Cognitive, Affective, and Meta-Cognitive Skill Development through Instrumental Music: A positive impact on academic achievement

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Abstract

This study explored the skills students develop through participation in instrumental music and the effect it has on their academic achievement through student and parent/guardian surveys. Fifty-eight percent of cognitive skills were identified as being obtained by a majority of students, 70% of affective skills, and 71% of meta-cognitive skills were identified as being obtained by a majority of students. Recent research shows that cognitive, affective, and meta-cognitive skills have the potential to increase academic achievement in high school students.

Introduction

Academic achievement of students is an important part of education. No Child Left Behind (NCLB) is a law that sets up standards and expectations of core subject area. As a music teacher, I feel that music is an extremely important core subject area. However, I understand that to prepare students for the challenges of society they need a well rounded education. My philosophy of instrumental music is that while it is an art form unto itself, it also provides many skills that can contribute to overall academic achievement and student success. What skills do instrumental music students develop? Are these skills transferable to other core subject areas, such as Math, Science, English, and Foreign Language? These are the questions, which I attempted to answer through my research.

Literature review

The interdisciplinary perspective of cognitive science has provided a vast source of knowledge pertaining to the learning domains of cognition, affect, and meta-cognition. Bloom (as cited in Hanna, 2007) defines these domains as:

> Cognitive skills include recall or recognition of knowledge and the development of intellectual abilities and skills. Affective skills are defined as individual interests, attitudes, and values. Meta-cognition is knowledge of self and ones personal cognition of thinking about thinking. (pg.8-10).

Cognitive Skills

Sparing, Meister, Wienemann, Buelte, Staedtgen, and Boroojerdi (2007) performed a study with the use of transcranial magnetic stimulation (TMI), which provides evidence of enhanced brain activity seen through neuro-imaging of music participants unlike non-music participants. Aniruddh and Iverson (2007) displayed the benefits of cognitive music abilities to linguistic abilities. Musacchia, Sams, Skoe, and Kraus (2007) also found that the cognitive development of musicians enhanced subcortiacal auditory and audiovisual ability to process speech in addition to music. Costa-Giomi (1999) found that there were marginal academic benefits to participation of students performing piano lessons compared to non-piano students. Longley found that music provides: significant cognitive skill improvement in critical thinking, problem posing, problem solving, and decision-making; music involves communication, manipulation, interpretation, and understanding of complex symbols; and music utilizes spatial, mathematical-logic, kinesthetic, and interpersonal skills; and the ability to use ones imagination and judgment (1999, pg. 6).

Affective and Meta-cognitive domains

The second and third domain of research discussed includes affective and meta-cognitive skills associated with academic success. Affective and meta-cognitive skills can be

associated with each other as thought and feeling theories are interrelated in cognitive theory. Lleras (2008) argues that the non-cognitive domain in student learning is directly related to the affective domain of attitudes and values. O'Connor and Paunonen (2007) found that the non-cognitive trait of conscientiousness was directly related to academic success of students. Conscientious skills and/or traits might include traits such as discipline, time management, goal setting, cooperation, teamwork, communication, listening, and the ability to stay focused while concentrating on different tasks. Hallam (2001) demonstrated a correlation between extensive meta-cognition developments in professional musicians as compared to nonprofessional musicians. Hallam (2001) finds that novice musicians also displayed a complex relationship between the development of meta-cognitive expertise and the use of planning strategies. Zhukov's (2007) study of music also supports the development of meta-cognitive skills through instrumental music. Harland, Kinder, Lord, Stott, Schagen, Haynes, Cusworth, White, and Paola (2000) in their study found that students felt that the involvement in any arts program influenced their meta-cognitive and cognitive skills in a positive manner.

We know from research that there are cognitive, affective, and meta-cognitive skills developed through music

participation. What specific skills do instrumental music students develop? Do instrumental music students achieve academic success in subject areas, such as Math, Science, English, and Foreign Language?

Participants

Participants were 32 guardians and/or parents of students enrolled in the instrumental music and 48 high school instrumental music students. Participants were met at a band parents meeting and introduced to the researcher. The research project was explained and the parent survey as well as participant release forms were provided to those who wished to participate with this research. The investigator also distributed student surveys to parents, who approved their child and/or children's participation in the research. Parents were informed prior to the meeting that extra-time would be needed of their children upon the completion of the parent meeting to fill out the student surveys. All surveys were collected at the conclusion of the band parents meeting.

Data & Research Tool: Instrumentation & Procedure

General data needed from parents or guardians included how many children were participating during the 2007-2008 school year in high school instrumental music. The parent or guardians filled out information pertaining to their child. If the parent or guardian had multiple children involved in an instrumental

program, they were asked to fill out information on their three oldest children. The data pertaining to the parent's children involved in instrumental music included gender, race, current grade level, school attended or home school, the students average grade in Math, Science, English, and Foreign Language for the previous year, instrument played, and the skills they think have been developed through their child or children involved in instrumental music. General data needed from students included the student's grade, gender, race, school attended, the instrument(s) the student plays, the instrumental music ensemble(s) in which the student participates, and the skills they feel they have developed from their participation in instrumental music. The data stated was gathered through surveys given to parents and/or guardians and students shown in appendix A and appendix B. The statements used in the skills portion of the surveys were developed from using Hanna (2007) new interpretation of cognitive and meta-cognitive skills. Both surveys took approximately five to seven minutes to fill out. The items adapted and used for my student survey are shown in Appendix C.

Findings

My research demographic population included all white students and contained the distribution of students between 9th and 12th grade found in table one.

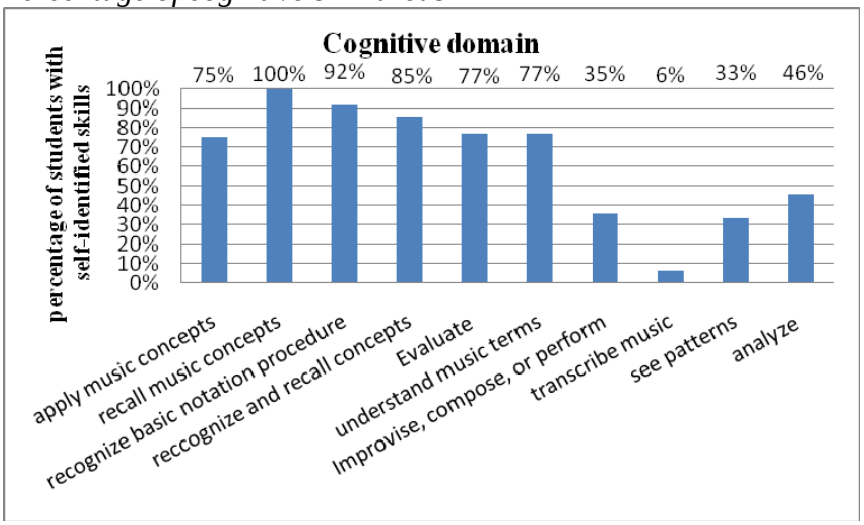
Table 1
Demographics Characteristics of Participants

Gender	Number
Girl	19
Boy	29
Current grade level	
9th	11
10th	10
11th	14
12th	13

Students identified skills, which they felt were part of their capabilities from the domains of cognition, affect, and meta-cognition. Fifty-eight percent of students identified a majority of cognitive domain skills as being acquired. The data from six of the cognitive processes found in table two scored 75% or higher as being skills students have and/or use. Seventy-five percent of students can apply music concepts to the performing, composing, improvising or listening to music using musical terms. One-hundred percent of students could recall musical concepts. Ninety-two percent of students acquired the ability to recognize basic procedures for musical notation. Eighty-five percent of students could recognize and recall concepts for musical theory, time periods, musical styles, and/or composers. Seventy-seven percent

of students are able to evaluate performances. Seventy-seven percent of students could understand music terminology in music when you saw it. The results of the remaining skills, found in table two, identified student skills scored between 30% to 75% with one skill area under 10%. Thirty-five percent of students had the ability to improvise, compose, or perform music using basic music elements. Only six percent of students were able to transcribe music. Thirty-three percent of students could recognize or see patterns. Forty-six percent of students were able to analyze music.

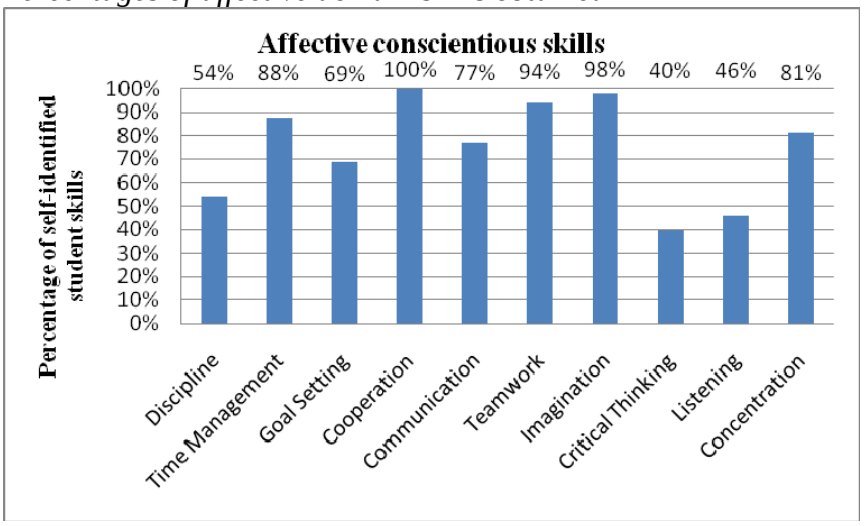
Table 2
Percentage of cognitive skill areas



Seventy percent of self-identified affective skills were acquired by students. The data, which students provided, produced findings about the affective domain focused on traits/ These traits described and encompassed skills an individual would have if they were considered conscientious. Seven of the skills or traits students identified in their responses scored 69% or higher. One-hundrend

percent of students had the ability to use cooperation. Ninty-eight percent of students acquired skills of imagination. Ninty-four percent of students obtained skills of teamwork. Eighty-eight percent of students were able to use time management. Eighty-one percent of students could use concentration. Seventy-seven percent of students acquired skills of communication. Sixty-nine percent of students had the ability to set goals. The three remaining results scored between 40% to 54%. Fifty-four percent of students had acquired the skill of discipline. Forty-six percent of students obtained listening skills. Forty percent of students acquired the skill of critical thining. Table three has the specific details of traits students had in the affective domain.

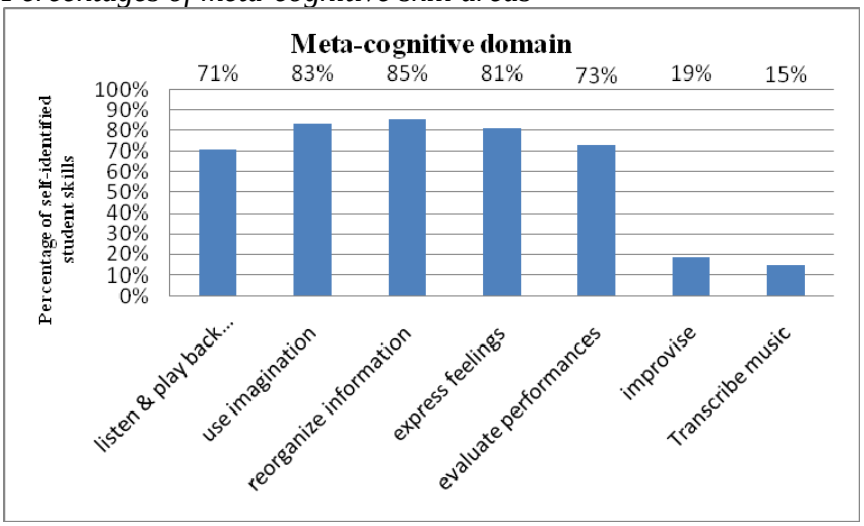
Table 3
Percentages of affective domain skills obtained



Seventy-one percent of meta-cognitive skills were identified as having been obtained by a majority of students. Five of the meta-cognitive skills were self-identified as being acquired

by over 71% of students. The five areas can be seen in Table four. Seventy-one percent of students had the ability to listen to music and play or sing to back without looking at music. Eighty-three percent of students could use there imagination, while playing to make the music tell a story. Eighty-five percent of students could reorganize information in different subject areas into categories, which made sense to them. Eighty-one percent of students used music to helps express individual feelings. Seventy-three percent of student had acquired the skill to be able to evaluate music performances. The lowest self-identified skills can be seen in Table six and include the ability to improvise and transcribe music. Only 19% of students self-identified that they had the ability to improvise. Additionally, only 15% had the skill to transcribe music.

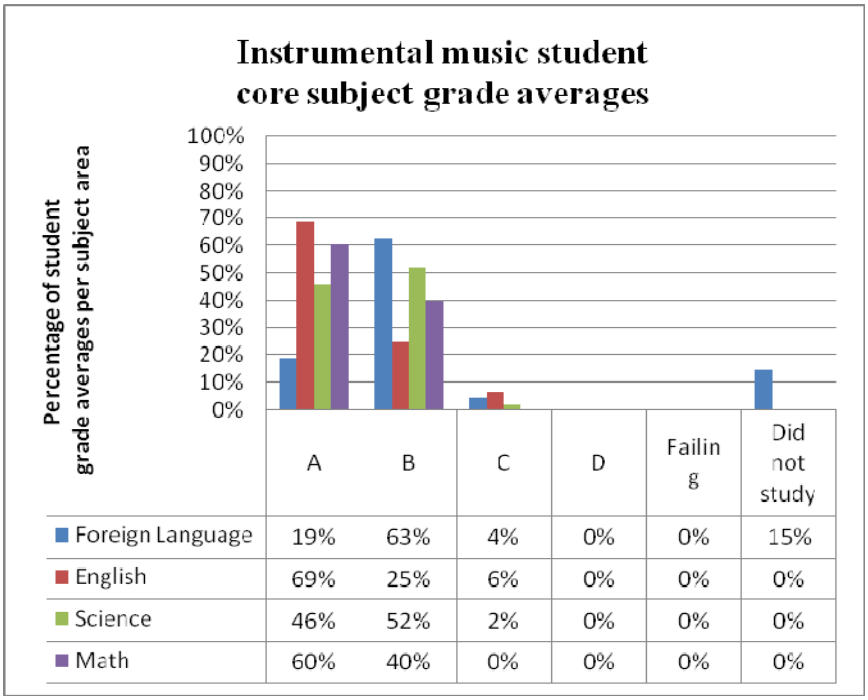
Table 4
Percentages of meta-cognitive skill areas



Students also provided results of what their grades were in the four following core subjects: Foreign Language, English, Science, and Math. The data pertaining to the academic performance of instrumental music students in Math, Science, English, and Foreign Languages seems to demonstrate that the majority students perform well, scoring at grade averages of, A or B grade in core subject areas. The lowest grade averages were C's and the largest percentage of students with this grade was only six percent in the core subject area of English. One-hundred percent of students earned a B or higher in Math, 98% of students earned a B or higher in Science, and 81% earned a B or higher in Foreign Languages. Please see table five below for the specific data results.

Table 5
Instrumental music student grades in core subject areas

Discussion



Summary

The purpose of my research has been to find skills that students develop through instrumental music that may have a positive impact on academic achievement. My philosophy of Music education in addition to creating outstanding musical performance students should develop skills and/or tools, which can assist them to be successful in instrumental music and life. It is my opinion that teachers should strive to produce students who can be successful and effective in society. Through this research, I have developed a clearer understanding of the skills that parents and students feel they may develop in instrumental music participation. With this knowledge I can focus on these skill areas and expand other skill areas, which students and parents did not identify. This information can assist teachers to produce more effective members of society through participation in instrumental music.

I have also been able to associate involvement in instrumental music with grades of students in core subject areas to produce findings of academic achievement, which may be associated with instrumental and other music involvement. The most significant finding of my research is that there seems to be a correlation between student participation in musical activities and a higher level of academic participation (Longley, 1999).

Strengths of the study

The principle strength of my research is that student surveys provided data, which showed a majority of students felt they had cognitive, affective, and meta-cognitive skills. I feel that the student survey included specific skill examples for students to identify. The skills included on the student survey were specifically associated with music related knowledge and skills, which a parent and/or guardian may not have known if their children possessed. Because the skills are broken down into cognitive, affective, and meta-cognitive skills I believe that this can provide a better foundation to producing student academic achievement in other areas of study.

Limitation

The limitations of my study include a small population, limited demographic sample, and a lack of several research tools to evaluate participants. The data collected specifically relies upon the responses of students and the grading criteria of core subject area teachers. As a researcher, I did not have knowledge of the criteria, expectation, and how students earned their core subject area grades. While, I feel that the survey's that I developed may have been effective in providing valid student skill listings and results I am not sure if the parent and/or guardian survey provided a listing of skills that were produced in a similar effective manner

as the student survey. By providing the parent and/or guardian in addition to the student survey, the results between the two surveys could be examined to ensure that the results seemed valid by comparing the two survey group populations. The demographics sample contained only one race of individuals and to produce a more accurate and valid representation of society there is a need to perform further research to include a diverse range of demographic participants. While my survey provided significant information, I believe that if one can use multiple methods of data collection this would produce further claims of validity.

There was one principle area of focus during my research. My primary concern in research was the interdisciplinary area of cognitive science focusing on skills, which can be cognitive, affective, or meta-cognitive. While, this is a broad field of study there are many researchers who have focused on how music impacts learning, the brain, and skills associated with the affect, cognition, and meta-cognition. Whether individuals researched the brain or academic achievement a majority of research confirms that there is an impact on individuals from participation in musical activities (Aniruddh, & Iverson, 2007; Hallam, 2001; Harland, Kinder, Lord, Stott, Schagen, Haynes, Cusworth, White, & Paola, 2000; Longley, 1999; Musacchia, Sams, Skoe, & Kraus, 2007; Zhukov, 2007). While there are many studies that examine skills

and many studies that examine academic achievement, I did not find studies which provided a correlation between skill development and academic achievement. There was one study which stated that music produced only a marginal difference in achievement of musicians vs. non-musicians (Costa-Giomi, 1999).

Implications and Recommendations

In conclusion, it is my belief that the cognitive, affective, and meta-cognitive skills are important contributing factors to the academic achievement and success of students in society. The results displayed that while a teacher is providing instruction for music students many skills are gained that are not traditionally items tested from the affective and meta-cognitive domains. It is my belief that these two areas affective and meta-cognition, influence specific skills that allow transfer of knowledge from subject to subject and assist the potential for student to achieve success. I would have preferred the instrumental music student's data to reflect higher percentages on the specific cognitive music skills, but feel that the value of these other domains is very important to student achievement. It is these intrinsic learned skills taken from the affective and meta-cognitive domains that make teaching music rewarding, because they provide skills students not only need as successful musicians, but additionally as successful human beings in society.

My recommendation is that further research and studies should be done in this area. Research should be done to assist in producing data from a broad demographic population. In addition, I feel that studies that compare and contrast instrumental music students with non-instrumental music students to produce data of possible skill development differences between the two population groups, could benefit music advocacy.

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Appendix A
Parent or Guardian Survey

How many children do you have in HS right now?
Please Circle One 1 2 3 More

Please answer the following questions for your children in high school.
If you have more than three children, please answer for the three oldest

Child 1	**Child 2**	**Child 3**
Age-	Age-	Age-
Gender- F or M	Gender- F or M	Gender- F or M
Grade: 9 10 11 12 School _____	Grade: 9 10 11 12 School _____	Grade: 9 10 11 12 School _____
Is your child home schooled? *Circle One* Yes or No	Is your child home schooled? *Circle One* Yes or No	Is your child home schooled? *Circle One* Yes or
Race – *Circle One* Bi-Racial White African American Asian Native American Hispanic Other_____	Race – *Circle One* Bi-Racial White African American Asian Native American Hispanic Other_____	Race – *Circle One* Bi-Racial White African American Asian Native American Hispanic Other_____
What instrument(s) does he/she play? *List*	What instrument(s) does he/she play? *List*	What instrument(s) does he/she play? *List*

Child 1	**Child 2**	**Child 3**
What skills may your child have developed in Instrumental music? *Check all that apply or fill in other* Discipline _____ Able to memorize_____ Ability to stay focused_____ Able to concentrate on different tasks_____ Time management skills to get thinks done_____ Cooperation _____ Can recognize patterns in music_____ Teamwork _____ Able to express feelings_____ Other_____ Other_____ Other_____ Other_____	What skills may your child have developed in Instrumental music? *Check all that apply or fill in other* Discipline _____ Able to memorize_____ Ability to stay focused_____ Able to concentrate on different tasks_____ Time management skills to get thinks done_____ Cooperation _____ Can recognize patterns in music_____ Teamwork _____ Able to express feelings_____ Other_____ Other_____ Other_____ Other_____	What skills may your child have developed in Instrumental music? *Check all that apply or fill in other* Discipline _____ Able to memorize_____ Ability to stay focused_____ Able to concentrate on different tasks_____ Time management skills to get thinks done_____ Cooperation _____ Can recognize patterns in music_____ Teamwork _____ Able to express feelings_____ Other_____ Other_____ Other_____ Other_____
Last years Average grade in **Math** A B C D Failing **Science** A B C D Failing		**English** A B C D Failing **Foreign Language** A B C D Failing Did not Study

Appendix B **9th through 12th grade Student Survey**

1. What grade are you in?

2. Where do you go to school?

3. Are you home Schooled? Yes or No *Please Circle one*

4. Gender- F or M *Please circle one*

5. Race – *Please circle One*

Bi-Racial White African-American Asian Native American Hispanic Other_____

6. What instrument(s) do play now? *List*

7. What was your average last year in the following subjects? *Please circle one*

Math A B C D Failing Did not study **Science** A B C D Failing Did not study
English A B C D Failing Did not study **Foreign Language** A B C D Failing Did not Study

8. X the box to the right of the skills you have and/or use.

Skills	**X**	**Skills**	**X**	**Skills**	**X**
Recall Music Vocabulary, symbols, note, values, and instrument parts.		Recognize basic procedures for musical notation		Recognize and recall concepts of music theory, time periods, musical styles, or composers	
Understand music terminology in music when you see it.		Can explain, and discuss performing, composing, improvising, or listening to music using music terms		Use imagination, while playing music to make the music tell a story	
Improvise, compose, or perform music using basic music elements		Can apply music concepts to performing, composing, improvising, or listening to music		Able to transcribe music	
Skill	**X**	**Skill**	**X**	**Skill**	**X**
Discipline		Time Management		Goal Setting	
Listening		Concentration		Cooperation	
Communication		Teamwork		Imagination	

Critical thinking		Can see patterns in different items		Read & notate music	
Analyze Music		Evaluate Music performances		Improvise	
Listen to music and play or sing it back without looking at music		Can reorganize information in different subject areas into categories which make sense to you		Helps you express feelings	
Ability to say focused		Able to concentrate on different tasks		Can recognize patterns in music	
Other _____		Other _____		Other _____	
Other _____		Other _____		Other _____	

9. Write anything you feel is important about the skills you have developed.