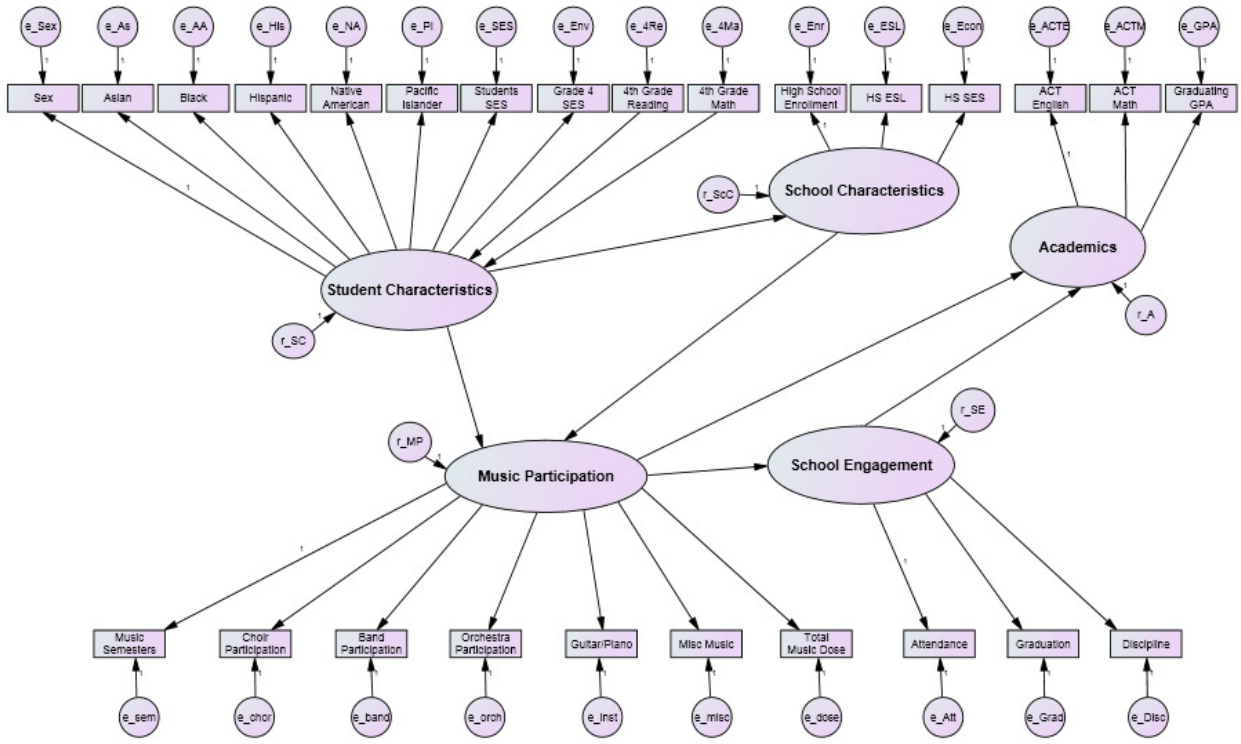
Statistical Analysis

The first step in this project was to create an original model based on previous literature and experience. The data were then obtained and scrubbed. Following this step, the data were subjected to SEM procedures and the model was adjusted until a satisfactory model was obtained.

Results

Multiple iterations of the base model were created in order to find a model that met the general criteria for Fit within Structural Equation Modeling Standards. This process involved

Figure 1 – *Initial Model of the Impact of Music Program Participation on Students' Musical and School Engagement and Academic Success.*



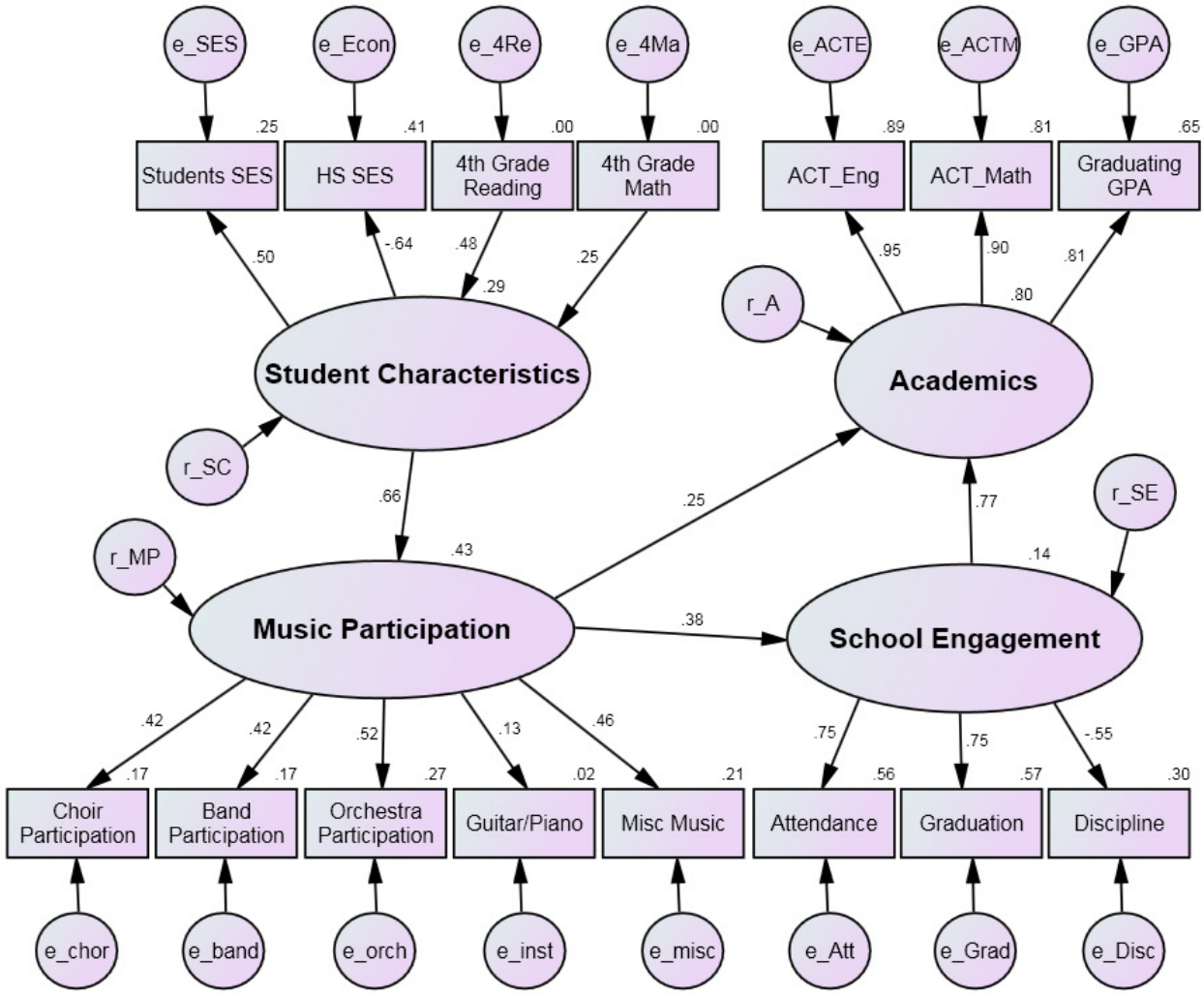
removing variables that too closely covaried with other measures. Also dichotomous demographic variables were removed, as they did not prove enlightening or help the model in terms of fit. Finally, the latent variable of School Characteristics was determined not to be a separate construct from Student Characteristics, and was removed from the model.

All student records for the 2012 school year were used in the analysis. When these data were compared with those from the 2008 set, there clearly were missing data for students who moved into and out of the district in the intervening years. AMOS (v. 20.0), the SPSS program used solely for SEM analysis, used FIML (full information maximum likelihood) techniques for all missing scores. FIML is generally the most accepted methodology for addressing missing data in SEM (Enders & Bandalos, 2001; Raykov, 2005), and the default method in AMOS.

Though there is not an established "gold standard" for fit indices, there are some generally accepted threshold points that have been deemed acceptable by the field. This study's model was one that had a model of fit approaching all standards. The Chi Square was significant (X^2 (61) = 3,077.84, $p < .001$). Though not desirable, the Chi Square is sensitive to *N*; with 6,006 subjects, a nonsignificant Chi Square was virtually impossible. The other measures of fit examined was a Root Mean Square Error of Approximation (RSMEA), which in this case was .088. This resulting number is less than .100, a point at which models come under great scrutiny, but not under .080, which would be the ideal threshold. This less than optimal level of RSMEA fit may well have also been caused by the extremely large *N* included in the model. Though RSMEA itself is not sensitive to *N* in the same way as the Chi Square statistic, RSMEA does diminish its correction for parsimony in models as *N* increases. The last measure of fit for the model is the Comparative Fit Index (CFI), which was .806. A threshold for the CFI has been the topic of some discussion (Fan & Sivo, 2005; Hu & Bentler, 1999; Yuan, 2005), and many researchers would feel more comfortable with a CFI exceeding .900. However, a score of .806 can still be considered acceptable. Indices that reflected a more solid fit would have been preferable. However, as is often the case with data sets such as these, when one gets a large *N* from the field, one also encounters more incomplete student records. Therefore, a cleaner fit is unlikely unless we start eliminating incomplete cases. Such a choice, however, would eliminate students who are subject to mobility issues from inclusion in the analysis. As it was important for us to include every student as much as possible, we decided to include everyone in the analysis, even with the resulting moderate level of fit.

It should be noted that all fit measurements were completed without covariate indicators in the model. This is standard procedure, and those indicators were reinserted for all regression estimations. The final model, with standardized estimations, is illustrated in Figure 2.

Figure 2 – *Resultant Model of the Impact of Music Program Participation on Students' Musical and School Engagement and Academic Success with Standardized Regression Weights*.



Squared multiple correlations can be seen next to each observed indicators and latent variables in Figure 2. This squared multiple correlation coefficient is the estimate of what percentage of the variable's variance is explained by the predictors in the model. For instance, it

is estimated that the predictors in the model for Graduating GPA explain 65 percent of the GPA variance. The error variance of Graduating GPA is approximately 35 percent of the variance of Graduating GPA itself. All of these correlations are also presented in Table 2. It should be noted that as the 4th grade standardized tests were used as covariates to the latent variable Student Characteristics, they have no measureable squared multiple correlation.

In examining the indicators of Student Characteristics, it is interesting to note that much more of the High School SES variability is accounted for in the model than each individual's SES variability. The variability for the participation time for each area of music study was somewhat matched across discipline, with the notable exception that more of the variability was accounted for in the area of orchestra participation, and almost no variability was accounted for with regard to class guitar and piano. Indicators for School Engagement had much of their variances accounted for in the model (.300 - .566), and even more variance was accounted for with regard to the indicators of Academic Achievement (.649 - .895).

All nineteen Regression Estimates in Figure 2 are significant at the level less than $p < .001$. Regression estimates mean that when the variable at the tail of the arrow goes up one standard deviation, the variable at the head of the arrow is expected to go up by the regression estimate proportion of its standard deviation. For example, in this model, when Student Characteristic goes up one standard deviation, Music Participation goes up by 0.656 standard deviations. In SEM, latent variable regression estimates of less than 0.200 are usually not highly regarded, but estimates greater than or equal to 0.200 are considered to be important. All direct Standardized Regression Estimates are also presented in Table 3.

Student Characteristics were predicted by 4th grade standardized test scores. It is interesting to note that reading scores had an estimated influence roughly twice as high as math

Table 2

Squared Multiple Correlations all Variables in the Model

Variable	Estimate
4th Grade Math	.000
4th Grade English	.000
Student Characteristics	.289
Music Participation	.430
School Engagement	.144
Academics	.798
Attendance	.564
Graduation	.566
Discipline	.300
Semesters of Misc.	.214
Semesters of Guitar/Piano	.018
Semesters of Orchestra	.273
Semesters of Band	.173
Semesters of Choir	.174
12th Grade GPA	.649
ACT Math	.811
ACT English	.895
High School SES	.408
Student SES	.253

Table 3

Standardized Regression Weights for all Variables in the Model

Variable	Effect	Variable	Estimate
4th Grade Reading	→	Student Characteristic	.478
4th Grade Math	→	Student Characteristic	.246
Student Characteristic	→	Music Participation	.656
Music Participation	→	School Engagement	.379
Music Participation	→	Academics	.252
School Engagement	→	Academics	.767
Music Participation	→	Semesters of Orchestra	.523
Music Participation	→	Semesters of Band	.416
Music Participation	→	Semesters of Guitar/Piano	.133
Music Participation	→	Semesters of Misc.	.463
Music Participation	→	Semesters of Choir	.417
School Engagement	→	Attendance	.751
School Engagement	→	Graduation	.752
School Engagement	→	Discipline	-.547
Student Characteristic	→	Student SES	.503
Student Characteristic	→	High School SES	-.639
Academics	→	ACT English	.946
Academics	→	ACT Math	.901
Academics	→	12th Grade GPA	.806

scores. These characteristics were reflected by two variables related to SES level as measured by free/reduced lunch data. Student individual data had an estimate of .50, which is very high. High School SES was based on the percentage of students on free/reduced lunch at the school where the student attends. Therefore, a negative estimate was expected. These four indicators accounted for 29% of the variance noted in the latent variable Student Characteristics.

Music Participation was reflected by five indicators. Participation in these activities was measured in semesters of enrollment. No further measure was generated, so while quality of instruction or performance has been noted to have an effect in past investigations (Johnson & Memmott, 2006), that aspect of the educational experience was not included in this model. The indicator titled Miscellaneous Music was the District's catch-all for general music classes, music appreciation, AP Theory, and so on. Clearly this indicator encompassed a wide range of student expertise—from the most general dabbler, to the serious potential music major. The class guitar and class piano indicator had an estimate that was the lowest in the entire model, and perhaps should not garner any extended attention, except in how it interrelates to the other classes. All of the other four indicators had consequential estimates, and accounted for 43% of the variance noted in the Music Participation variable.

The latent variable of School Engagement was composed of three variables. Discipline reflected the number of discipline reports filed on each student. Therefore, a negative estimate was expected. The indicator Graduation included all data on whether each student graduated from high school on time, graduated late, dropped out or withdrew from school prior to graduating, or transferred. Transfer students were entered as missing data when no more data on the student's disposition were available in the records. Attendance data were simply a

percentage of days that student attended school. All three indicators had consequential estimates. Fourteen percent of the School Engagement variance was accounted for in this model.

Academic Achievement was created from data from three indicators. In MNPS, all students take the ACT as their 12th grade state assessment. The English and Mathematics scores from that examination served as two of the academic indicators in this project. Both had a very high estimate. The third indicator was student cumulative grade point average. That variable also had a very high loading. Eighty percent of the variance for Academic Achievement was accounted for in this model.

The Regression Estimates for the Latent Variables was a key focus in this project. All four paths tested in this model had important estimation figures. Student Characteristics clearly have a strong relationship (0.656) to Music Participation. On the other side of the model, School Engagement to Academic Achievement had an even higher Regression Estimate of 0.767. However, the primary focus of this investigation was in Music Participation. In this model, estimates indicate that if Music Participation increases by one standard deviation, then School Engagement would be expected to go up 0.379 standard deviations, and Academic Achievement would also increase by 0.252 standard deviations. Further, the indirect effect calculated for Music Participation mediated by School Engagement for Academic Achievement resulted in an Indirect Effect of 0.293. The researchers consider all three of these estimates to be significant.

Other relevant results for the Model are presented in the tables at the conclusion of this paper. Table 4 presents the intercepts for the observed variables. Table 5 illustrates the all the unstandardized measurement error variances. These are critical in determining the proportion of unexplained variance in the model.

Table 4

Intercepts for all Variables in the Model

Variable	Estimate	S.E.	C.R.	P
4th Grade Reading	633.128	.656	964.475	<.001
4th Grade Math	618.900	.629	984.429	<.001
Student SES	-3.437	.252	-13.624	<.001
High School SES	164.106	4.607	35.621	<.001
ACT English	-16.768	1.747	-9.598	<.001
ACT Math	-4.775	1.143	-4.179	<.001
12th Grade GPA	-.097	.145	-.668	.504
Attendance	.649	.017	39.082	<.001
Graduation	-.388	.127	-3.058	.002
Discipline	9.813	.430	22.836	<.001
Semesters of Choir	-1.911	.124	-15.455	<.001
Semesters of Band	-1.859	.119	-15.643	<.001
Semesters of Orchestra	-1.777	.100	-17.770	<.001
Semesters of Guitar/Piano	-.324	.065	-4.994	<.001
Semesters of Misc.	-1.373	.086	-15.932	<.001

Table 5

Variances for all Error and Residual Terms in the Model

Variable	Estimate	S.E.	C.R.	P
e 4th Grade English	1732.356	39.471	143.890	<.001
e 4th Grade Math	1534.099	35.038	43.784	<.001
r School Characteristics	.164	.011	14.330	<.001
r Music Participation	.047	.004	11.337	<.001
r School Engagement	.006	.000	27.058	<.001
r Academics	12.338	.787	15.686	<.001
e Student SES	.683	.016	42.307	<.001
e High School SES	146.753	4.927	29.787	<.001
e ACT English	7.204	.404	17.813	<.001
e ACT Math	6.016	.215	27.967	<.001
e 12th Grade GPA	.222	.006	37.320	<.001
e Semesters of Choir	.393	.008	47.851	<.001
e Semesters of Band	.364	.008	47.876	<.001
e Semesters of Orchestra	.173	.004	42.275	<.001
e Semesters of Guitar/Piano	.255	.005	54.212	<.001
e Semesters of Misc.	.161	.004	45.760	<.001
e Discipline	10.466	.246	42.470	<.001
e Graduation	.331	.010	34.496	<.001
e Attendance	.006	.000	35.184	<.001

Discussion

The purpose of this project was to examine the effect of participating in music on school engagement and academic achievement in a Metropolitan Nashville Public School district. The value of this study is threefold. First, the analysis procedures of this study are different than those used in any prior study. Second, the data set used for this study was more comprehensive than any used in prior studies. Finally, this study has defined variables differently. In many cases where variables have been defined using one measure in the past, they are now defined by multiple indicators, creating latent variables that more clearly reflect the ideas that they represent.

To clarify, the use of SEM in this project has enabled the researchers to examine variables more in depth than has been possible in prior studies. Certainly structural equation modeling is the next generation of multivariate statistics (Lani, 2009). By using this methodology, we were able to measure school engagement not by attendance, graduation rates, or discipline reports, but by the interrelationship between all three factors. Because modeling itself has so many requirements, it does restrict the researcher to certain practices. We were not able to examine issues of race or sex within the SEM structure. Further, we had to eliminate many indicators and restructure some of our latent variables. However, the resultant model not only has good indices, but it also makes sense to our adopted theory and purpose.

Based on the regression estimations inherent in this model, Music Participation plays an important role both in students' level of Engagement and in Academic Success. The aforementioned theory (Kuh, 2001) of school engagement was clearly supported by the results of this study. However, the role of music participation in this particular paradigm is compelling. Certainly if we ascribe to the notion that it is important to keep students engaged in the schools,

the role that participating in music can play in student engagement should garner substantial attention from decision-makers.

This model worked for all of the students in the NPS. But not all students participate in music equally. It seems only reasonable that, once participation discrepancies are known, something should be done to accommodate any noted patterns of differences. This model clearly indicates that if students feel more enfranchised in school music, they might well become more engaged in their school, and academic success might well follow. Generally the variables that combine to create the Student Characteristics are not readily malleable; those factors are outside our control. However, if music offerings can be made more available and attractive to a wider range of students, overall educational effects might well be enhanced. It then seems axiomatic that it would be of benefit to either: a) attract more students into the district's current offerings of band, choir, orchestra, and so on, or b) widen our offerings such that we can attract more students to participate in musical activities. It might be considered particularly important to find and provide opportunities to students in the groups identified here to be disenfranchised populations. Finding musical opportunities for all students might well have a positive impact across all aspects of school engagement and eventually academic achievement.

The contribution of this project to the research community is a model that has accomplishments that no previous research has made. First, it used fourth grade standardized test results as covariate to all other computations. One of the previous discussions regarding this kind of work is that the reason kids participating in music are the kids who have been excelling is that they were the same kids that were excelling from the beginning of their education. This study evened the field at fourth grade, so all differences in variability stem from educational activity, not from predisposition. Further, in this study music participation was turned into a

much more refined measure – no longer a nominal yes/no, but an intervallic measure of time spent in the instructional paradigm. This is undoubtedly the most persuasive evidence to date indicating the specific effects of public school music participation on overall educational experience. In a time then school engagement has become an indicator of school effectiveness, it seems more important than ever to support an activity that has been shown to have such a strong impact on this touch point.

Of course, these results are not conclusive, and further research is clearly warranted. Though the observable variables for Student Characteristics had good regression weights, the level of variable variance accommodated by these observed variables was not as high as might be able to be found. Not to mention, the observable measures used are anything but malleable. The level of the School Engagement variance accounted for in the model are even a bit lower, leading to maybe even more thoughtfulness. It is also interesting to note that even with the level of measurement for the variable of music experience, semesters in each type of class still only accounted for 43% of the variance. A more refined measurement of the total musical experiences would also be something to be pursued in future investigations. A fourth area for future work needs to be the construction of a theory of what is happening in student lives that leads to regression estimates as high as these. Clearly there is enough literature now that an aesthetically influenced and scientifically educated theory of what is transpiring in the lives of students can be constructed.

As can be seen from the exhaustive research literature, there is more than a passing interest in the nonmusical benefits of studying music. Clearly, there is little doubt that those exist. However, a cautionary note is necessary. A fine music education might improve a student's engagement with a school environment. It might also lead to improved academic

success, whether just because the student comes to school more regularly, or because all the other kids they know do their homework so they might as well comply. We may never know. But it should never be forgotten that the primary reason one would receive a fine education in music is because being educated in music matters in and of itself. Experiencing the beauty that is music is no more or less important than having a great experience in studying the scientific method, or the beauty of a parsimonious proof, or the aesthetics of reading Shakespeare. Although the important byproducts that music participation can bring to an educational environment are only becoming clearer with each new study, it should never be forgotten that each student should be afforded the opportunity to study meaningful music because what music can teach is unique from any other educational experience.

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