

A Study of the Relationship Between Instrumental Music Education and Critical Thinking in 8th- and 11th-Grade Students

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Abstract

The purpose of this study was to explore the possible relationship between instrumental music education in Grades 8 and 11 and critical thinking as assessed by the Pennsylvania System of School Assessment. The subsets that were examined included Reading (B): Interpretation and Analysis of Fictional and Nonfictional Text, which assesses the academic standards 1.1, Learning to read independently, standard 1.2 Reading critically in all content areas, standard 1.3 Reading, analyzing and interpreting literature, and Mathematics, sections C.1 Geometry—Analyze characteristics of two and three dimensional shapes, D.2 Algebraic concepts—Analyze mathematical situations using numbers, symbols, words, tables and/or graphs, and E.1 Data analysis and probability—Interpret and analyze data by formulating answers or questions (Pennsylvania Department of Education, 2009–2010). The sample consisted of Instrumental students ($N = 50$) and Noninstrumental music students ($N = 50$) over 2 graduated high school classes. The results indicated that the Instrumental music sample consistently outscored the Noninstrumental music sample when comparing the Reading B, Mathematics M.C.1, M.D.2, and M.E.1 subsections of the Pennsylvania System of School Assessment with significant increases noted from 8th to 11th grade.

Dedication

All the work and desire that I have today, I owe to my father, Kenneth Zellner, who passed away during the doctoral process. For someone who never stepped foot inside of a college classroom, you are much wiser than I will ever be and I can never thank you enough for all the values you instilled in me.

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

Traditional music education trains students to perform on their instrument by recognizing both rhythmic and tonal patterns within a structured musical experience. The making of music seeks to go beyond notes on a page. It seeks to energize and create musical compositions that make aural sense to the untrained listener. The instructional design of music education is to teach the student both melodic and rhythmic patterns through the process of active learning. This focuses the responsibility of learning on the learner, thereby allowing the learner to engage in the processing of information in an interactive environment where the teacher uses activities that promote student engagement through problem-based, collaborative and cooperative learning (Prince, 2004). An example of active learning includes interactive lectures, which incorporate activities that encourage discourse between students using demonstrations, visual aids or peer interactions. Prince cited a study by Ruhl, Hughes, and Schloss that examined a traditional classroom lecture of 45 minutes versus a lecture that allowed the students three pauses of 2 minutes each to check their notes with a peer. The results indicated increased short and long term retention in the group that allowed for the breaks. Other examples of active learning include the use of analogies, contemplation, student groups,

class discussions and verbal studying. These activities must promote thoughtful engagement and promote learning outcomes (Prince, 2004).

Interactive engagement activities have been shown to increase conceptual understanding. Hake (1998) examined 6,000 undergraduate students in introductory physics courses that utilized substantial interactive engagement methods. Those students who studied under this method outscored their peers in conceptual understanding scores by nearly two to one. The origins of active learning can be traced back to hands-on learning theories, which are derived from master–apprenticeship models that are based on knowledge through experience. The theory of active learning is at the very core of music education and in becoming a musician. The student is an active and functional learner who is contributing directly to the output of a product, much like that of an apprentice.

The first step of the musical process is to be able to master the instrument. This mastery process was famously established in the 1920s by Suzuki, resulting in his own pedagogical method called Talent Education. Suzuki was the son of the first and most prolific Japanese violin maker. Suzuki credits this early exposure to music as well as his father’s willingness to learn from others and strong moral fortitude for shaping himself as a person and educator (Cooney, Cross, & Trunk, 1993).

The philosophy of Shinichi Suzuki’s educational method is that all students are capable of learning music just as they are capable of learning and mastering a language. Suzuki was mesmerized by the language acquisition of children and the capabilities that are displayed in language versatility by the ages of 5 and 6. All learners must be nurtured through the learning process, and it is the process that is at fault when there is a slow learner not the individual (Cooney et al., 1993). Suzuki was convinced, however, that the

path to any learning begins with the creation of character, and this character is the precursor to ability. The motivation of the learner in this method is paramount, and when the motivation is no longer present, the activity ends.

Suzuki insisted that students learn his Talent Education method by imitating an exact model while learning each step perfectly before advancing to the next. By the end of the system, the student has synthesized each lesson so that the playing of the music had become a habit. In the Suzuki method, the child masters each new composition acquiring new skills with each piece preparing the student for the ones to follow (American Suzuki Center, n.d.). Even within this regimented approach to education, Suzuki believed that education should be for everyone, appeal to the child's interest and should in turn work to develop a total person.

The Suzuki model insists on the mastery of each skill before a new skill is added. While this quest for perfection would seem to create monotony in adults, children work in the environment that they are given. By their inherent nature of curiosity and their inquisition for understanding they work toward perfection through repetition without hesitation. Many times in contemporary education, goals are sought rather than the development of the process of acquiring information. End results are measured as tests and other assessments; however, as Suzuki stated, these are more a measurement of the teacher than of the student (Cooney et al., 1993). The clear application for modern education is the perfection of process rather than the perfection of the student. If students have committed themselves to the process of learning and develop along this path, their success will breed success.

Suzuki's Talent Education spoke much to the development and mastery of skills and this learning method utilizes the teacher-centered method to focus and hone the students' transfer of knowledge. While the students are actively engaged in the learning process it does little to address student's prior knowledge and incorporate discovery learning. Teachout (2007) recognized this disparity in music education. He stated, "Music education should be about developing such musical knowledge, skills and dispositions to demystify music and afford all students opportunities for higher levels of independent engagement with music" (p. 21). Traditional music education, which is based mainly on large ensemble settings, utilizes the teacher-centered model, in which the instructor is responsible for providing feedback. The instructor guides rehearsals with the goal of these rehearsals being an excellent musical performance. The performance is then a reflection of the instructor's skill and expertise both in the field of music as well as leadership (Teachout, 2007). However, this philosophy does little to impart the student with problem-solving or critical thinking skills. Teachout stated that music education should not only be about what students can do, but what they know and how they value music. To accomplish this task, a sequenced and spiraled curriculum model must be established in order for the active learning model to be complete.

One of these skill sets is the ability to develop critical thinking skills. The construct is that as students have exposure to musical training their ability to think critically increases. The ability to think critically in music allows for the performer not only to interact within a musical composition but also to anticipate and solve problems in action. The performance of music is a delicate balancing act between the entire melodic, harmonic and rhythmic acts that occur at the same point in time, thus allowing for a

seamless composition to occur. Without active critical thinking on the part of the performer, the music itself would not be allowed to be a serendipitous exchange between the musicians.

Background of the Study

“Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed” (Halpern, 1997, p. 4). In 1998, Halpern proposed a four component model for the transfer of critical thinking skills. The first component is attitude, which she describes as the recognition of critical thinking as a skill and then the implementation of such by the individual. Next is that the instruction and practice of critical thinking as a skill in that a person will recognize the benefit of the utilization of critical thinking skills. The third component is the ability to transfer the elements of problem and the application of them to a new contextual situation. The last component is the use of metacognition to enhance and facilitate the process of critical thinking.

In order to apply Halpern’s model, the delineation between music listener and performer must be recognized with the latter of which being the point of reference for this research. Being that music is an active endeavor that involves a multisensory experience, the application of critical thinking skills is both a complex task and developmental process. The first component of Halpern’s model is the recognition and implementation of critical thinking as a skill. Within a musical context, this invites the teacher to act as a guide in order for proper interpretation, analyzation and execution in the practice and performance application of the musical experience. Lisk (2006)

described music as intelligence in action and that performing in an instrumental ensemble requires a multisensory approach combined with a perceptive decision-making process. Making music is then a problem-solving, in-the-moment exercise. Students, however, must be taught not only how to apply critical thinking skills but to recognize where they become a necessary and vital component of music. Between the ages of 5–12, when the children are developing this musical intelligence repertoire, the children are functioning within the concrete operational period, which would allow for optimal operant conditioning. The concrete operational period is where the child is gaining the ability to experience and understand multiple perspectives coupled with a structured, guided and appropriate stimuli and response behavior. Therefore, students can be taught to think critically within a musical environment.

Moog (1984) described music as a multisensory learning experience that involves the temporal phenomena of acoustic, motoric, and other. The last classification of other refers to the outside conditions that may be experienced during a musical experience such as color, temperature and pain.

This creates a crossroads in that music becomes both an individual and ensemble task each requiring in its own specific skill set. The ensemble setting allows for the interaction of students with others either developing or having established musical abilities. The latter would allow for the application of Vygotsky's zone of proximal development theory, which occurs when people are learning from their interaction with someone that has a more advanced ability than theirs (Sternberg, 2003).

The second step in the Halpern structural model states that the instruction and practice of critical thinking skills are necessary for their transfer. Lisk (1996) stated that

the musician must have an active involvement in the musical decisions of the ensemble, therefore allowing the individual to create meaning in the musical performance. This active involvement needs to include both the intrapersonal and interpersonal development of the musician in order to facilitate a consonance within the ensemble. In this scenario, the music teacher or director becomes the vehicle behind the transfer of critical thinking skills, through his use of guided practice on a routine and structured basis. This directly leads to the third component of transferring this structured facilitation to new contexts. In the setting of a music ensemble rehearsal, a new piece of music allows for a reexamination of skill sets that previously have been previously acquired and the transfer of said skill sets to the new context. Music because of its inherent nature of patterns and structure allows for a combination of both applying known skills as well as the learning of new ones.

The last component introduced by Halpern is metacognition, which is the reflection upon one's thinking process. This process, which is sometimes referred to as thinking, about thinking is the evaluative stage in the critical thinking process. This evaluation provides for an examination of one's actions in retrospect and, therefore, the possibility of providing alternatives or response to similar stimuli in future situations or behaviors.

These cognitive connections between music and other skills sets have been recognized as a contributory factor to an individual as a whole. Because of the multisensory nature of music, the development of musical skills has been shown to have an impact on a student both academically and personally.

Statement of the Problem

The research problem is to what extent does instrumental music education have an impact critical thinking skills. The purpose of this study is to demonstrate the impact of instrumental music education on critical thinking skills of school-age students.

Purpose of the Study

The purpose of this research was to explore the relationship between critical thinking and instrumental music education. “If creative thinking is just everyday problem solving, then there should be general principles that can be applied across domains of knowledge” (Halpern, 1996, p. 372). Problem solving can be described as the difference between what has happened and what one wanted to happen. The solving aspect occurs when one takes corrective action in order to meet objectives. The Global Development Research Center (2008) outlined the following sequential steps for problem solving:

- Problem definition
- Problem analysis
- Generating possible solutions
- Analyzing the solutions
- Selecting the best solution(s)
- Planning the next course of action (next steps)

This research was done through analyzing testing of both instrumental music participants and nonparticipants through the course of their school years (8th and 11th grades). This study was able to examine the differences between students and the amount of music exposure they have had based on the number of years. According to Breakwell,

Hammond, Fife-Schaw, and Smith (2006), this would constitute a longitudinal design, whereas data are being collected from the same sample over a period of time with all data being collected retrospectively.

Research Questions

The main research question examined the relationship between instrumental music education instruction in Grades 8 and 11 and critical thinking skills on the Pennsylvania System of School Assessment (PSSA; sections RB, C.1, D.2 and E.1).

PSSA Operational Definitions

- Reading B: Interpretation and analysis of text
- Mathematics C.1 (geometry): Analyze characteristics of two and three dimensional shapes
- Mathematics D.2 (algebraic concepts): Analyze mathematical situations using numbers, symbols, words, tables and/or graphs
- Mathematics E.1 (data analysis and probability): Interpret and analyze data by formulating answers or questions

These selected areas not only provide the appropriate prerequisite of critical thinking skills and demonstrate problem-solving ability but also remain consistent data throughout the grade levels of the assessment (8th and 11th).

Research Question 1

How does the number of years (8th and 11th) that a student is involved in music education provide any statistical difference in the development of critical thinking skills as assessed by the PSSA (cumulative score per grade level)?

Research Question 2

How do the Instrumental music students' mean scores on sections (RB, C.1, D.2 and E.1) of the PSSA assessment compare to Noninstrumental music students from 8th to 11th grade.

Research Question 3

Utilizing the means of the individual PSSA scoring (sections RB, C.1, D.2 and E.1), what is the relationship between the following:

- Instrumental group scores versus Noninstrumental group scores from 8th–11th grades

Significance of the Study

The significance of this topic relates to all of music education. In the times of cutbacks and the so-called return to the basics, music education for its own sake has placed music on the endangered list. Bridging this gap in literature would allow music educators to demonstrate and show the importance of music education to all students.

This study examined the development of critical thinking skills over a period of time. The students' scores will be available from their 8th- and 11th-grade years. This means that the research can quantitatively demonstrate the effect of music education of a period of time. Psychologically, it allowed for a greater understanding of how thought, adaptation and developmental processes are acquired by an individual. It allows for the congruent developmental processes and the ways in which they can be affected by outside influences.

In addition, this study engaged the active learning process and its own effectiveness. Active learning focuses the responsibility of learning on the learner by allowing the learner to engage in the processing of information in an interactive environment where the teacher uses activities that promote student engagement through problem-based, collaborative and cooperative learning (Prince, 2004). McManus (2001) stated that much of the theory of active learning is the difference between a teacher-centered paradigm and a learner-centered paradigm. The teacher-centered paradigm is much the traditional approach of higher education. The teacher passes information by lecture to the student, who acts as an empty vessel. The learner-centered paradigm focuses on the absorption and application of material by the students. The differences between these two philosophies of learning are as basic as those of learning themselves. The teacher-centered paradigm is structured on the premise that the teacher has mastered the material and is going to pass this knowledge along to the student. Conversely, the student-centered paradigm recognizes that the student has already accumulated knowledge and that by processing the information dynamically, new information and knowledge structures will be informed. Perhaps more importantly, these paradigms point to significant differences between the relationships of instructors and students. In the teacher-centered paradigm, the instructor is the center of learning. However, there is limited or no interaction between student and teacher. In the learner-centered paradigm, the relationship and interaction between teacher and student is the cornerstone of transferring the material from information to knowledge. The teacher-centered paradigm and learner-centered paradigm can also be referred to as the difference between passive

and active learning, since passive learning is mostly accomplished through verbal lectures where the student is simply a recipient of the information (McManus, 2001).

The influence of instrumental music education on the development of the cognitive process allows for greater understanding of the ability of instrumental music to influence learning. Because of the availability of the students' scores from their 8th- and 11th-grade years, the research can quantitatively demonstrate the effect of music education of a period of time. Critical thinkers are evaluating new situations, looking for complexity and ambiguity making connections, speculating, searching for evidence, looking for connections between particular situation and prior knowledge and experience (Halpern, 1996).

In addition, this research allows for a greater understanding of how thought, adaptation and developmental processes are acquired by an individual. It also allows for the congruent developmental processes and how they can be affected by outside influences such as music. Schellenberg (2006) examined 6- to 11-year-old children who each varied in amount of musical training. The baseline IQ was established by administering the Wechsler Intelligence Scale for Children (WISC-III) as well as other areas of intellectual functioning such as grades in school and standardized tests of academic achievement. The sample was comprised of 72 boys and 75 girls ($N = 147$) ages 6–11 recruited from a middle class suburb of Toronto, Canada. The predictor variables were measured using a questionnaire that was administered to the parents about their child's history with private music lessons. The criterion variables consisted of measures of intelligence, which were assessed using the WISC-III, academic ability, which was assessed using the Kaufman Test of Educational Achievement (K-TEA), and

social adjustment, which was measured using the Parent Rating Scale of Behavioral Assessment System for Children (BASC).

The principal analyses, consisting of correlations between the main predictor variable and criterion variables demonstrated that music lessons were positively correlated with both academic achievement and IQ but not social adjustment. The outcome was that the duration of music lessons has a small but positive correlation to measures of intelligence.

The second study examined the effects of long term music lessons on intellectual abilities and more specifically if these had lasting effects even after the music lessons had ended. The participants of the second study were undergraduates at a suburban Canadian university with the range in age being between 16–25 with more than half taking private music lessons $N = 84$ for an average of 7.8 years. The students were surveyed based on a questionnaire where the students were paid to participate in the 2-hour survey. The criterion variables in the second study consisted of intelligence and academic achievement, which was measured using the Wechsler Adult Intelligence Scale (WAIS–III), and an additional subtest was Object Assemble, which was administered to measure spatial–temporal ability (Schellenberg, 2006). The results indicated that taking music lessons regularly was correlated positively with IQ especially in the areas of perceptual organization and working memory.

The results of the Schellenberg (2006) study indicated that there was a positive correlation between childhood lessons and IQ, and that the correlation would have an impact into early adulthood. Perhaps the more important conclusion in this study is that there is a direct causal effect between the duration of musical training and the predictor of

better intellectual functioning. The benefit of this study to the efforts of music education was enhanced because the effects of music lessons on intelligence could not be discounted by parents' education or family income.

As a result of the previous findings, intelligence is an adaptable and modifiable skill that can be enhanced over a period of time. This, in turn, directly relates to the ability of instrumental music education to create cognitive links through the conceptual development of child and adolescent mind. As presented in the Schellenberg (2006) study, the single factor of instrumental lessons could account for the substantial proportion of the variance of the tests. Therefore, the summation could be made that music lessons were the determining predictor valuable that altered the test scores. Critical thinking, just like that of intelligence, personality and academic achievement is a skill that can be either taught or enhanced over a period of time. Therefore, instrumental music education can have a similar longitudinal impact to a student's critical thinking skills. Halpern (1997) stated that critical thinking skills can be taught effectively through the transfer of training where thinking skills can be applied to a vast array of contexts. When people think critically, they are evaluating the outcomes of their thinking processes, which could involve solving problems, making inferences and evaluating decisions. In music education, critical thinking skills are applied where the paradigm shifts from teacher-centered to student-centered learning. The musicians use these skills to evaluate their performances in the context of technique, intonation, stylistic interpretation, notation and ensemble (Reimer, 2002).

Definition of Terms

Critical thinking/problem solving. Problem-solving assessments are administered as part of the PSSA with the testing occurring in 3rd, 5th, 8th, and 11th grades. The PSSA uses open-ended questions to assess student's problem-solving ability. This assessment uses open-ended questions in both the reading and mathematics portion of the assessment. The PSSA provides a separate score for each individual to their respective schools.

Instrumental music education. The student will have participated in the following grade levels and therefore demonstrate formalized experience in music education (instrumental music lessons and band). Fifth grade will have 1 year of instrumental music experience, 8th grade will have 4 years, and the 11th graders will have 7 years of experience in music education.

Problem solving and critical thinking. According to Skinner (2005), the determinant for how one thinks critically must be based and trained in operant conditioning. Therefore, the abilities required to be a critical thinker are trainable through a sequenced stimuli and response generative conditioning. Skinner referred to this action of decision making as the behavior of deciding with the primary reason being to escape from indecision (Skinner, 2005). Skinner stated that problem solving in its most basic sense is simply satisfying a need, such as hunger. He said, "Problem-solving may be defined as any behavior which, through the manipulation of variables, makes the appearance of a solution more probable" (Skinner, 2005, p. 247). To any problem, there are a multitude of responses. Some of these responses are based on past situations, and the same response may work with this given stimuli. However, there are times when an