COMPOSING IN GROUPS: CREATIVE PROCESSES

OF THIRD AND FIFTH GRADE STUDENTS

by

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ABSTRACT

Composing in groups: Creative processes of third and fifth grade students

Music education has long included creative music activities and provided opportunities to compose in foundational learning environments. As the use of varying technologies increases in foundational learning, it is unclear how composing with acoustic rhythm instruments compares with technology-mediated applications when considering pedagogy and children's creative processes in third and fifth grades. It is also unclear what differences of application technology-in-composition lesson plans require when considering composing at different grade levels or if there are gender differences when composing at these levels.

This experimental study, with a between-subjects factorial design, was completed in three phases. In the first phase, participants were tested on the Intermediate Measure of Music Audiation (IMMA) (Gordon, 1986). In the second phase, children were invited, in groups of four by grade levels three and five, to compose with acoustic rhythm instruments or a graphic notation computer program, *Hyperscore*. Participants' compositional processes were observed using a researcher-constructed protocol, the Crawford Index of Quality for Composing Groups (CIQCG) (Crawford, 2016). The third phase tested all participants using the Measure of Creative Thinking in Music (MCTM) (Webster, 1994). Additionally, variables of grade level and gender were tested.

Results showed that third grade participants scored higher than fifth grade on the IMMA. Third grade scored higher composing with *Hyperscore* while fifth grade participants scored lower. No statistically significant correlations were found between gender and IMMA scores, however, male participants composing with acoustic instruments scored higher on the MCTM while female participants scored higher on the MCTM after composing with *Hyperscore*. Additionally, there were no statistically significant correlations between the test scores for the IMMA, CIQCG and MCTM,

indicating that musical aptitude, musical composition process, and creative thinking are three separate areas in which music educators may focus.

Implications of this study for music education indicated that while technology may be a well-received tool for compositional work in classrooms, acoustic instruments were also well received by the third and fifth grade students in this study. These findings further indicate a strong need for development of close observation of composing opportunities in music classroom groups. Creative processes may be observed with greater understanding through use of the Crawford Index of Quality for Composing Groups.

Keywords: composing with technology, *Hyperscore*, composing with traditional acoustic instruments, children, creative process, music composition, Intermediate Measure of Music Audiation, Measure of Creative Thinking in Music, Crawford Index of Quality for Composing Groups

DEDICATION

This dissertation is dedicated to all who listen to the music children compose, but especially to those who help children compose it.

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I am indebted to the children who participated in this study without whom this work would not exist.

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My deepest gratitude is given to Kelly, my precious daughter Elicia, Nathan, and my dearest granddaughters Kylee and Lyla. To my parents, Pauline and Dr. Darrell Crawford, my music educator father whose mentorship has supported me musically throughout my life, thank you for your support of me and this work. To Dr. Christine D'Alexander, thank you for your friendship, best fun and laughter ever, and for supporting my thinking in such a scholarly way.

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PREFACE

While earning my undergraduate degree in composition, parents called, unexpectedly, asking if I would work with their children whom they described as composers. Following these conversations, parents would bring their children to my home in the hopes that there might be someone to work with their child compositionally. These children had most often been composing with acoustic instruments such as the piano, learning computer programs for notation, and composing parts. Each of these families appeared to hold limited value for their in-school music teacher and music program to assist their children with compositional learning.

I understood these young composers and songwriters well because I, too, had begun composing at the age of six. As was true for me, these children were following their natural, instinctive musicality by composing music. Having found the piano and being able to work with chords by age three and having begun piano lessons at the age of four, I received no assistance with my own composing anywhere during my private lessons, general music or band, from elementary through high school. I learned to arrange music on my own, checked out books from the library, and asked questions when I had them. For me, attending college followed a successful career in Hollywood writing and producing commercial music for film, television, songs, marketing projects, and also, founding a boutique agency for representing emerging composers for film.

In 1991, I was invited to work with the Suzuki School associated with my university. The program was long running and well-established. My job was to develop a composition and music theory program for K-12 Suzuki strings and piano students. My work with these children included inviting them and grouping them for development of four-part strings compositions that they could perform in their concerts. Students in these composition classes had at least three

years of experience on their instruments, extraordinary ear training skills, and remarkable abilities to notate their ideas in Western notation. Some of the most remarkable scores I have heard from elementary-level students came from the Suzuki group.

Several years later, I taught at a private K-12 music school. Teaching individual students again, children with composing and song writing interests took piano and composition lessons with me. Their pieces were creative, much longer than I had previously encountered, and their compositional interests seemed to echo what they knew of the music industry and commercial music. These were strong musicians, and, music listeners.

A few years later, I entered graduate school intending to study and write about young composers. I earned a music teaching credential. My thesis invited music education professors to discuss their experiences with presenting K-12 and music students in music teacher education programs opportunities to compose (Crawford, 2004). The results were indicative of a profession interested in the topic yet relatively few with time to invest, as well as, limited knowledge of who and when to teach what. My response to the findings of my thesis was to develop clinics for conferences. Foundational learning was where I found myself working and I began teaching elementary general music offering students a variety of opportunities to compose. I developed materials for both music educators and students to use in classrooms and, while there is nothing more engaging for me than working with the entire fifth grade to develop a composition or song to perform, I had to transform my teaching methodologies into lesson plans.

Over a period of eight years in public schools, presenting opportunities to compose, and developing materials to support these projects, I began to notice recurring student types. These included students who 1) possessed a natural ability to compose (as I had seen early on in my work as a piano teacher and in the Suzuki School), 2) exhibited ability to compose after being

invited to compose, 3) enjoyed composition projects but exhibited no further inclination to compose, 4) had little to no interest in composing, and, a more recent addition to this list, 5) composed at a higher level, with greater interest, or with interest where there was none prior, when finding a particular instrument that was appealing. See Chapter Five for the conceptual framework I propose.

What I have come to value greatly is student-centered compositional teaching experiences. Activity with creating music is one of the best ways to learn about it. My interest has always been students' process, but often I am amazed by students' musical outcomes, referred to as “product” by the music education profession. I am interested in how music educators develop composing projects for groups of students with different types of abilities, and how these collaborations are designed, utilized, and modified differently over time, by different groups. I am also interested in what creates successful group experiences. And, for more than thirty years, my own compositional work has included using notation and recording software, so I want students to be capable, no matter their story, of using technology, well-equipped to manage technology as it changes our learning environments and our musical world at its current fast pace.

What made student process and product remarkable with the students I have observed? Creative thinking was clear and communication was uniquely mature, perhaps related to experience. Students' ideas were also unique, novel and fresh, had originality, and presented logical syntax. Aspects of musicality, related to creativeness, included the way these kids worked together, were not shy about communicating with each other, and how much they thoroughly enjoyed the process.

Interestingly, not one student has ever seemed to question if they could compose and there is often joy in the compositional process. This is the foundation of my dissertation, that composing is possible for any student, that there are ways teachers may observe the quality of students' process when composing, and that there are different student types to consider when working compositionally with children. This is true whether a teacher composes or does not, or has, or has not worked compositionally with children, but may in the future. The ability to compose as a child exists and is something the music education profession may need to more consistently embrace.

CHAPTER I

INTRODUCTION

> *You can't give a child musical knowledge until he has had musical experiences. The best learning is that which cultivates and refines one's emotions, and you can't reach a child's emotions through a page of printed signs. He must feel something first.*
>
> *Satis Narrona Coleman, 1917, p. 50.*

Providing opportunities to compose has long been found in music education classrooms. Even though inconsistent, there are those who have greatly benefitted our profession by their example of providing opportunities to compose with students at the K-12 level over time.

For example, in 1895, Satis Narrona Coleman began developing opportunities for children, which she called "creative music" (Volk, 1996). With an ethnomusicological perspective, Coleman (1922) studied Native American instruments as well as other instruments from around the world. Coleman developed a number notation system and, working with very young children aged two to four, provided instruction for creating music on instruments students made themselves and composed with. Using an improvisational approach, Coleman believed children should be engaged by musical activities for fostering lifelong music making (Boston, 1992). From 1917 to 1942, Coleman taught music and wrote numerous publications about her work; her experiments were completed in public schools and through the Association for Childhood Education (see Southcott, 2009).

Throughout the twentieth-century, textbooks designed for music teachers have included chapters related to creative music projects and composing with children (Campbell & Scott-Kasner, 1995; Harrison, 1983; Pierce, 1959; Reimer, 1970; Snyder, 1957; 1962; Timmerman, 1958; Wright, 1941). More recently, texts such as *Music outside the Lines* (Hickey, 2012) and *Composing Our Future* (Kaschub & Smith, 2013) have been published to support music teaching

and learning. Chapters found in these volumes include focused elements of study across disciplines. Other examples include Koops's (2013) chapter on composing in middle school instrumental ensembles, Strand's (2013) work on composing in choral settings, and Dammers' (2013) discussion of composing with technology.

In recent decades, for some, "creating" music at the elementary level has come to include engagement of children musically in context with the development of creative thinking (Randles & Webster, 2013). While offering opportunities to compose independently, materials, research, and newly revised standards (National Core Arts Standards, 2014) support the relevance of composing and creativity within the music classroom for both independent and group activities.

While opportunities for children to compose as a part of creative musical learning may provide potential for their musical development, some have argued, over time, for the use of more descriptive terms when discussing creativity (Webster, 1990). With concern for educational undertones that prefer convergent thinking (i.e., one correct answer), Webster noted that we may actually, as a profession, be confused through superlative knowledge and subjective definitions of creative thinking in music as to what creativity really is. Webster proposed that performance opportunities do not equal creativity, that creative work may appear chaotic, and that more time is required in teacher education programs for developing creative music teaching strategies with and for educators.

To complicate matters, the pervasiveness of new technologies touching children's lives

and the roles these play in music education classrooms is also changing the educational landscape. Dorfman (2013) contends that:

> We must understand that technology is not just a set of toys, nor is it just a set of teaching tools. Rather, technology is an important means by which we can teach music—introduce its concepts, reinforce them, provide experience, provide practice, assess and evaluate achievement, structure aesthetic interactions, and do all the educational activities that make learning music a distinct, artful pursuit. (p. 4)

As the development of iPad, MOOC[1], and Blackboard[2] applications increase and virtual environments expand, disciplined study of differences in the composing process in classrooms associated with online tools, technology, and computer programs as compared with elementary acoustic instruments may be urgently needed. However, few studies to date involve observation of elementary students' creative process through composing using different tools (i.e., acoustic rhythm instruments and computer technologies) or comparison of these.

The thrust of this experimental study was to determine quantitatively if there were differences between groups composing in terms of creative process, and to determine the role of music aptitude and creative thinking dimensions, grade, and gender. To support the need for greater understanding of differences in the creative process of third and fifth grade students, participants worked in groups of four with acoustic rhythm instruments or technology in a composing treatment.

Need for the Study

Recent empirical studies have highlighted the importance of music composition in sociocultural contexts of creative and collaborative process (e.g., Wright, 2010), yet little has

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[1] MOOC is an acronym for massive open online course on the Internet

[2] Blackboard is a Course Management System (CMS) used in many universities

been discussed in terms of children's composing experiences in groups using acoustic instruments and/or technology in elementary schools, and more specifically, in third and fifth grades. There may be questions, as well, about the meaning of "collaborative". While an abundant number of studies have investigated K-12 students composing, researchers have yet to examine children's group composing experiences using acoustic instruments frequently found in elementary music classrooms and technology. This may hold significance as school districts increase the use of technology in classrooms at the elementary level.

It is also unclear what group-related skills in elementary-level group-based composing exist or may be developed in the process of composing projects at the elementary level. This is rather important, given that classrooms are collective, social, and cultural environments. Further study is needed to consider ways in which the development of creative process and creative thinking may occur in foundational music learning regardless of the tools that are used, who is in the room, or the culture of the music classroom. Finally, a thorough examination of divergent thinking at the elementary level, as related to the process of compositional tasks, is currently needed for the development of pedagogy for both individual and group composing using technology in music teacher education programs.

Rationale

As educators become increasingly interested in digital devices and virtual environments, and mobile device applications become more available in education settings, the potential for using these technologies with children in composition and creative musical activities also increases. There is, then, a clear need to understand how the incorporation of new technologies in composing experiences where foundational learning occurs *compares* with composing

experiences using traditional musical instruments long used in general music education, particularly with respect to children's creative process.

Purpose of the Study

The purpose of this study was three-fold. First, the study sought to investigate how composing with acoustic rhythm instruments and a graphic technology-mediated program, *Hyperscore*, (see https://Hyperscore.wordpress.com/about/) impacted third and fifth grade students' compositional process as measured by a researcher-constructed observational protocol, Crawford Index of Quality for Composing Groups (CIQCG). Second, the study aimed to examine how composing with acoustic rhythm instruments and a graphic technology-mediated program, *Hyperscore*, impacted the scores of third and fifth grade students on Webster's (1994) Measure of Creative Thinking in Music. Finally, the researcher was also interested to learn if there were any significant correlations between children's music aptitude as measured by the Intermediate Measure of Music Audiation (Gordon, 1986) and creative thinking in music as measured by the Measure of Creative Thinking in Music by grade and gender.

Research Questions

This study addressed the following questions:

1. a. Using the Crawford Index of Quality for Composing Groups (CIQCG) as the dependent variable, are there statistically significant differences in group process scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated)?

   b. Do the factors of gender and grade level play a role in these comparisons?

2. a. Using the Webster Measures of Creative Thinking in Music (MCTM) as the dependent variable, are there statistically significant differences in group scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated)?

   b. Do the factors of gender and grade level play a role in these comparisons?

3. a. Are there statistically significant relationships between (a) group process scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated) (b) music aptitude scores as measured by the Gordon Intermediate Measure of Music Audiation (IMMA), and (c) creative thinking (MCTM) scores?

   b. Do the factors of gender and grade level play a role in these relationships?

Definition of Terms

The following definitions were used for this study:

Active musical learning: Learning through goal-oriented activity, either in groups or alone.

Composing/composition: The process of writing music.

Convergent thinking: thinking process that leads to one "correct" answer.

Creative process: is a balance of imagination and analysis and purposeful generation of new ideas directly asserted by the thinker. Creative process is the undertaking of making something with elements of structural models that prepare, observe, incubate, reflect, and verify in a loop format that ends with a novel outcome. Creative process requires a drive to action and implementation of new ideas as they are generated.

Creative music: Exploratory musical opportunities for creating music with, or without, guidelines for specific outcomes of completed tasks.

Creative thinking: The process of developing unique or novel ideas.

Creativity: The generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group.

Creativity as mini-c: Some scholars make a distinction between types of creativity such as Beghetto and Kaufman's (2007a, 2007b) "mini-c" which can be defined as the creativity inherent in the learning process as when children discover something for the first time.

Critical thinking: The process used to reflect on, access, and assess our own and others' questions, assumptions, points of view, and perspectives. The Socratic Method, supporting inquiry and discussion amongst individuals, encourages critical thinking.

Divergent thinking: Thinking process that leads to multiple possible correct answers

Formal learning: Type of learning that is intentional, systematic, and delivered by a teacher.

Group process: The many ways in which a group works together to accomplish a defined outcome. Groups may, or may not, be collaborative, yet still work well together.

Group work: Students working together in a group small enough so that everyone can participate in completion of a task that has been clearly assigned.

Informal learning: Type of learning that may be unintentional and with no set objective in terms of learning outcomes.

Measurement of creativity: A way to assess and measure creative activity. Here, this concept is used to refer to measurement approaches that consider individuals, groups, or cultures, as well as, creative process or creative thinking.

Sociocultural theory: A cross-field theory that identifies how behavior is affected by both social and cultural surroundings. Also implies the construction of knowledge through social aspects of activity.

Technology: Digital devices or tools such as computers, computer software, apps (i.e., applications) mobile devices, tablets, MOOCs, that may be used in the process of composing music.

Assumptions

Due to the current status of music education in many California schools, it is assumed that most participants in this study will have had limited to no music composition training prior to taking the IMMA, composing treatments, or administration of the MCTM measure in this study. It is also assumed that, as reliable measures, the IMMA and MCTM are valid tests for measuring music aptitude and creative thinking of students who may be inexperienced with opportunities to compose.

Delimitations

This study does not intend to measure musical achievement, musical talent, or musical ability, but to observe children's creative process. Given the sample size and the particularities of music education in elementary schools in California, generalization of findings to the population at large should be considered with caution. Rather, the study aims to contribute to the ever growing body of knowledge on composing at the elementary level (i.e., particularly in grades three and five), and to the discussion of students' use of acoustic instruments and computer technology in elementary music education teaching and learning.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter examines the study of creativity particularly in regards to children's compositional work. The areas considered in this chapter should not be viewed as complete overviews of all of the study to be found in each area, but offers a structure for music teaching and learning related to compositional context. This structure is reviewed through the following eight areas: (1) definitions of creativity and their applications in music education; (2) measurement of creativity, intelligence, and tests of musical aptitude; (3) measurement of creativeness; (4) composing and music teacher education; (5) creativity and composing process of young children; (6) composing in groups; (7) composing and technology; and (8) development of an observation protocol through lenses of creativity researchers.

Definitions of Creativity and Their Applications in Music Education

An increase in the study of creativity, particularly in the beginning to mid-twentieth century, resulted in a large body of knowledge with some seminal ideas that continue to be influential today (Sawyer, 2012). Even though creativity continues to be a rigorously studied concept, differing approaches to definitions abound. *Merriam-Webster* (2016) defines creativity as "…the ability to make new things or think of new ideas." *The Oxford Dictionary* (2016), in turn, defines creativity as "…the use of the imagination or original ideas, especially in the production of an artistic work." Whereas the first definition suggests that ability is required, the

second posits that imagination is required. Many definitions imply that creativity is related to artistic work.

Sawyer (2012) described research involving creativity as waves with particular foci. For example, the first wave studied creators' personalities (p. 4) during the 1950s and 1960s. The second wave of the 1970s and 1980s studied the cognitive approach involved with creative behavior and the mental processes involved. Sawyer marks the 1980s and 1990s as a sociocultural approach, the third wave, complementing the second wave with a focus toward creative social systems such as what is considered by this study.

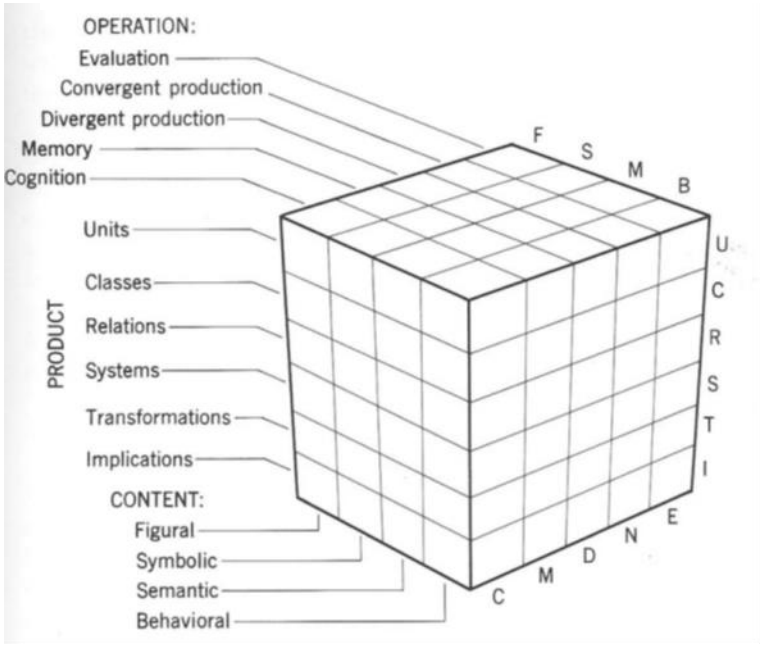
Definitions of creativity have been subject to interpretation, and are often considered in terms of concepts such as process (i.e., what is experienced by a composer during the work of composing) and product (i.e., compositional outcome of composing, and the word used by the music education profession to identify and discuss it). In addition, creativity may be related to other terms such as child and adult, individual and group, and applications of psychology, science, social science, and education (Isaksen, S., Murdock, M., Firestein, R., & Treffinger, D., 1993; Kaufman & Sternberg, 2006, 2010; Lau, S., Hui, A., Ng, G., 2004; Runco, 2007; Sternberg, 1999). For example, Wallas (1926) suggested that there are four stages in the creative process: preparation, incubation, illumination, and verification. Rhodes (1956; 1961) identified four paradigms to describe foundational elements of creativity in his seminal model, namely, person, process, press (environment), and product.

Guilford (1956; 1967), through his study of creativity, favored the notions of divergent and convergent thinking as part of his structure of intellect model. This model included three dimensions: contents, products, and operations (see Figure 2 .1). Using a three-dimensional cube, this approach aimed at representing the behavioral aspects of creating (1) content, (2) the

systems involved in products, and (3) all related cognitive influences of operations. Representing multiple components of intellect, Guilford's model represents, understandably, the complexity of defining creativeness in context with the notions of intelligence.

Figure 2.1

Guilford's Structure of Intellect Model



Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill. (Figure taken from inside cover).

Beghetto and Kaufman (2007a), in turn, defined three components of creative ideas, with the aim of clarifying what is and what is not creative. For them, a creative idea must represent something different, new, or innovative. Second, a creative idea must be of high quality. Third,

the creative idea must be appropriate to the task at hand. In a later work on the essentials of creativity assessment, Kaufmann, Plucker, and Baer (2008) proposed a link between cognitive ability and creativity. Other scholars have also considered cognitive abilities as part of creativity, with some of the rationale resting on the notion that tests of cognitive abilities, including IQ tests, often include both divergent and convergent thinking processes.

Beghetto and Kaufman (2007b) (see also Kaufman and Beghetto, 2009) interpreted creativity using identifiers of big C (eminence), little c (every-day), and mini-c (novice, or, without judgment of others) in discussions of what creativity looks like. The authors proposed that:

> …novelty and meaningfulness…need not be original or (even meaningful) to others [to be creative]. The judgment of novelty and meaningfulness that constitutes mini-c creativity is an intrapersonal judgment [which] distinguishes mini-c creativity from other forms of creative expression…. Eminence (Big-C) and everyday (little-c) rely on the judgment of others… [from the perspective of] interpersonal and historical…novelty, appropriateness, and lasting impact (p. 73).

Beghetto and Kaufman also made clear that mini-c "…highlights an important relationship between learning and creativity" that removes some judgment (p. 73). In other words:

> Including mini-c helps address gaps in how creativity is represented in prevailing models and theories of creativity. Specifically, the inclusion of mini-c creativity offers an additional unit of analysis for creativity researchers interested in studying the creative potential and development of children and novices. (p. 78)

Additionally, mini-c may be used when identifying beginning efforts of children when given opportunities to compose.

In a literature review of creativity, Hennessy & Amabile (1987) suggested that "while creativity relates to both product and process, it is the distinguishing characteristics of product that some define as creativity" (p. 7). In an earlier work, Amabile (1983) had postulated a

comprehensive theory of creativity that included intrinsic motivation and social-environmental influences. She believed that these largely affected one's creativeness. Considering consensual assessment techniques, Amabile (1982) raised the point that, in addition to personality characteristics, intelligence affects the expressiveness of creativity. Amabile's research provides important connections for this study:

> To articulate a theoretical model of creativity, it is necessary to make some assumptions about the nature of observers' responses when they call something creative. The theoretical framework to be presented here is based in a conceptual definition of creativity that comprises two essential elements: A product or response will be judged as creative to the extent that (a) it is both a novel and appropriate, useful, correct, or valuable response to the task at hand and (b) the task is heuristic rather than algorithmic. (p. 360)

Importantly, Amabile's understanding of the creative process was related to cognitive and motor operations leading to "…an acceptable response or product in the…endeavor" (p. 360) using both "…formal and informal observation" (p. 361). These ideas are important to the current study because the observations of students' work are heuristic in nature.

Sternberg (1985) identified creativity as a psychological construct of implicit and explicit theories. As a guide to observe the creative process, explicit theories, historically focused toward intelligence, were based on "…data collected from people performing tasks [and] presumed to measure psychological functioning" (p. 607). Explicit theories, Sternberg suggested, defined by many from Guilford (1950) to Amabile (1983), reflect the layperson's

conception of how they view something in their own mind, and "…have played the major role in conceptualizing creativity" (p. 608).

Runco (2004) reviewed creativity research of the 1980s and 1990s, and arrived at a definition of creativity as the development of the origin of ideas that are useful or influential. In his own words:

> Creativity is usually tied to original behavior, and indeed, originality is necessary for creativity, but it is not sufficient…. Creativity is a syndrome or complex and flexibility is a part of it. The flexibility of creative persons is what gives them the capacity to cope…. The view of creativity implies that it is reactive…often is a reaction to problems or challenges. (p. 658)

Taking a slightly different angle, Sawyer (2012) considered creativity and the challenges associated with defining it by stating that:

> …to explain creativity, we first need to agree on what it is…. Psychologists argue over the definitions of intelligence, emotion, and memory; sociologists argue over the definitions of group, social movement, and institution…. Creativity researchers can be grouped into two major traditions of research: an individualist approach and a sociocultural approach. (p. 7)

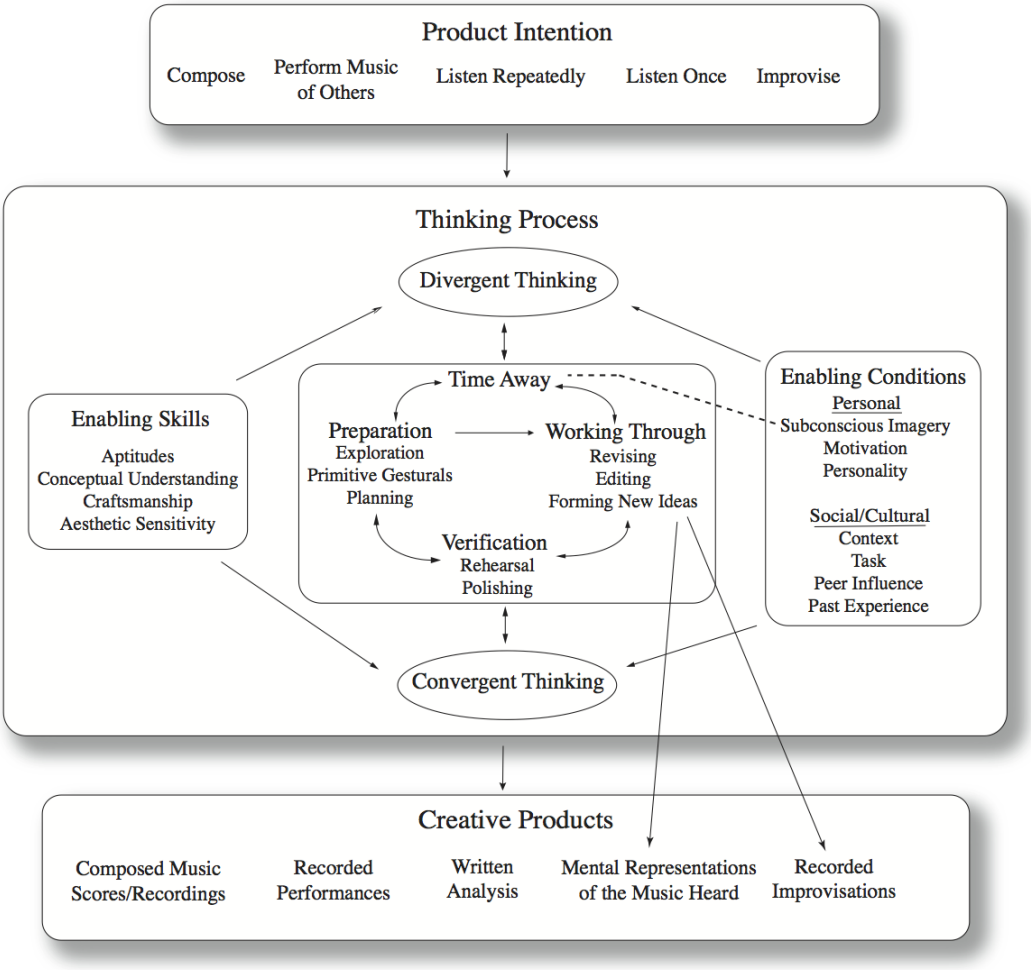
Sawyer's individualist and sociocultural definitions work well for the purpose of this dissertation as related to children composing music. Whereas the individualist creativity "is a new mental combination that is expressed in the world" (p. 7), a sociocultural creativity "is the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group" (p. 8).

Webster (1977) has written about creative thinking and children's thinking processes in music for nearly four decades. Webster proposed conceptual bases for creative thinking (1987) that endorsed the four stages of creative thinking: preparation, incubation, illumination, and verification, as found in the earlier work of Wallas (1926). According to Webster (2002a), the

process begins with intention and moves through divergent and convergent thinking processes to the outcome of creative products (see Figure 2.2). Throughout his academic career, Webster has considered not only models for creative thinking in music but a measurement that examines creative thinking through his Measure of Creative Thinking in Music (1994; 2002b).

Figure 2.2

Webster's Model of Creative Thinking Process in Music



Webster, P. (2002). Creative thinking in music: Advancing a model.
In T. Sullivan, & L. Willingham, (Eds.), Creativity and music education (pp. 16-33).
Edmonton, AB: Canadian Music Educators' Association. (revised 2004)

Randles and Webster (2013), drawing in part from Webster's (2003) model, offered the following definition:

> Creativity in music refers to the divergent and convergent thought processes enacted both in solo and ensemble, that lead to musical products that are both novel and useful, within sociocultural contexts, manifested by way of specific modes of musicianship or combinations of modes that can include improvisation, composition, performance, analysis, and listening. (p. 1)

Their definition, related to "modes of musicianship" (p. 2), reflects philosophies of Reimer (1970; 2003) who called for composing in K-12 classrooms in order for students to explore musicianship more fully. Through decades of influence, notions that Reimer and others frequently discussed can be found within the National Standards for Arts Education, Music (Consortium of National Arts Education Associations, 1994), Common Core (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) and the new National Core Arts Standards (2014). The new music standards implement the anchor, "Creating" with modes of generating and conceptualizing, developing, refining, and completing [making] artistic work (see Table 2.1). These are deeply based in the contact humans have with music and the music teaching and learning process, and connect well with Glover's (2002) suggestion that the "…impact of music itself feeds back into the making process" stating:

> The development of the skills associated with the processes of evolving music is central in learning to compose more effectively. A major part of any teaching of composing is helping pupils to become aware of the processes they use, to develop the skills they can use in these and extend or adapt their composing strategies in order to realize their ideas more successfully. (p. 32)

Table 2.1

Alignment of National Standards for Music Education, Common Core, and National Core Arts Standards

National Standards for Music Education (1994)	**Common Core (2010)**	**New National Core Arts Standards (NCAS) (2014)**
	Philosophical Foundations and Lifelong Goals	Arts Discipline Enduring Understandings Essential Questions
Performer (Singing and Playing) Improviser Composer Arranger Listener Theorist (Analyzing, Describing) Psychologist Philosopher Neuroscientist Educational Theorist Historian Ethnomusicologist Anthropologist Sociologist	Arts as: Communication	Performing
	Creative	Creating
	Personal Realization	Responding
	Culture-History Connectors	
	Means to Well-Being	Connecting
	Community Engagement	

Clearly, many approaches to understanding creativity exist. Over the course of this study, a compilation was created of researchers' creativity lenses and related terms. Researchers and their creativity-related terms have led in historical study and further development of understanding creativity in the fields of education and psychology (see Table 2.2). These

assisted with the development of an observation protocol for observing creative process of young composers while they composed. Over time, researchers have shaped models and theories of creativity to fit with 21st century thinking. For example, Glăveanu (2013) transformed Rhodes' four Ps of creativity into current cultural norms called the "Five As": Person-Actor, Process-Action, Press-Audience/Affordances (environment), and Product-Artifact.

Table 2.2

Creativity Lenses and Related Terms

Researcher	Lens	Related Terms			
Wallas (1926)	Creative process	Preparation	Incubation	Illumination	Verification
Guilford (1956)	Structure of Intellect Model Creativity not independent from intelligence)	Contents	Products	Operations	
Rhodes (1961)	Four Ps of Creativity	Person	Process	Press (Environment)	Product
Torrance (1972)	Torrance Tests of Creative Thinking Ability	Fluency	Flexibility	Originality	Elaboration
Vaughan (1973)	Developmental Sequence of Musical Creativity	Acquisitional-Procreative	Combinational Different contexts of acquisitional stage)	Developmental Distinguishing between productivity and creativity	Synergistic - Creative product functions within the context of the requirements of society; Evaluation
Amabile (1983)	Componential Framework (Components of Creativity) Motivation	Task presentation Preparation	Response generation	Response validation	Outcome
Webster (1989)	Measure of Creative Thinking in Music	Extensiveness	Flexibility	Originality	Syntax
Kratus (1990)	Creativity Measurement	Originality	Fluency	Flexibility	Elaboration
Burnard & Younker (2008)	Defining characteristics of collaborative music composition through Activity Theory	Tool use	Rules	Division of labor	Ethnographic observation

Measurement of Creativity, Intelligence, and Tests of Musical Aptitude

There is a distinction between aptitude (measured by perception) and creativeness (measured by production) (see musical aptitude, Oxford Music Online, 2016). Particularly in the first half of the twentieth century, measurement of musical aptitude was a premier focus of research for scholars such as Seashore (1919a; 1919b), Larson (1938), Thorndike (1921), Kwalwasser (1927; 1928), Glover, Ronning, and Reynolds (1989), and Stanton (1928; 1935) (see Table 2.3 for measures of musical aptitude). These scholars devised tests for measuring musical abilities which continue to be influential to this date. Included in conceptualizations of creativity, the measures are divided into two groups:

> (a) Tests and measurements of musical capacities…independent of training; (b) tests and measurements of musical abilities…dependent upon capacity and training. Capacity means undeveloped, innate, native talent, receptive powers, i.e., potentiality for development; ability denotes acquisition of knowledge, skills, and techniques, i.e., development of a capacity. (Harvard Dictionary of Music Online, 2016)

The study of creativity has been directly linked to studies of cognitive abilities and intelligence. A task force of the American Psychological Association (1995) proposed a definition of intelligence as follows:

> Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. Although these individual differences can be substantial, they are never entirely consistent: a given person's intellectual performance will vary on different occasions, in different domains, as judged by different criteria. Concepts of "intelligence" are attempts to clarify and organize this complex set of phenomena.

Intelligence has been studied in conjunction with creativity, due in part to the substantial influence of Binet and Simon (1919), whose original definition of intelligence was described

Table 2.3

Standardized Measures of Musical Aptitude

Date	Author	Standardized Measure	Musical Aptitude – Abilities Measured
1919/ 1939	Carl Seashore	Measures of Musical Talents	Sensory Test: Discrimination of pitch, intensity, time, consonance, rhythm, tonal memory
1924	Jacob Kwalwasser and G. M. Ruch	Test of Musical Accomplishment	Knowledge Tests: musical symbols and terms, recognition of syllable names from notation, detection of pitch errors in the notation of a familiar melody, knowledge of pitch or letter names of bas and treble clef, time signatures, note values, rest values, and recognition of familiar melodies from notation (Grades 4-12)
1926	Jacques W. Conrad	Conrad Instrument Talent Test	Tempo, rhythm, harmony, tone recognition, and talent (No data reported on reliability and validity [and]…Conrad's battery could not be considered as a carefully constructed and standardized music aptitude test. (Comeau, 2009, p. 127)
1927	Jacob Kwalwasser and Peter Dykema	Kwalwasser-Dykema (KD)	Tonal memory, discrimination of: quality, intensity, feeling for tonal movement, time, rhythm, pitch, melodic tastes
1934/ 1954	R. M. Drake	Musical Aptitude Tests	First test to measure musical memory through comparison of two-measure melodies; 1954 revision- Form A for students with less than five years of training and Form B for students with more than five years of training.
1939/ 1957	Herbert Wing	Standardized Tests of Musical Intelligence	Test for potential success with an instrument and with band participation
1942	E. Thayer Gaston	Test of Musicality	Perceptual responsiveness to musical structures (Grades 4-12)
1966	Arnold Bentley	Measures of Musical Abilities	Pitch discrimination, tonal memory, chord analysis, rhythmic memory
1965	Edwin Gordon	Musical Aptitude Profile (MAP)	Rhythmic, tonal, and musical sensitivity to phrasing, balance, and style
1979	Edwin Gordon	Primary Measures of Music Audiation (PMMA)	Rhythmic and tonal perception of students (Grades K-3)
1982	Edwin Gordon	Intermediate Measures of Music Audiation (IMMA)*	Rhythmic and tonal perception (Grades K-6)

through four terms: comprehension, inventiveness, direction, and criticism (see also Sternberg, 2000, p. 30; Wolf, 1969). Guilford (1956) continued Binet's work with his structure of intellect model. Guilford's point of view was that creativity could not be separated from intelligence. The emergence of the Torrance Tests of Creative Thinking (Torrance, 1968), which grew from the conceptualizations of Guilford, were non-musical, divergent thinking tests which emphasized commonly understood factors of creativity by the 1960s, namely, fluency, flexibility, originality, and elaboration.

Sternberg (1985) developed a cognitive approach to intelligence more than in prior psychometric formulations. His Triarchic Theory of Intelligence examined how well humans manage environmental changes in their lives through three components: componential (e.g., parts or elements), experiential (e.g., as related to experiences within an environment), and practical (e.g., what actions or, results of actions). These components also highlight how individuals manage cognition, define what is familiar or unfamiliar, and fit elements of experience into context. Interest in measuring creativity, in its many aspects and domains, found strong support in the variety of early studies of creativity in general (Mackinnon, 1962) who studied the relationship of intelligence to creativity and found it unrelated, as related to work environments (Amabile, Conti, Coon, Lazenby, & Herron, 1996), and systems (Csikszentmihalyi, 1999). Many studies, in turn, influenced the movement of intelligence testing toward divergent thinking, which became the basis for tests of intelligence and aptitude.

In the 1970s and 1980s, however, more common were studies that evaluated and critiqued creative thinking measures. Hocevar and Bachelor (1989) developed a taxonomy of

creativity measurements. With more than 100 sources, they divided creativity measurements into eight categories, or, inventories:

> (1) Tests of divergent thinking; (2) attitude and interest; (3) personality; (4) biographical; (5) ratings by teachers, peers, and supervisors; (6) judgments of products; (7) eminence; and (8) self-reported creative activities and achievements. (p. 53)

In their analysis, Hocevar and Bachelor noted that the correlations of studies would be higher if there was no measurement error suggesting that:

> …judges seem only to be able to establish some overall opinion that influences all of their judgments…. [and] fail to discriminate creativity from other related constructs…. researchers cannot assume that the creativity construct has discriminant validity, particularly when subjective judgments are involved. (p. 61)

Hocevar and Bachelor further stated that the two types of reliability most useful to creativity research are internal consistency and interjudge reliability.

Unsurprisingly, creativity and intelligence have also been linked with musical aptitude as defined by O'Neill and Sloboda:

> Musical aptitude refers to a person's innate ability to acquire skills and knowledge required for musical activity, and may influence the speed at which learning can take place…. It is an issue closely related to that of intelligence and IQ, and was pioneered by the work of Carl Seashore. While early tests of aptitude, such as Seashore's The Measurement of Musical Talent, sought to measure innate musical talent through discrimination tests of pitch, interval, rhythm, consonance, memory, etc., later research found these approaches to have little predictive power. (Grove Music Online, 2016)

Carl Seashore's Measures of Musical Talent (1919b) and the Kwalwasser-Dykema (1930) are two of the most well-known tests of musical aptitude. Comparing these two tests, Whitely (1932) suggested that Seashore's test was:

> ...developed to measure the innate musical capacity of the individual, while the Kwalwasser-Dykema was said to tap into the original capacity of the individual...[or] an index of a student's musical status at the time of testing based on responses to pitch, intensity, time, memory, and rhythm. (p. 733)

These tests, along with the many others, have influenced the works of later researchers, including their attempts to define the relationship between musical aptitude and creativity.

Rainbow (1965), for example, developed a pilot study to examine the constructs of musical aptitude and investigated fourteen variables that were generally investigated in tests: 1) pitch discrimination, 2) tonal memory, 3) rhythm, 4) musical memory, 5) academic intelligence, 6) school achievement, 7) gender, 8) age, 9) musical achievement, 10) musical training, 11) home enrichment, 12) interest in music, 13) participation in music by family (relatives), and 14) socio-economic background (p. 3-4). Defining musical aptitude as "potential talent in music" (p. 4), Rainbow further identified aptitude:

> As with other forms of learning, high aptitude does not necessarily mean high achievement will result, but it does indicate that under favorable conditions, high achievement is possible. A person who possesses a high level of aptitude for music will have an exceptional awareness for musical sound. This awareness, or talent, manifests itself in the manner in which a student is readily able to grasp…relate and organize ideas presented through the media of music. (p. 4)

Rainbow used this perspective from which to evaluate the Seashore Measures of Musical Talent, and the Drake Musical Memory Test.

As noted earlier, Whitely (1932) compared Seashore's Measures of Musical Talent to the Kwalwasser-Dykema test. Highlighting the importance of shorter components and clearer

construction of the Kwalwasser-Dykema test as compared to the Seashore test, Whitely discussed the importance of providing opportunities for imagination and variety. As well, greater validity and reliability of the Kwalwasser-Dykema was found even though this particular test had fewer items within each section than the Seashore test. According to Whitely, the drawback of the Kwalwasser-Dykema test was the fact that it was potentially more challenging for younger participants than their older counterparts. In any case, these tests set the stage for more study of this type and development of observation and inventory protocols.

During the 1960s, Edwin Gordon first developed the Musical Aptitude Profile (MAP), a precursor measure to the well-established Primary and Intermediate Measures of Music Audiation still used today. Gordon was interested in learning sequences (1980; 2003). Walters (1991) suggested that the development of Gordon's work occurred through challenges related to lack of reliability with the early MAP measure, as often was the case with aptitude measures that were presented to elementary students. Then, the Primary and Intermediate Measures of Music Audiation (1986; 1990) were Gordon's "…inquiry into the nature of the young child's music aptitude" (p. 68).

Measurement of Creativeness

Measurement of creativeness or, how creative a student or a student's effort is, has been considered in several ways and differs from aptitude. Kiehn (2003) considered measurement of creativity through development of an instrument measuring elementary students' improvisational work. DeLorenzo (1989), and others (Burnard, 2004; Webster, 2002) have considered measurement of creativity through the process of problem-solving. Auh (1997) studied predictability of creativity and found it to be supported through informal musical experiences.

Mid-twentieth century researchers considered creative thinking and creativity through music measurements. Vaughan and Myers (1971) developed a musical, nonverbal test, of creative thinking (p. 338) to learn if musical experiences resulted in improved performance. Vaughan and Myers examined musical processes related to creative thinking of 60 fourth and fifth grade students by studying if musical experiences improved performance on a nonverbal test of creative thinking. They also wanted to understand if there were relationships between musical ability and aptitude. In their study, Vaughan and Myers devised tasks that required no formally learned musical skills following focus on improvisational format rather than a final compositional product. For a period of three months, 32 fourth graders were given a general music class, which included singing, ear training, and concert music listening. The experimental group of 28 fourth and fifth graders were given activities aligned with creative thinking, such as, rhythmic improvisation, development of themes, ear training using 20th century music, and use of general music instruments by students, their use chosen by the students. Fluency, flexibility, originality, and elaboration were considered through the activities. Outcomes included gains in elaboration and a slight gain by the experimental group in originality with no relationship between musical aptitudes for any of the four activities. In this study, the authors requested a more comprehensive measure of creativity. In a subsequent study, Vaughan (1973) presented a theoretical framework that suggested yet another developmental sequence of creativity: acquisitional, combinatorial, developmental, and synergistic followed by evaluation with the knowledge of redefining creativity for oneself. This theoretical framework continues to be useful to researchers.

Hocevar (1979) considered the broad range of criteria of creativity considering the measurement of creativity. Hocevar examined ten techniques for measuring creativity on the

basis of reliability, discriminant validity, dimensionality, and convergent validity, and concluded that creative activities were most successfully measured through self-reporting or observation. These ten categories included tests of divergent thinking, attitude and interest, personality, and biographical inventories, teacher and peer nominations, supervisor ratings, judgments of products, and eminence and self-reported activities and achievements. Hocevar suggested that measurement of creativeness was problematic as experts and non-experts often disagree, yet presented evidence that, often in studies, inter-judge reliability was moderately high. Hocevar suggested that rather than using predictors, asking or observing participants would be useful even though rarely used. Hocevar recommended "a simple and straightforward inventory of creative achievement and activities as most defensible" (p. 29).

During the 1980s, Webster (1988; 1990) offered a new perspective to the field of music education projecting the importance of considering creative thinking when measuring creativity in music. Webster discussed the challenge:

> The study of creative thinking in music involves a complex combination of cognitive and affective variables, often executed at the highest levels of human thinking and feeling….it becomes quickly apparent why this field has not attracted more music researchers and why many feel the topic is hopelessly impregnable (Webster, 1990, p. 421).

By consistently clarifying his points of view and thoughts on topics outside the general research domain, rather than defining solutions, Webster offered music teachers ample opportunities to learn about creativity with their students. His work was influential in many areas of music teaching and learning, including young children's process of composing music. In 1994, Webster published the Measure of Creative Thinking in Music or MCTM[3], an instrument that aims to

[3] The current study is guided by Webster's points of view of creative thinking during the composing process. Much of his work on the topic of composing considers creative thinking and

identify creative musical thinking of children between the ages of six and 10. The MCTM, which is thoroughly discussed in Chapter Three, includes ten tasks completed by students individually and measures creative thinking skills through four factors: extensiveness, flexibility, originality, and syntax.

Webster (1992b) recommended that there was a need for more study of children's music-making that focused on creative process. Webster and Hickey (1995) considered techniques of rating scales for assessing children's compositions.

While measurement of students' compositional work may be related to a finished product, some have considered observation of process as a means to understand the development of students' creativeness. Still others have examined the construct of whether creativity can truly be measured at all.

Piffer (2012) asked the question, "Can creativity be measured?", through confronting the uncertainty of definitions found in the beginning of this chapter with recommendations for new possible tools to consider for creativity measurement. Piffer considered the three dimensions of creativity as novelty, usefulness, and impact, and used them as a defining framework while questioning measurement of creative process. While his conclusions suggest that defining students' creativity is indirect, Piffer also recommended that tests should measure creativity of a person or product rather than predictive measure.

To summarize, creativity has been studied in conjunction with intelligence and musical aptitude. From Seashore (1919a) to Webster (1990) and Allsup (2014), music teaching and learning has gained much from almost a century of study of measurement of creativeness. There

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Hickey and Webster (2001) write about creative thinking in music and discuss creative process in several contexts.

are strong arguments throughout for learning more about creativity in order to provide access for students to work more closely with imagination, problem solving, spontaneity, communication, and leadership in music education environments of all types, classrooms, and technology labs. These ideas also lend well to the study of composing and music teacher preparation.

Composing and Music Teacher Education

The experience of providing opportunities for students to compose may be met with resistance and anxiety, particularly when music educators have little or no experience compositionally. One response to this challenge may be to develop opportunities within coursework for not only formal constructs of working with lesson plans for composing with children but requiring pre-service music teachers to compose music more informally on their own followed by coming together to share with one's cohort. In this way, music teachers learn about the many possibilities of working with K-12 students, but both formally and informally, learn about themselves as composers and their relationship to music.

But this is not a new idea. Kennedy (2007) developed a program between Rutgers University and Holland Brook School with the purpose of providing those in pre-service fieldwork a place to work in collaboration with university teacher educators and fifth grade student groups compositionally. Kennedy presented her study in three sections, (1) what was learned from observations of teachers, (2) what was learned from observations of children, and, (3) children's observations.

Pre-service teachers confirmed that team-teaching was challenging, but this was overcome as systems between pre-service and in-service teachers became better determined. Differences in early-career teaching styles, such as formal and informal structures, posed challenges as well. Pre-service teachers who had completed a broader range of foundational coursework were more comfortable in

their teaching process. And, team-teaching with other pre-service teachers was noted as appearing to be different than the master teacher's teaching (Kennedy, 2007).

Findings in the Kennedy study centered around observations of fifth grade students centered toward musical abilities of children, group work, and composing. The issues of leading and following presented some challenges, on- and off-task students, and the idea of comfort as time went on that seemed to improve the group composing process but also the compositions. The observations of pre-service teachers suggested that process was greatly examined; students experimented, brainstormed, revised, finalized, and rehearsed in preparation for a performance.

In Kennedy's study, fifth grade students were asked to write reflections following their three-meeting experience. They were also invited to discuss new knowledge about composing. Some children identified with composers being any age and all could compose, and there was much work involved with the variety of ways one can compose. Teachers and students gained from the development of the Holland Brook Project, especially in learning about composing and working in groups while developing musical skills and even ensuring elementary music programs are valued and essential.

Crawford (2004) surveyed 97 accredited NASM institutions to examine music education professors' attitudes about inclusion of composition in pre-service music teacher education coursework. Forty-nine respondents expressed limited experience, if any, with composing and expressed relatively little to no instruction in the area of compositional work with pre-service teachers or as a pre-service teacher. Yet, while suggesting they were uncomfortable with presenting composing tasks, respondents felt capable of teaching composition. Overall, respondents stated that there was little time for these experiences in coursework in their institutions.

Strand (2006) examined music teachers' use of composition in public school classrooms and why composing tasks were used or not and to learn if music teachers held a definition for providing

opportunities to compose. Approximately 88% of 339 music educators responded that they used composing tasks in elementary music classrooms more frequently than higher grade levels. Only 5.9% of respondents stated that they used composing tasks frequently. And, as in the Crawford (2004) study, respondents said time was too limited or that they felt uncomfortable. In the Strand (2006) study, no significant correlations were found between length of teaching experience, years in a school, or used of standards. Additionally, no definition of composing was found in the responses of this study.

Definitions, pedagogies, and experience appear to be fundamental to challenges facing composing and music teacher education. Fundamentally, there are several types of students who may be found in every music classroom. A greater focus for changing how we teach providing opportunities to compose may exist within student types. As can be found in the discussion in Chapter Five, a framework is presented that suggests different types of students who compose. Using this framework as a beginning to develop discourse and pedagogy may assist with development of coursework that aspires to assist with building creativity and composing processes of young children.

Creativity and composing processes of young children

> "I have yet to meet a child who could not or would not compose when asked…"
> (Hickey, 2012, p. 3)

Since the 1950s, discussions of creativity in music education research have considered a variety of perspectives about why it is important to provide opportunities for young children to compose. These include teaching children to think creatively (Torrance, 1972; Webster, 1988), considerations related to process and product (Hickey, 2003), and, as a road toward a broader understanding of music (Reimer, 2003).

Relationships between creativity and composing with young children include experimental and historical studies from the fields of education, philosophy, sociology, and psychology and each has influenced music education research. Within the domain of music education, studies on creativity have also focused on creativity as creative thinking (Webster, 1990; 2002a), reconstructing creativity in music education for teachers (Humphreys, 2006), improvisation and jazz (Sarath, 2013), and development of musical creativity (Burnard, 2015).

Upitis (1989; 1990; 1992), for example, considered the challenge of developing facility with young children for notation and has considered how children may be engaged with composing through movement, improvisation, writing stories, and making instruments. Music education research has examined various aspects of how creativity relates particularly to providing children with opportunities for children to compose. Studies that assist with understanding how this has been examined are discussed ahead.

When considering composing in childhood, researchers have examined the natural and informal musical tendencies of children for composing music. Doig (1941; 1942a) discussed results of two studies of young children's composing efforts. While Doig's first study (1941) invited children to compose a song based on a given poem, the second study (Doig, 1942a) requested children to write a song on a topic of interest to them. Participants, ages six through 12 composed songs in groups during a period of one morning each week. Each composition was analyzed and, while there were similarities in the structure of the pieces and groups of different ages did, there also was a strong correlation of musical learning with language learning. In examining Doig's work, Bennett (1975) offered a checklist for "...specific components of an improvisational approach to teaching musical composition..." (p. 208) and communicated concern about Doig's findings (1942a; 1942b). These related to students' compositional

procedures as compared to "...the way music is really composed" (p. 206) are also found in his point of view about group composition activities in teacher education programs.

In a longitudinal study of 15-20 pre-school children aged two through six, Moorhead and Pond (1942a; 1942b) observed children's musical experiences, individually and in groups, through testing modules. Emergent findings, via observation, included two types of vocal chants, imitation and variation, a wide range of sounds that were played (and perceived as "not random"), and polyphonic improvisation during short training periods. One of their discussions points was the impetus of children for being what they called a "maker":

> What seems to me to be a major and destructive misconception is the notion that musical creativity in early childhood originates from a compulsion for self-expression. The compulsion that I observed was for being a maker, an inventor of sound shapes, and for creating linear movement and enjoying the patterns that simultaneously moving lines of sounds could produce. Additionally, the children exhibited an instinctive and ingenious facility for devising and sustaining spontaneous polyrhythms and sometimes baffling complexity and for enjoying their seemingly effortless repetition. (p. 40)

Pond (1980; 1981; 2014) further stated that his job was to observe "…the spontaneous creativity of indoctrinated normality…rather than specialized genius" (p. 39). Pond also noticed that children "invented" music for every ritual or celebrated experience and noted that "a young child is able to savor a single sound as a unique experience" (p. 41). That is, there is a fair degree of spontaneity in young children's music making linked to composing.

Taking a different perspective, Swanwick & Tillman (1986) defined composition in a study of children aged three to nine in the following way:

> We define 'composition' very broadly and include the briefest utterances as well as more worked out and sustained invention. Composition takes place when there is freedom to choose the ordering of music, without notational or other forms of detailed performance instruction. Others may prefer to use the terms improvisation, invention or 'creative music'...the advantage of this approach is that we are observing relatively undirected musical processes rather than products of polished performances. (p. 311)

In their study, children were recorded, individually or in small groups of two to three, using rhythm and barred instruments to develop patterns during the course of ten meetings. Compositions (n = 745) made by forty-eight children were collected and recorded over a period of four years. The recordings were analyzed and evaluated by age, with the aim of understanding musical development in young children's perception and production of music.

An important outcome of Swanwick and Tillman's work was their group of implications for music teaching and curricular design. The researchers were able to develop an overview of three important areas for classroom music through analysis of the compositional work of the children: (a) general curriculum planning with much attention to challenges with music teaching that is "arbitrary" and without universally shared intentions, (b) individual development and knowledge by the teacher where students are in the music learning process regarding their musical aptitude and knowledge, and, (c) the role of the teacher, with introduction of musical activities as being central to the delivery of music teaching. It is worth commenting that while these authors provided students with opportunities to compose, this expression was not used in their work.

One finds the phrase "providing opportunities to compose" possibly for the first time in the work of Levi (1991). The author examined original compositions of 22 children, ages seven and eight, who composed independently over a period of eight consecutive weeks. Presented similarly to writing exercises in their classrooms, when returning to continue their compositions, students could revise their previous work or begin a new score. With a variety of notation styles, Levi analyzed scores and found growth in motivic development over the course of the study.

Even though most students could not use traditional notation, they were able to come up with ways to represent their compositions.

Paynter (2000) developed a preK-12 experiential program of study focused on creativity called Empirical Composition, which directed teachers toward engaging students in the compositional process. Within this work, Paynter discussed the provision of opportunities to compose in K-12 classrooms, including: "How do we know when it's right?" (p. 20), issues concerning musical meaning (p. 22), knowledge as dilemma (p. 26), and consideration of "necessity" as the basis for the music making of composers (p. 25). Paynter also suggested that "...to help pupils to get better at composing is to encourage them to think about the essentially musical process, not as abstract rules, but directly in relation to what they themselves create" (p. 7), and argued that:

> ...when anyone has tried putting sounds together and is pleased with the results, enough to remember them, then the teacher can start to teach by asking questions about what is presented...Where are these musical thoughts leading? What are the possibilities? Why should I choose that path rather than any other? How do I know when this piece is completed? (p. 8)

Paynter further identified many of the ramifications of presenting children with opportunities to compose. With consideration for the evaluation of student work through fixed criteria (p. 5) to the necessity designated by administrators to show progression through the music curriculum, Paynter identified that creativity, of itself, is essentially an outcome of composing in the general music classroom and "should be at the heart of all affective areas of the curriculum" (p. 5). His consideration of composition as an intuitive act was also aligned with much consideration of musical thinking and how teachers may respond. Paynter added that:

> the word 'composing' means 'positioning [things] together', and when anyone has tried putting sounds together and is pleased with the results, enough to remember them, then the teacher can start to teach – mainly by asking questions about what is presented. (p. 8)

He also considered student influences, musical preferences, and what students believe music "is" in relationship to composing music. The role of the music teacher, then, is to focus on decisions young composers make while prompting for where a child's composing is leading.

Paynter (2000) analyzed two pieces, one by three ten-year-old girls, the other a piece by Robert Schumann. Full analyses of children's compositions are few and this study provided important details and insights through a surprising discussion of *context*, the non-musical part of composing, and, *idea*, the outcome of thinking about and around context...entirely musical and may be a sudden revelation (p. 10). Paynter's ideas in making progress with composing provide important frameworks for evaluating compositions by young children. The work also states that context (also found in Webster's MCTM) is what comes of musical ideas, which is something that is highlighted in the text as a "sudden revelation" (p. 10). Additionally, Paynter discussed the use of silence in the piece written by the three ten-year-olds as having purpose, and describes in detail how these decisions worked for the piece and conversations with the composers of the piece. Underlying these descriptions is the notion that there is some forward thinking before children actually begin to compose. This may be where improvisation sets the stage for the ideas that will be selected to move an original composition forward.

Well-known for empirical work with composition, collaboration, and creativity, Barrett (1996) studied 137 compositions by 137 students, aged five to 12, from kindergarten through sixth grade. Students' compositional outputs were examined in one school over a period of three months. Through student reflections and discussions on their process and completed projects, Barrett concluded that, discussing process and product are actually one way through which students demonstrate learning. Barrett's study identified that, through careful examination of the

creative processes of child participants engaged in musical "work", researchers could learn much about young children's thinking processes.

In another study, Barrett (2006) chose to observe the process of an eminent composer-teacher to better understand how composition is taught. Barrett interviewed the composer and two university student participants in the beginning the study. The composer was videotaped while working with students during six meetings of one hour each. Interviews were again conducted following the meetings. Through this study, Barrett identified five rationales for inclusion of composition in K-12 music curricula: (a) the development of music cognition, (b), the promotion of a deeper understanding of theory and practice of music, (c) training opportunities for beginning composers, (d) opportunities to guide students to greater sensitivity and appreciation of contemporary music, and (e) the provision of a means to explore creative experiences. Barrett also identified twelve teaching strategies. These included (1) extended thinking and provided possibilities, (2) referenced work to and beyond tradition, (3) set parameters for identity as a composer, (4) provoked the student to describe and explain, (5) questioned purpose, probed intention, (6) shifted back and forth between micro and macro levels, (7) provided multiple alternatives from analysis of student work, (8) prompted the student to engage in self-analysis, (9) encouraged goal setting and task identification, (10) engaged in joint problem finding and problem solving, (11) provided reassurance, and (12) gave license to change. Additionally, Barrett found that the composer defined himself as following a "mentor-model", or one which aims to draw out the student's voice and develop his or her identity of

composer by providing reassurance, and giving license to change ideas through creative collaboration. This led Barrett to conclude that:

> ...an emergent feature of the combined analysis of the data was the role of cooperation and collaboration in the teaching and learning process. This was evident in those instances where the composer-teacher and student-composer engaged in problem-finding and problem-solving....Whilst the teaching and learning relationship between an eminent composer-teacher and a student-composer is inherently imbalanced in terms of experience, power, skills, and understanding, I suggest that these relationships include collaborative as well as cooperative processes. (p. 213)

It is interesting to note that the concept of problem solving, as identified in Barrett's writing, has also been noted by scholars as an important process-oriented aspect of composing in groups. It has also been used as a methodology for studying how teachers present opportunities to compose. Unsurprisingly, Barrett's study (2012) is in synchrony with the historical development of composition as a musical skill developed in music classrooms around the world (Green, 2008; Hickey, 2012; McPherson, Davidson, & Faulkner, 2012).

Berkley (2004) conducted a study that examined how teachers work compositionally with students through the General Certificate of Secondary Education (GCSE). There is no composition curriculum for the GCSE, which is an exam most often taken over two years at the age of sixteen. Two hundred and fifty-one students, who attended eleven schools and worked with fourteen different teachers, took part in the study. Berkley focused on teachers' understanding of composing and how these influence their music classrooms. Data were collected through classroom observations once a week for the course of one year using Bernstein's (1996) framework for coding knowledge. Assessments made by the teacher of compositional work were reviewed. Both students and teachers were formally interviewed to explore the relationship between teacher and student. Results included a better understanding of developing music composition opportunities as problem-solving that effectively "…recognizes

the instability and opportunity inherent in the understanding of composing" (p. 258). Berkley acknowledged limited resources for teachers' roles in teaching composition with K-12 students and called for a coherent composing pedagogy.

Smith (2004) examined compositions of upper elementary students created under various conditions. Twelve fourth grade recorder students completed six videotaped composing tasks, observed the videotapes, and discussed what they were doing while composing. Their products were rated by four judges with findings indicating that compositions without imposed structures were ranked lower than structured tasks (e.g., a poem task), which were considered of higher quality. It did not appear that the amount of time spent composing or previous instrumental or choral experience increased compositional quality. However, of three types of compositions, auditory, visual, or kinesthetic, the kinesthetic style pieces received higher rankings.

In a series of well-known studies, Kratus (1989; 1990; 1994; 2001) studied the compositional processes and strategies used by elementary children. In the earliest study (1989), Kratus examined students "making up a song" on a Casio keyboard within a ten-minute time frame. Two independent judges evaluated compositions of 60 children, aged seven, nine, and eleven, to learn about their abilities to replicate songs that they had composed. As in the current study, Kratus' findings suggested that, as children grew older, their creative instincts shifted from process to product. Kratus also found that children's creative process, more so than product, should be analyzed and that curricula should assist with expressive objectives for children rather than focus on objective outcomes.

Aiming to gain insight into the compositional efforts of young children Kratus (1993), compared improvisatory composing experiences of children and adults. Considering historical studies and personal accounts of jazz musicians' development, Kratus submitted that a child's

approach to creativity differs from the models in teacher toolkits and when immersed in the composition act, children may be more involved in the process rather than in product in the beginning stages of improvisation.

Following his substantial studies on children's creativity, Kratus (2012) arrived at four questions related to the pedagogy of composition that are central to music education: the role of composition in the school music curriculum, the role of the teacher, the role of the environment, and the role of assessment (p. 380). Relating back to Rhodes' (1961) foundational elements of creativity, (i.e., person, process, press, and product), Kratus (2012) submitted the educational value especially of person, process, and product with definitions:

> Person: Learning to compose can develop the personal traits of students, encouraging them to be original, accept ambiguity, and solve problems alone and with others; Process: Teaching students the processes of composition enables students to compose on their own and with others, and composition is a satisfying form of music making in its own right; and Product: When students compose they manipulate musical sounds, developing sensitivity to musical characteristics such as form, texture, and timbre. (p. 380)

Hickey (2013) has written with much emphasis about what can be learned from composition-related research and K-12 students' compositional learning. Hickey's work has included vast development of compositional ideas including the child as musician related to technology (Hickey, 1997), assessment rubrics (Hickey, 1999, 2001a, 2002), creativity in the general music classroom (Hickey, 2001b), and creative thinking in music (Hickey & Webster, 2001). Hickey (2003) has also edited an important work, possibly the first of its kind, which invited educators to consider compositional processes, creativity thinking, identity, feedback and encouragement of revision and extension in children's composing.

To conclude, we are at the very beginning of understanding the process of children working compositionally in classrooms. No matter the method used, individually or in groups,

children have been observed, over time, in their variety of processes of composing with different tools and different lesson plans. The concept of creativity has sometimes been at the center of these studies and discussions, but there is much work to be done in order to best support compositional work in elementary school music. As well, there continues to be limited research about composing in groups, no matter the tools presented for children's use. And this is particularly true when considering group compositional work in classrooms, as seen ahead.

Composing in groups

Because general music classes, especially at the elementary level, are short in length and may contain 25 – 35 students or more, composing together in groups can be a valuable method for working with students so that all may experience the opportunity of creative music experiences and composing. Definitions about group work or collaboration are many and numerous studies with differing ideas about what it is, and which nuances of group work create the most effective option in the music classroom (Cangro, 2015; Cohen, 1994; Sawyer, 2003; 2007).

Music education researchers have provided valuable resources in support of group composing for both research and practice. Webster (1992b), for example, suggested that there is great potential in compositional group work in music classrooms. Some have studied what specifically creates successful group composing experiences for elementary students (Cornacchio, 2008; Glover, 2002), while others have developed pedagogical materials connecting creativity and composing in groups (Kaschub & Smith, 2009). Yet, while group composing is one method of offering a composing opportunity, it is often unknown whether

students will be “collaborative”, an idea greatly connected to the pedagogy of composition (Berkley, 2004; Cangro, 2015; Hewitt, 2008; Levi, 1991; Wiggins, 1990, 2005, 2007).

Hindson, Barbeler, and Blom (2007) studied the ways in which music teachers may present opportunities to compose with elementary, secondary, and college students. Through their study, the authors developed a pedagogy for use by teachers with little experience with composing called the *Music Composition Toolbox* that focused on creativity and originality of beginning students. While the text appears more advanced than beginning music learners might use, it may be an example of pedagogical teaching materials so needed by our profession.

In an earlier study, Blom (1999) used ethnographic methods to study the processes of students composing. The author introduced minimalist composing ideas to students at the elementary level, ages nine and ten. Using the phrase “composition by committee”, classes composed together with two teachers in order to understand the processes of not only the students but that the teachers imposed. In six lessons, one teacher working with elementary level students performed two of their pieces, one successfully, the other less so. This study allowed, not only for examination of children's creative process and decision-making in their class, but also the two teachers' experiences with leading students from composing a new piece from pre-existing minimalistic material (p. 27) to performance of students' original works. Overall, this study generated more knowledge about what teachers need when working with young children in compositional activities, especially when moving from individual to group composing opportunities.

Burland and Davidson (2001) investigated how groupings of elementary children based on friendship affected group musical composition. Eleven-year-olds (n = 59) participated in this study and their composing sessions were videotaped. The researcher observed the interactions of

randomly assigned groups to understand quality of interactions: friendship, non-friendship, matched intelligence, mixed intelligence, and random (p. 48), and their impact on children's composing work. Findings indicated that friendship increased participants' interaction and enjoyment in the composing project while both friend and non-friend groups experienced no increase or reduction in the quality of the products created.

MacDonald and Miell (2000) also examined the importance of social aspects of composing in groups from the perspective of friendship and age (N = 40) when composing in pairs in music classrooms. Considering process in collaborative work, this study examined both process and product while examining the element of "interaction" while composing. The authors found that communication is enhanced when children are composing with friends, possibly due to previously established patterns of interaction. This is not to say that non-friends cannot work well together, but it is just an indication that they must first develop a pattern of interaction. It follows that collaborative work may take longer to occur as groups adjust to initiating suggestions with unknown partners during compositional work. When students are already successful with transactive communication, they are able to initiate and elaborate on each others' ideas (p. 365). Students may also be unafraid to challenge one another when working with friends as opposed to working with strangers.

In a follow up study, Miell, Mitchell, and MacDonald (2002) examined the processes and products of children working compositionally in groups, with age as a variable of interest. Results confirmed that non-friend 8-year-olds had much less transactive dialogue than both older children and same age children who were paired with friends. In sum, friends were more capable of quickly establishing what the authors termed a "joint productive activity" (p. 160).

St John (2006) studied the interactions of nine boys and three girls aged four to six in a private music center for 75 minutes over a period of 15 weeks. Although this study did not examine group composing directly, it provided important clues concerning children's group music-making. Sessions were videotaped and observed by the researcher, who examined how musical interactions contributed to music learning through inclusion of singing, movement, and instrument-playing activities. St. John provided descriptive narratives of the children's experiences of "playing off each other" as well as how children positioned themselves in the group. The study found that young children personalized their learning experiences when encountering ways to engage with musical materials for their own enjoyment. Children in this study relied upon peers as a way to become involved and create knowledge through shared experiences. This finding suggests that both verbal and non-verbal interactions play a role in collaboration early in musical experiences.

The studies described in this section engage educators in thinking about what may be expected when providing children with opportunities to compose in groups. Findings from these studies are promising, yet there is still much to uncover in terms of the provision of specific research-based tools or pedagogy for working compositionally with students at the elementary level.

Composing and Technology

Composing opportunities for children are increasingly found connected to technology in K-12 classrooms, however, Webster (1998) wrote about his concern for the use of technology in classrooms as a "time saving" device rather than a support system for music learning. Webster also discussed his ideas about technology's support of the creative thinking process and advocated for the use of technology as a medium to support children thinking in sound.

Considering the daily use of technology by children in classrooms decades later, this may still be an important consideration; that technology be used with specific purpose with well-defined instructional methods. Webster's extensive writing includes many aspects of technology-related topics (1989b; 1992a; 1998; 2002b; 2007; 2012a), creative thinking and assessment (1992b), composing (2012b), and intelligence (2013). Creative thinking processes are also discussed by Seddon and O'Neill (2003), Syverud (1992), Watson (2011).

Lipscomb, Hickey, Sebald, and Hodges (2003) developed a study to gain a clearer understanding of instructional methods for technological tools and providing students with opportunities to compose and an objective of understanding levels of creative process. Fifth grade classes completed composition tasks along with the researchers in a technology laboratory for 30 minutes weekly, over a period of ten weeks. Eighty-six compositions were then evaluated for creativity using Lomax's (1976) cantometrics. Used in ethnomusicology, cantometrics is a coding system for analyzing songs through 36 style elements such as tempo or range and divided into nine areas: differentiation, ornamentation, orchestra organization, vocal cohesiveness, choral organization, noise-tension level, energy level, rhythm, and melody. Children's compositions were analyzed by two independent evaluators, as it is customary to use more than one judge in analyses based on cantometrics. Findings indicated that fifth grade students were capable of composing music, although there were variations in quality. Through-composed pieces were evaluated as "more different", that is, were presumably identified as being more creative. The researchers concluded that cantometrics could be a useful resource when studying creative processes of different age groups.

Other studies have examined differing contexts related to creativity and composing when using technology at the elementary level (Finney and Burnard, 2009; Huang and Yeh, 2014;

Hyun, 2005). Hewitt (2008), for example, worked with pairs of students aged 10 and 11 who were asked to compose melodies on computers. Hewitt was interested in understanding "transactive communication" (i.e., initial communication is given an immediate response) of pairs of students when making compositional decisions. Contrary to other studies, Hewitt's work suggested that musical expertise and friendship did not influence student communication. Transactive dialogue, or, communication that moved the project forward, in turn, increased with music experience, although it did not reach statistical significance.

Younker (2000) studied the thought processes and strategies of students when they were composing with technology. Nine students, ages eight, 11, and 14 composed independently. Younker highlighted a broad range of developmental patterns of elementary and middle school students when composing including how to begin composing, the actual sounds of the keyboard and interaction students had with these, differences in the use of the keyboard across grade levels, and use of known material in a new composition.

While there is little study of elementary students' uses of music technology, there are comparatively more studies related to music technology and composing with secondary and tertiary students. As Ruthmann (2006) contended "…researchers in music education know relatively little about learning and teaching in technology-infused environments" (p. 2). Ruthmann investigated the experiences of compositional teaching and learning in a music laboratory environment to better understand the challenges of developing pedagogy that exists in a limited fashion in classrooms revealing some of the challenges associated with providing clear instructions when working with students within creative musical experiences.

A research project carried out by Jennings (2005) examined how students interacted with *Hyperscore*, the computer program used for composing in this study. Jennings, who assisted with

the development of *Hyperscore*, worked with ten children, aged nine to eleven, who used *Hyperscore* for up to ten fifty-minute meetings for five weeks. Participants were videotaped as they composed one piece that lasted between two and four minutes. The author solely offered instructions to participants about what to compose, with very little guidance or input. Jennings analyzed one case and found the child's compositional processes to be similar to the ones described by expert composers, in which levels of compositional detail were shifted from focus on large sections to small, and in-between sections. Jennings also found that even though the participant had extensive aural skills but little formal musical knowledge, he was able to complete a composition.

Mota, Goncalves, Oliveira, Sousa, Calheiros, and Ribeiro (2007) also reported on an exploratory study of using *Hyperscore* in general music in Portugal. Three classes of 26 students in each, aged ten to 13, worked independently with a computer (i.e, with *Hyperscore*) and headphones – one per child. The researchers noted that students were highly engaged with the task and while they worked alone, communicated with each other collaboratively. They also increased their music vocabulary following the use of *Hyperscore*. The researchers noted the strong appeal of the program for children.

Not challenging to learn and fun to use, *Hyperscore* is a useful support system for beginning opportunities to compose, as shown by earlier studies (e.g., Mota et al, 2007). Yet more studies are clearly needed to investigate potential outcomes of using *Hyperscore* on children's creative thinking in music individually and in groups. As will be seen in Chapter Three, *Hyperscore* was selected for this study because it does not require knowledge of music notation, allowing for greater student beginning efforts with group composing tasks.

Chapter Summary

This chapter considered eight areas of research related to the study of compositional work young children do in groups in music classrooms. Fundamentally, the review included:

- Definitions of creativity and their applications in music education
- Measurement of creativity, intelligence, and tests of musical aptitude
- Measurement of creativeness
- Composing and music teacher education
- Creativity and composing process of young children
- Composing in groups
- Composing and technology
- Development of an observation rubric through lenses of creativity researchers

As discussed in this chapter, defining creativity is difficult yet, sustaining its application to young children when given opportunities to compose is fundamental.

Composition, as a creative task, is a complex endeavor. Decades have been spent researching the constructs of creativity from a psychological perspective, creativity and intelligence, and creativity and aptitude. Measuring creativeness is perhaps the fundamental aspect of this study within the compositional process of children in foundational learning environments.

A rubric was constructed over the course of this study for the observation of group process when composing. It was also of interest to learn if there were statistically significant differences between the factors of grade level and gender for all questions for this study. The Intermediate Measure of Music Audiation and Measure of Creative Thinking in Music were used to understand the statistically significant results and correlations of these with a composing treatment.

Children may be naturally drawn to composition but even when not, are very capable of doing it. Children may also successfully compose individually, with peers, or both. Composing in groups has much potential in music classrooms but may be underexplored, particularly where technology is concerned. However, whether technology or acoustic instruments are used may not matter. It may be the nature of the process presented by the music teacher, and experienced by the child, that may be most significant when considering a child's musical learning.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter presents the methods employed to answer the stated research questions. An experimental between-subjects factorial design was used to answer most of the research questions. Measures of correlation were also employed.

1. a. Using the Crawford Index of Quality for Composing Groups (CIQCG) as the dependent variable, are there statistically significant differences in group process scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated)?

   b. Do the factors of gender and grade level play a role in these comparisons?

2. a. Using the Webster Measures of Creative Thinking in Music (MCTM) as the dependent variable, are there statistically significant differences in group scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated)?

   b. Do the factors of gender and grade level play a role in these comparisons?

3. a. Are there statistically significant relationships between (a) group process scores of all participants in Groups A and B, (b) music aptitude scores as measured by the Gordon Intermediate Measure of Music Audiation (IMMA), and (c) creative thinking (MCTM) scores?

   b. Do the factors of gender and grade level play a role in these relationships?

Dependent measures in this study included: (1) the Intermediate Measure of Music Audiation (Gordon, 1986), (2) a researcher-constructed measure called the Crawford Index of Quality for Composing Groups (CIQCG), and (3) Measure of Creative Thinking in Music (MCTM) (Webster, 1994). Independent variables included: (1) composing treatment groupings

(Acoustic Instrument, Computer Instrument (*Hyperscore* software), and a non-contact Control Group, (2) grade, and (3) gender. IMMA scores were used in a preliminary way to evaluate the equivalency of groupings.

Study Design

School Setting

One medium-sized elementary school site (678 students in total enrollment) from a suburban school district and identified as a "bedroom community" near Los Angeles, California served as the location for this study. The school district is comprised of lower middle to upper middle income levels. The student ethnicities in the site used for the study were as follows: 54% white, 22% Hispanic, 11% Asian, and 3% black. The site selected was this author's first year of employment for this school district. The site administrator and district administrators negotiated entrance into this site, for the purposes of completing this study. The Institutional Review Board of USC approved all study materials and procedures (see Appendix A).

Instruments Used

Intermediate Measure of Music Audiation (Gordon)

Gordon (1990) defined music aptitude as "...a measure of a student's potential to learn music" (p. 4). As noted in Chapter Two, Gordon is the creator of the music aptitude tests titled Primary Measures of Music Audiation (PMMA) and Intermediate Measures of Music Audiation (IMMA). According to Walters (1991), these were Gordon's "…inquiry into the nature of the young child's music aptitude" (p. 68). More specifically, the IMMA is a two-part tonal and rhythmic test devised for children in grades one through six. Children are required to listen to

two sets of recordings of sound patterns with forty pairs each (i.e., rhythmic and melodic) for approximately 40 minutes. After each pair of patterns is heard, children must determine if the two sound patters are "the same" or "different" and mark their responses on a score sheet. The researcher then scores each test to determine the number of correct responses per subtest.

Crawford Index of Quality for Composing Groups (Crawford)

The Crawford Index of Quality of Composing in Groups (CIQCG) was developed by the author to examine the quality of participants' process when composing in groups. The rubric contains five sub-sections and applies rating scales of one to five for each sub-section (see Table 3.6).

Stratified random sampling (Creswell, 2009) was used to select groups referred to herein as Groups A, B, and C. Following completion of the IMMA, students were randomly assigned to two composing treatment groups: Group A – composed with acoustic rhythm instruments, Group B – composed with a graphic computer program, *Hyperscore*. Group C – Control group participants took the IMMA and MCTM however, used as a control, did not participate in a composing treatment.

Group A (n = 16) was comprised of four subgroups with four participants in each: two groups of Group A and Group B for both third and fifth grade. Participants in group A composed music with acoustic rhythm instruments (e.g., bells, drums, sticks, shakers, and found objects). To do so, they took part in meetings of up to 45 minutes each and chose to return for further composing time until they felt their compositions were completed.

Group B (n = 16) was comprised in the same way. All participants composed in groups of four participants using *Hyperscore* and took part in meetings of up to 45 minutes each choosing to return for further composing time until they felt their compositions were completed.

Group C (n = 16) or the control group, comprised of third grade (n = 8) and fifth grade students (n = 8), did not receive any composing treatment prior to taking the MCTM.

Measure of Creative Thinking in Music (Webster)

The Measure of Creative Thinking in Music (Webster, 1994) was completed by all participants (N = 48). The design of the measure comprises four factors: musical extensiveness, musical flexibility, musical originality, and musical syntax, with a variety of different tasks within each factor (see Figure 3.1).

Table 3.1

Factors of the Measure of Creative Thinking in Music (Webster, 1994)

Musical Extensiveness	The amount of clock time involved in the creative tasks
Musical Flexibility	The extent to which the musical parameters of "high"/"low" (pitch); "fast"/"slow" (tempo) and "loud"/"soft" (dynamics) are manipulated
Musical Originality	The extent to which the response is unusual or unique in music terms and manner of performance
Musical Syntax	The extent to which the response is inherently logical and makes "musical sense"

Webster (1994) developed the Measure of Creative Thinking in Music (MCTM) for children aged six to ten. The MCTM is divided into three parts, namely, exploration,

application, and synthesis with a total of ten tasks. The MCTM was administered individually to students and takes about twenty to forty-five minutes to complete. Materials included in the MCTM are a round sponge ball, woodblocks or temple blocks with five different pitches, two mallets, and a piano. Additionally, line drawings, three pieces of blank paper, and a video/sound recorder are also used. Sessions were videotaped for subsequent analysis and scoring. The administrative dialogue for researchers to use with participants is clearly presented in Webster's Administrative Guidelines (1994), the full content of which may be found in the Appendix of this study (see Appendix E).

The MCTM progresses from a game-like introduction to increasingly difficult improvisatory tasks that require creative or, divergent thinking. The approach of the MCTM is that there are no wrong answers. Scoring of the videos is aided by a scoring sheet that is provided with the MCTM materials. There are four factors integral to the MCTM that Webster identified from the areas of composition, music education, and psychology including musical extensiveness, musical flexibility, musical originality, and musical syntax. Factor scores were computed separately from the scores of these four areas and then standardized using SPSS.

Participant Selection and Timeline for Study

All third and fifth grade students attending the school were invited to take part in the study via invitation letters that were distributed to their parents or legal guardians with the permission and assistance of the site administrator and classroom teachers. Students volunteered to participate in the study by returning a signed permission form from their parent/legal guardian (Invitation to Participate in a Research Study-Parental Permission, see Appendix B). When students reported for the first meeting, they signed a Student Assent to Participate (see Appendix

C). Demographic information concerning student grade level, gender, and prior musical experience were also collected from all students by way of a simple questionnaire.

All meetings of the three phases (see Table 3.2) of the current study (administration of Gordon's IMMA, composing treatments, and administration of Webster's MCTM) took place at the elementary school in the music classroom, during regular school hours. The researcher prepared the testing area in the music room at the selected school site prior to the arrival of students for each meeting. A texted script provided Groups A and B with an overview and instructions for the composing tasks, as discussed below. The researcher participated in the treatments as a timekeeper only, but was available to answer questions if needed. A detailed description of procedures for each of the composing treatments is presented below.

Table 3.2

Three Phases of the Current Study

Phase 1	a. Students completed assent to participate in this study	b. Students completed Intermediate Measure of Music Audiation (IMMA)	c. IMMA scores analyzed for parity of scores and elimination of outliers
	Students randomly selected for composing treatments and control, Groups A, B, and C		
Phase 2	Participants completed Composing treatment – Composing Index of Quality for Composing Groups (CIQCG) - Group A (acoustic instruments) and Group B (*Hyperscore*) (Group C acted as Control Group and did not compose)		
Phase 3	Participants in all groups completed Measure of Creative Thinking in Music (MCTM)		

During Phase I, students took the Intermediate Measures of Music Audiation (IMMA) by Gordon, (1986). Because more students wished to participate than the number needed (N = 48), the IMMA was used to learn the range and distribution of students' scores and to determine if there might be outliers scores that would affect the study. Sixty-four students volunteered to be a part of the study. Thus, eliminating very high and very low-scoring students, students with IMMA scores closest to the mean were selected to become participants in the subsequent phases.

While students who achieved extreme scores on the Gordon measure were not selected to take part in the remainder of the study, they were informed they could participate at a later time, if they were interested. No students requested this. Students not selected to take part in the composing treatment were also notified that they could participate in the event of dropouts, however, no participant ever dropped out from the study.

To control for threats to validity in this study, the treatment and control groups experienced the same environmental conditions in the same environment. Participants were also asked not to discuss their involvement in the study until all data were collected.

Sample Description and Treatment Conditions

The selected sample of forty-eight participants was randomly grouped for the two treatment conditions and the control group. Group A (n = 16) and Group B (n = 16) composed with different tools in groups of four participants. Group A composed with acoustic instruments and Group B composed with a graphic computer program, *Hyperscore*. Group C (n = 16) did not compose but took the MCTM. The Control Group was used to determine if the mean scores of the MCTM and IMMA were different, between the two treatment groups, and a third group of children, but was not used for any of the main research questions in this study.

Phase One - Intermediate Measure of Music Audiation (IMMA)

Phase 1 of this study tested all students who volunteered (N = 67) to be a part of this study using the IMMA. Selecting the needed forty-eight participants from scores closest to the mean and then randomly grouping them in Groups A, B, and C, Table 3.3 describes the scores received for the IMMA by composing groups by grade and gender.

Table 3.3

IMMA Scores by Composing Groups A, B, and C and by Grade and Gender

Male	Grade	**A**	**B**	**C**
	3	75	25	75
	3	40	75	
	5	50	15	10
	5	60	50	50
	5		70	75
	5		60	
Female	Grade	**A**	**B**	**C**
	3	30	75	20
	3	75	25	40
	3	40	75	75
	3	80	30	30
	3	75	60	30
	3	40	40	50
	3			40
	5	15	25	40
	5	70	25	40
	5	50	50	50
	5	60	60	75
	5	30		25
	5	10		

IMMA scores were examined by grade. Outcomes of the IMMA score frequencies were between 10 and 80 for the participants in this study. The mean score of participants (N = 48) who took the IMMA was 47.60 (see Table 3.4).

Table 3.4

IMMA Score Frequency for Third and Fifth Grades

	IMMA Scores	Frequency	Valid Percent	Cumulative Percent
Valid	10	2	4.2	4.2
	15	2	4.2	8.3
	20	1	2.1	10.4
	25	5	10.4	20.8
	30	5	10.4	31.3
	40	8	16.7	47.9
	50	7	14.6	62.5
	60	5	10.4	72.9
	70	2	4.2	77.1
	75	10	20.8	97.9
	80	1	2.1	100.0
	Total	48	100.0	

Third grade participants (n = 24) scored higher on the IMMA with a mean of 50.83 on the IMMA. Fifth graders (n = 24) scored a mean of 44.37. Participants (n = 15) earned scores of 40-50 on the IMMA while others (n = 10) earned a score of 75 while remaining participants scored between 10 and 80 creating a large standard deviation (see Table 3.5).

Table 3.5

Means of IMMA Scores by Grade Level

Grade	Mean	Std. Deviation	N
3	50.83	21.196	24
5	44.37	20.658	24
Total	47.60	20.961	48

Phase 2: Composing Treatments and Crawford Index of Quality for Composing Groups

This study was designed to examine the effects of group composing treatments using an observation protocol (see Table 3.6). acoustic rhythm instruments or *Hyperscore* to compose. In this section, the two composing treatments are described.

Table 3.6

Crawford Index of Quality for Composing in Groups

Crawford Index of Quality for Composing Groups (CIQCG)					
Process Scoring Rubric for Composing Groups	**1**	**2**	**3**	**4**	**5**
Interaction	Group is challenged by working together and may not overcome the challenge. (1)	Group is challenged by working together but may overcome the challenge at times. (2)	Group is able to work together and even if challenged at times, they improve over time. (3)	Group works together well and experience few challenges. (4)	Group works together in a unique way that supports successful outcome of the composition. (5)
Communication	Communication techniques are not improved over the course of the project. (1)	Communication techniques are somewhat developed over the course of the project. (2)	Communication techniques are improved over the course of the project. (3)	Communication techniques work well amongst most/all members of the group and support development of a strong project with rehearsal and revision of the project. (4)	Communication techniques are at a high level and rehearsal, revision, rehearsal, additional revisions are unchallenging. (5)
Leadership/ Innovation	Leadership remains unexplored generally by this group. (1)	Leadership is explored but at a low level. (2)	Leadership is found in at least one member of the group and group effort and project development are improved because of this. (3)	Leadership is explored well by more than one member of the group; group effort and project development are high because of this. (4)	Leadership is explored well by each/most members of the group; group effort and project development are at highest level. (5)
Creative Process	Creativity is limited or missing from the group effort and in their project development. (1)	Creativity is found at times in group effort and/or in project development. (2)	Creativity is found in group effort and/or in project development. (3)	Creativity is evidenced through working relationships and process. (4)	Creativity is evidenced through working relationships, process and final product. (5)
Product Completion	Composition remains incomplete or brief. (1)	Composition is incomplete or complete but brief. (2)	Composition is nearly completed or is completed for this project. (3)	Composition is complete or completed for this project. (4)	Composition is completed and perhaps additional work is begun. (5)
(Scoring note: Scores may be produced by following each column for one overall score, or, one section from any column (totaling five) may be selected with score noted in parentheses.)					

Composing Group A – Acoustic Instruments

Students entered the testing area following a schedule provided to classroom teachers via email. When arriving for the first meeting, students received a scripted verbal introduction with instructions. (See Figure 3.2). A brief demonstration of the acoustic instruments to be used for the composing task was given by the researcher.

Students composed with acoustic instruments for up to 35 minutes followed by one or two verbal hints to think about completion of their work for the meeting. Students completed their projects in up to four, 25 – 45-minute meetings.

Group A participants selected from a variety of non-pitched instruments for their composing activity. These included drums of several types, tom toms with mallets, rhythm sticks of several types, non-pitched bells, bongos, rain sticks, cymbals, cluster bells, triangles, sand blocks, whistles, a large tone block with mallet, maracas, tambourines, claves, and miscellaneous found objects.

Acoustic Instrument Room Arrangement

Four tables were placed at the center of the classroom workspace and instruments, organized by type, were placed on the tables. Each table (see Figure 3.3) was photographed as a way to ensure that the same instruments would be made available for each composing group on subsequent meetings. Students were able to select any instruments made available to them when developing their compositions. Space in front of the tables allowed for arrangement of instruments on the floor for exploration, rehearsal, and performance.

Figure 3.1

Group A - Room Arrangement for Acoustic Instrument Composing Treatment

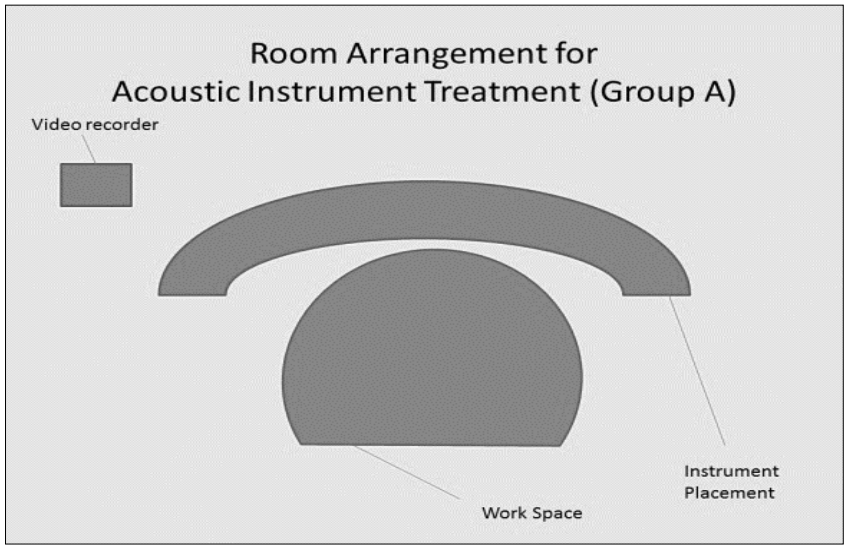

Figure 3.2

Group A - Acoustic Rhythm Instrument Composing Treatment Script

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1. Introduction: Welcome to the first part of our composing session. Today, you will have the opportunity, as a group, to create a musical composition. All of these instruments can be used by you to make your own choices as a group about your composition.
2. I want you to forget I am here. I will let you know when you need to begin to think about finishing your work but you have a good amount of time before that happens so you don't have to feel rushed. You will still have more time when I ask you to begin to finish.
3. You may want to think of a title for your piece. I might suggest you think of a theme before you begin. You might also want to have a beginning, a middle, and ending sections in your piece.
4. Whatever you compose today, I know it will be your best work and I am looking forward to listening to it when it is finished.
5. This means you have to agree on how it will sound and remember how to play it when you are finished. You may use the paper and pencils on the table to create your score. A score is the notation that reminds you how to perform your piece.
6. Please look at the instruments.
    a. You may choose any instrument.
    b. You may also decide you want a different instrument.
    c. You may want to play more than one instrument or more than one instrument at a time.
7. One thing you might want to remember. You may choose to have silence in your composition. In other words, you may make many choices as you compose your piece.
8. Now it's your turn. If you have any questions, let me know because I will be right over here.
9. One more thing, please wait to speak about your experiences today until the study is completed. You may meet again or until you feel your composition is completed.
10. Any questions?

Composing Group B – *Hyperscore*

Designed by Seymour Papert (1980; 1991), Mary Farbood, and Egon Pazstor at the MIT Media Lab in Cambridge, Massachusetts, *Hyperscore* is a non-notational (i.e., graphic) music composition computer program that engages students through mapping complex musical concepts visually (see Farbood and Ludwig, 2002; Farbood, Kaufman, & Jennings, 2007). Papert has long considered children and technology (1980), and constructionism (1991) as methods for developing creativity and new ways to learn.

Hyperscore has specific instrument modules within the program. In this study, participants were given the option of selecting from any of the non-pitched instruments in the Percussion Kit for their compositions. Groups could hear their pieces via a sound system connected to the computer as they composed.

As explained above, participants assigned to Group A composed and notated a score using general classroom acoustic instruments in groups of four. Musical scores were notated with paper and pencil provided by the researcher. Children assigned to Group B composed a piece using *Hyperscore*, also in groups of four. Their compositions were saved as computer files.

Students entered the testing area and received a scripted verbal introduction with instructions (see Figure 3.5). Students were given a simple overview of the *Hyperscore* computer program and the elements of the work space on the computer screen. The researcher demonstrated how to place the first workspace block in the screen and how to find the voices available to participants for their composition. The researcher demonstrated use of the composing tool and how the drawing feature identified how the color-coded parts might work when creating a score.

Hyperscore **Room Arrangement**

The classroom computer was used for the main work space for participants in Group B. Child participants used the attached keyboard and mouse. A white screen was utilized for greater visibility of each subgroup (n = 4) of participants; however, this proved to be a distraction more than an assist and was discontinued. (See Figure 3.4). Participants were invited to compose for up to 35 minutes followed by reflection and provision of one or two verbal hints on the

completion of their work during the meeting. Students completed their projects in up to four meetings of 25-45 minutes.

Figure 3.3

Group B – Room Arrangement for Hyperscore Composing Treatment

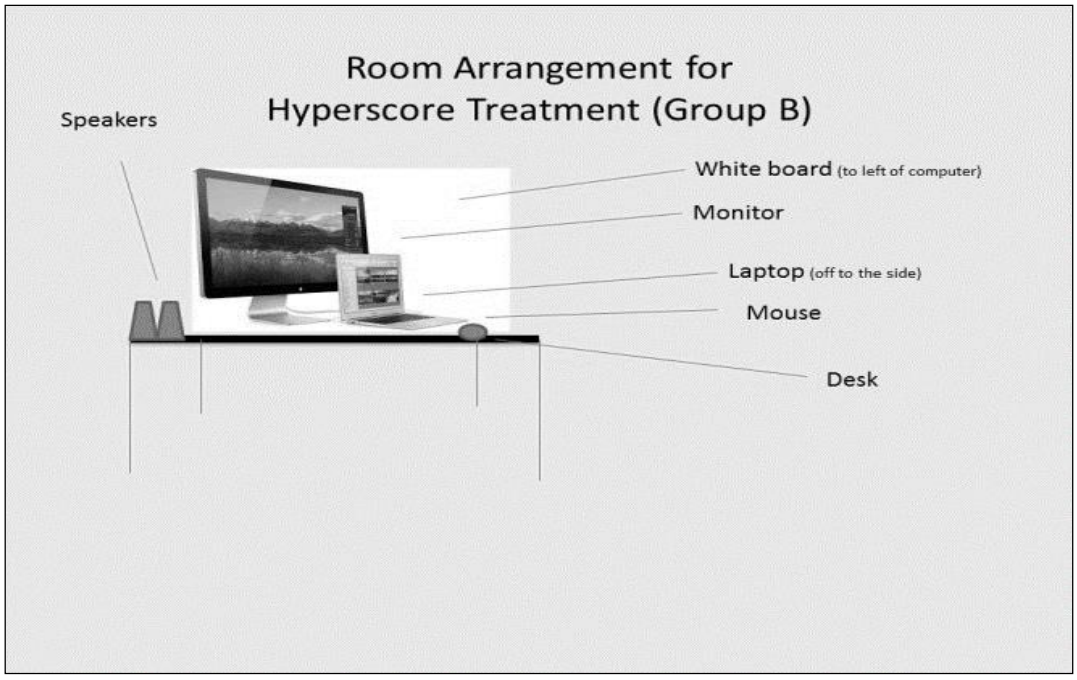

Figure 3.4

Group B - Hyperscore Composing Treatment Script

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1. Introduction: Welcome to the first part of our composing session. Today, you will have the opportunity, as a group, to create a musical composition. I will show you how the program, called *Hyperscore*, works and then you will make all of your own choices as a group about your composition.
2. I want you to forget I am here. I will let you know when you need to begin to think about finishing your work but you have a good amount of time before that happens so you don't have to feel rushed. You will still have more time when I ask you to begin to finish.
3. You may want to think of a title for your piece. I might suggest you think of a theme before you begin. You might also want to have a beginning, a middle, and ending sections in your piece.
4. Whatever you compose today, I know it will be your best work and I am looking forward to listening to it when it is finished.
5. This means you have to agree on how it will sound when you are finished.
6. Please look at the computer monitor. *Hyperscore* instructions:
    a. To choose your first instrument, you will click on the MELODY WINDOW.
    b. Next, Click on INSTRUMENTS to select your first Instrument. You may select from the following groups of instruments: 1) percussion, 2) sound effects, and 3) synth effects.
    c. Click on the DROPLET tool to add your sounds.
    d. Add the Instruments that you want in your composition.
    e. Click on the SKETCH WINDOW tool.
    f. Select the PEN TOOL and try a stroke in the Sketch Window.
    g. Your strokes color matches with the MELODY WINDOW.
    h. You will be able to go back and change instruments any time you like.
    i. You can drag the METRONOME tool to change how fast or slow you want the composition to be.
    j. (Close out of everything and open one MELODY WINDOW). Ok, now it's time for you to try it. I will open your first MELODY WINDOW. (Demonstrate.) Now I will select an Instrument. (Demonstrate). I will add it to sound this way. (Demonstrate). I will add a second MELODY WINDOW. (Demonstrate). I will select a second Instrument. (Demonstrate). Now I'm going to open a SKETCH WINDOW. (Demonstrate). I think it would be fun to put this voice here (Demonstrate) and the second voice like this (Demonstrate). Ok. Let's press Play. (Listen). What do you think? (Clear screen).
7. One thing you might want to remember. You may choose to have silence in your composition. In other words, you may make many choices as you compose your piece.
8. You may want to play more than one instrument or more than one instrument at a time.
9. Now it's your turn. If you have any questions, let me know because I will be right over here.
10. One more thing, please wait to speak about your experiences today until the study is completed. We will meet three more times.
11. Any questions?

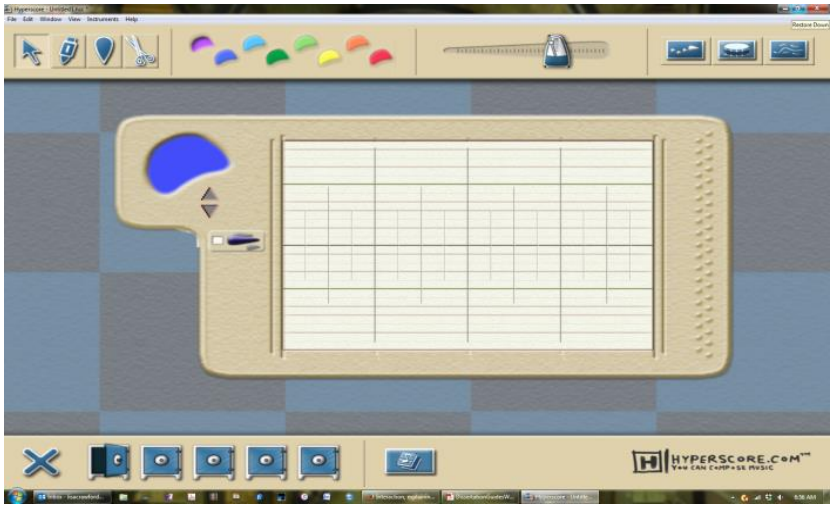
Hyperscore Screenshots

What follows are screen shots of the introductory process given to participants demonstrating the use of the computer program *Hyperscore*. The screen shots were taken from this author's computer and represent instructions for beginning use of the program for participants.

1. Participants were given a brief overview of how *Hyperscore* works through a simple script (see Figure 3.5). First, participants were shown an empty Melody Window and the droplet icon that allows the composer to enter sounds from the instrument bank.

Figure 3.5

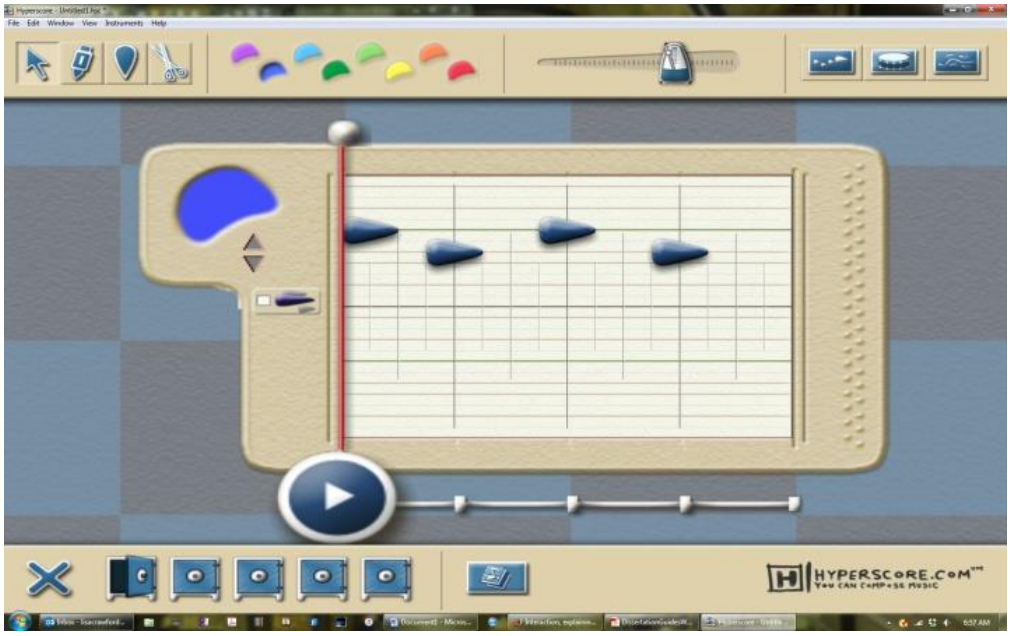
Hyperscore Melody Window Screenshot



2. Participants were instructed on how to use the basic features of the program including creating additional Melody Windows, playback and selection of instruments, inserting sounds (see Figure 3.6), and use of the metronome.

Figure 3.6

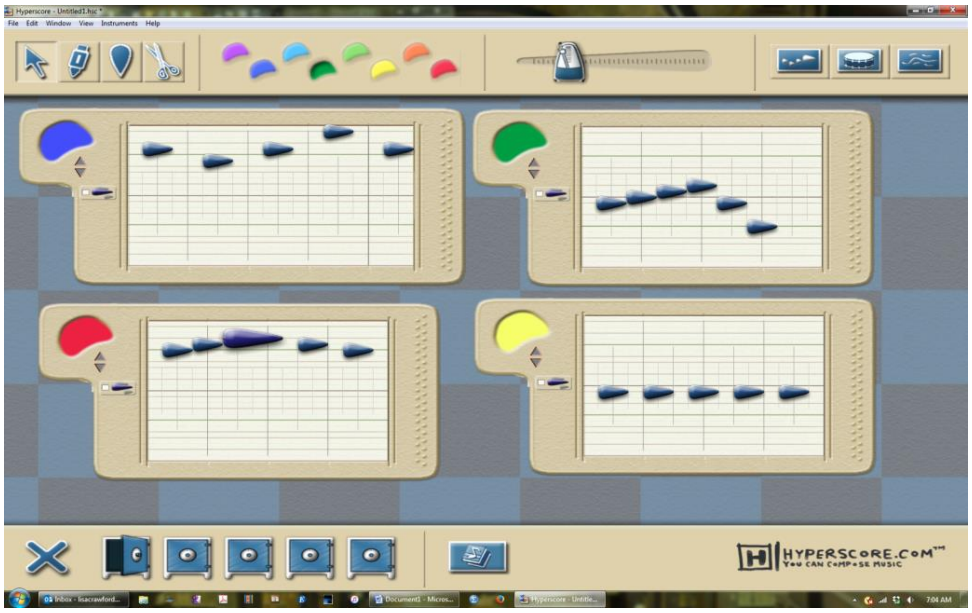
Hyperscore Melody Window – Inserting Sounds Screenshot



3. Participants were invited to make several Melody Windows and how to fit multiple voices simultaneously on the same screen (see Figure 3.7).

Figure 3.7

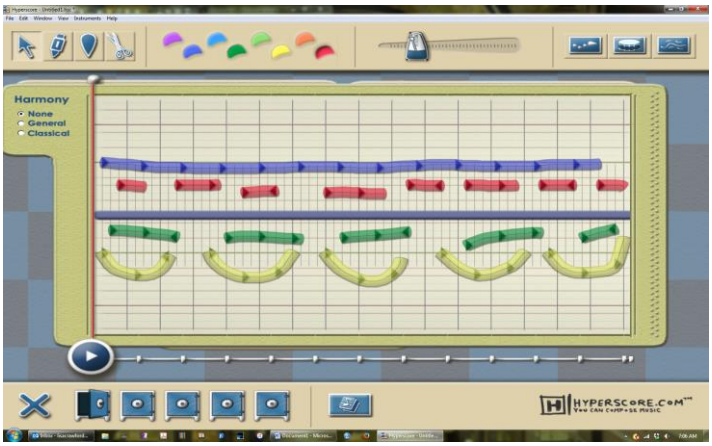
Hyperscore Melody Window – Multiple Voices Simultaneously Screenshot



4. Participants were shown how to use the Sketch Window (see Figure 3.8) for compositional development and how to save their projects.

Figure 3.8

Hyperscore Sketch Window for Compositional Development



Chapter Three Tables

Chapter Three includes tables that are not related to answering the three questions proposed by this study. Findings for the questions may be found in Chapter Four.

Inter-judge Reliability of Composing Treatment Scores

Inter-judge reliability for CIQCG scores is displayed in Table 3.7 showing the score outcomes for each sub-section and scores provided by two judges.

Table 3.7

Inter-judge Reliability of Composing Treatment Scores (Third and Fifth Grades) when using Crawford Index of Quality for Composing Groups

Composing Treatment Groups	Composing Group Scores (Judge 1)	Total Score	Composing Group Scores (Judge 2)	Total Score
Third Grade				
Acoustic: 1A3 (1-4)	1, 2, 2, 1, 1	7	1, 2, 2, 1, 1	7
Acoustic: 2A3 (5-8)	3, 4, 4, 3, 4	18		
Hyperscore: 1B3 (9-12)	4, 5, 5, 5, 5	24		
Hyperscore: 2B3 (13-16)	5, 4, 4, 4, 3	20		
Fifth Grade				
Acoustic: 1A5 (1-4)	4, 4, 4, 5, 4	21		
Acoustic: 2A5 (5-8)	3, 4, 3, 3, 2	15		
Hyperscore : 1B5 (9-12)	4, 3, 3, 4, 4	18		
Hyperscore: 2B5 (13-16)	4, 5, 4, 5, 5	23	4, 4, 4, 5, 5	22

Third grade participants scored higher (22.29) than fifth (20.14) using *Hyperscore*. Fifth grade participants scored much higher (18.00) than third grade (9.20) using acoustic instruments. Fifth grade scored better (19.00) than third (16.83) overall in group composing scores.

Table 3.8 shows the mean differences of the composing group scores between the acoustic instrument (Group A) and *Hyperscore* (Group B) groups. The mean differences, (M Acoustic = 14.25 and M *Hyperscore* = 21.25) were highly statistically significant (see Table 3.9).

Table 3.8

Means of Acoustic vs. Hyperscore Group Composing Scores

Composing Groups	Mean	Std. Deviation	N
Acoustic	15.25	5.385	16
Hyperscore	21.25	2.463	16
Total	18.25	5.124	32

Table 3.9

Two-way ANOVA of Group Composing Scores by Acoustic and Hyperscore Groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	288.000[a]	1	288.000	16.426	.000
Intercept	10658.000	1	10658.000	607.871	.000
Composing Groups	288.000	1	288.000	16.426	.000
Error	526.000	30	17.533		
Total	11472.000	32			
Corrected Total	814.000	31			

a. R Squared = .354 (Adjusted R Squared = .332)

Phase Three: Measure of Creative Thinking in Music (MCTM)

IMMA and MCTM scores were compared to learn if there were any statistically significant results. Composing group scores are included in this comparison to understand if those who scored high on the IMMA also scored high on group composing scores, but especially as related to the MCTM (see Table 3.10). While there were no statistically significant correlations between IMMA, composing group, and MCTM scores, this Table shows that the Control Groups who scores closest to the IMMA mean (47.60) scored higher on the MCTM than composing groups in that range.

Table 3.10

IMMA Scores Compared to MCTM Means by Composing Groups

IMMA Scores	Composing Groups	MCTM Means	Std. Deviation	N
10	Acoustic	-.0854	.	1
	Control	.5977	.	1
	Total	.2561	.48300	2
15	Acoustic	.9017	.	1
	Hyperscore	-.7584	.	1
	Total	.0716	1.17389	2
25	*Hyperscore*	-.8521	.16558	4
	Control	-.4897	.	1
	Total	-.7796	.21641	5
30	Acoustic	-.7152	.79862	2
	Hyperscore	-1.0262	.	1
	Control	.1036	.68432	2
	Total	-.4499	.74023	5
40	Acoustic	-.2435	.	1
	Hyperscore	-.5935	.	1
	Control	.1683	.62388	4
	Total	-.0273	.58104	6
50	Acoustic	.8523	1.14268	2
	Hyperscore	-.5337	.29664	2
	Control	.8981	1.29593	3
	Total	.4760	1.12616	7
60	Acoustic	-.3549	.91847	2
	Hyperscore	.7520	.90299	2
	Total	.1986	.98050	4
70	Acoustic	-.4757	.	1
	Hyperscore	-.2285	.	1
	Total	-.3521	.17478	2
75	Acoustic	-.3710	1.13779	3
	Hyperscore	.5710	.60605	2
	Control	.5513	1.02502	4
	Total	.2482	.98961	9
Total	Acoustic	-.1117	.88792	13
	Hyperscore	-.3169	.74611	14
	Control	.3925	.85369	15
	Total	.0000	.86645	42

MCTM scores were examined by composing groups A, B, and C, grade level, and gender. Table 3.11 provides an overview of MCTM scores by composing group. Fifth grade acoustic and third grade control groups scored highest on the MCTM.

Table 3.11

MCTM Scores Overview by Grade and Gender

Composing Group	Grade	Gender	MCTM Means	Std. Deviation	N
Acoustic	Third Grade	M	-.7467	.	1
		F	-.4725	1.04	4
		Total	-.5273	.909	5
	Fifth Grade	M	.9775	.965	2
		F	-.1283	.629	6
		Total	.1481	.823	8
	Total	M	.4027	1.20	3
		F	-.2660	.782	10
		Total	-.1117	.887	13
Hyperscore	Third Grade	M	-1.0172	.	1
		F	.0159	1.00	6
		Total	-.1317	.994	7
	Fifth Grade	M	-.4370	.282	3
		F	-.5509	.460	4
		Total	-.5021	.368	7
	Total	M	-.5820	.370	4
		F	-.2108	.845	10
		Total	-.3169	.746	14
Control	Third Grade	M	1.0355	.	1
		F	.0708	.718	6
		Total	.2086	.750	7
	Fifth Grade	M	.5898	1.56	3
		F	.5317	.602	5
		Total	.5535	.954	8
	Total	M	.7012	1.29	4
		F	.2803	.679	11
		Total	.3925	.853	15
Total	Third Grade	M	-.2428	1.11	3
		F	-.0856	.881	16
		Total	-.1104	.888	19
	Fifth Grade	M	.3017	1.12	8
		F	-.0210	.696	15
		Total	.0912	.856	23
	Total	M	.1532	1.09	11
		F	-.0544	.785	31
		Total	.0000	.866	42

Following instructions in the administrative guidelines of the Webster measure, four judges evaluated Musical Originality and Musical Syntax factors of the MCTM. The following tables present statistical correlations of interrator reliability overall, Musical Originality, and Musical Syntax (see Tables 3.12, 3.13, and 3.14).

Table 3.12

Inter-Item Correlation Matrix of Four Judges' MCTM Scoring

	Judge 1	Judge 2	Judge 3	Judge 4
Judge 1	1.000	.762	.446	.404
Judge 2	.762	1.000	.555	.500
Judge 3	.446	.555	1.000	.412
Judge 4	.404	.500	.412	1.000

Table 3.13

Inter-judge Reliability for MCTM Scoring – Musical Originality

	Mean	Std. Deviation	Total Correlation	Cronbach's Alpha if Item Deleted
Judge 1	23.44	105.863	.680	.734
Judge 2	21.50	105.467	.790	.668
Judge 3	18.19	148.962	.560	.792
Judge 4	23.13	139.583	.511	.808

Table 3.14

Inter-judge Reliability for MCTM Scoring – Musical Syntax

	Mean	Std. Deviation	Total Correlation	Cronbach's Alpha if Item Deleted
Judge 1	15.06	35.129	.650	.753
Judge 2	15.94	61.529	.564	.733
Judge 3	14.69	60.096	.726	.681
Judge 4	16.94	61.263	.582	.727

Composing Group C – Control

Control Group C included the participants who took the IMMA and the MCTM, but did not participate in any composing treatment. Correlations were performed to understand the Control group scores in this study. It is important to note that, half of the fifth grade scores in the control group, all females, (n = 4) were involved with the Gifted and Talented Education (GATE) program for fourth and fifth graders in their school site. Therefore, no third grade participants in this study participated in GATE.

Each of the composing groups had one GATE student and one group had zero GATE students. If the scores of fifth grade participants on the MCTM are considered (see Table 3.14), some of the highest scores of the MCTM factor, Originality, are found from the control group. Possibly, this result was related to the variety of learning experiences afforded students in GATE programs such as science fairs and camps, math and writing projects, or, for example, building Ozobot maps, and working with extra coding resources. In other words, comfort with new experiences may have carried into participants' work with the MCTM in this study.

There were no statistically significant correlations (see Table 3.15) between MCTM scores of the Control Group (Group C) participants and gender. In this study, there were nine fifth grade participants who were male (n = 9), and sixteen who were female (n = 16). No correlations were found between MCTM scores and gender, however, there were significant correlations found between gender and Gifted and Talented Education (GATE). However, participants in this study included two fifth grade GATE students who were male (n = 2) and five fifth grade GATE students were female (n = 5).

Table 3.15

Correlations between MCTM Scores of Control Group C, GATE Participation, and Gender

		GATE	MCTM	Gender
GATE	Pearson Correlation	1	.089	.775*
	Sig. (2-tailed)		.833	.024
	N	8	8	8
MCTM	Pearson Correlation	.089	1	.023
	Sig. (2-tailed)	.833		.957
	N	8	8	8
Gender	Pearson Correlation	.775*	.023	1
	Sig. (2-tailed)	.024	.957	
	N	8	8	8

*. Correlation is significant at the 0.05 level (2-tailed).

When MCTM scores were correlated between fifth grade participants, GATE participation, and gender, no correlations were found (see Table 3.16).

Table 3.16

Correlations between Fifth Grade, GATE Participation, and Gender

		Gender	GATE	MCTM
Gender	Pearson Correlation	1	.005	-.107
	Sig. (2-tailed)		.971	.502
	N	48	48	42
GATE	Pearson Correlation	.005	1	.252
	Sig. (2-tailed)	.971		.108
	N	48	48	42
MCTM	Pearson Correlation	-.107	.252	1
	Sig. (2-tailed)	.502	.108	
	N	42	42	42

Summary

Forty-eight participants (24 third graders, 24 fifth graders) took part in this three-phase study. In phase one, all participants were tested with Gordon's Intermediate Measure of Music Audiation (IMMA). As there were more students wishing to participate in the study than the researcher required, upon analysis, outlier scores were removed yielding forty-eight participants. For phase two, participants were randomly assigned to three composing groups: two experimental groups (herein known as composing treatment groups) and a control group. Participants composed in groups of four either with acoustic instruments found in many elementary classrooms or *Hyperscore*, a graphic notation music computer program. Scoring was completed for Groups A and B through observation by the researcher using an original protocol,

the Crawford Index of Quality for Composing Groups (CIQCG). Participants in Group C, the control group, did not participate in phase two in the composing treatment.

Finally, for phase three of this study, all participants were tested with Webster's Measure of Creative Thinking in Music (MCTM).

CHAPTER FOUR

ANALYSIS OF THE DATA & RESULTS

Introduction

The purpose of this study was to investigate if there were differences in the observed creative process of group participants composing with two different types of tools, acoustic rhythm instruments and a graphic technology-mediated program, *Hyperscore*. The author was also interested to learn if individual participants' scores of the Intermediate Measure of Music Audiation (IMMA) or the creative thinking scores of the Measure of Creative Thinking in Music (MCTM) correlated, in any way, with the group creative process scores of the Crawford Index of Quality for Composing Groups (CIQCG).

This study addressed the following questions:

1. a. Using the Crawford Index of Quality for Composing Groups (CIQCG) as the dependent variable, are there statistically significant differences in group process scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated)?

   b. Do the factors of gender and grade level play a role in these comparisons?

2. a. Using the Webster Measures of Creative Thinking in Music (MCTM) as the dependent variable, are there statistically significant differences in group scores for the two treatment conditions (acoustic rhythm instrument and technology-mediated)?

   b. Do the factors of gender and grade level play a role in these comparisons?

3. a. Are there statistically significant relationships between (a) group process scores of all participants in Groups A and B, (b) music aptitude scores as measured by the Gordon Intermediate Measure of Music Audiation (IMMA), and (c) creative thinking (MCTM) scores?

   b. Do the factors of gender and grade level play a role in these relationships?

Analysis of the Data

This chapter presents results for each research question that formed the basis for phase three of the study. The Statistical Package for the Social Sciences (SPSS) (Version 22) was utilized for the statistical analysis of all data presented here. Four judges scored the MCTM and two judges scored composing groups. The inter-judge scores may be found in Chapter 3 (Tables 3.7. 3.11, 3.12, and 3.13). Chapter Four presents analyses and findings for each study question.

Question 1

Findings

Composing groups and grade. Using group composing scores as the dependent variable from the CIQCG observation protocol, a two-way factorial ANOVA was completed to understand if there were statistically significant differences between means for Group A (acoustic rhythm instruments) and Group B (*Hyperscore*) participants and by grade levels. It is clear from Table 4.1 that *Hyperscore* participants did far better overall for both grades. While fifth grade participants did better than the third grade group under the acoustic instrument condition, they scored lower with *Hyperscore*. This may indicate the *Hyperscore* application

was more effective with the third grade than fifth grade participants. Figure 4.1 displays the interaction between the composing treatment by third or fifth grades.

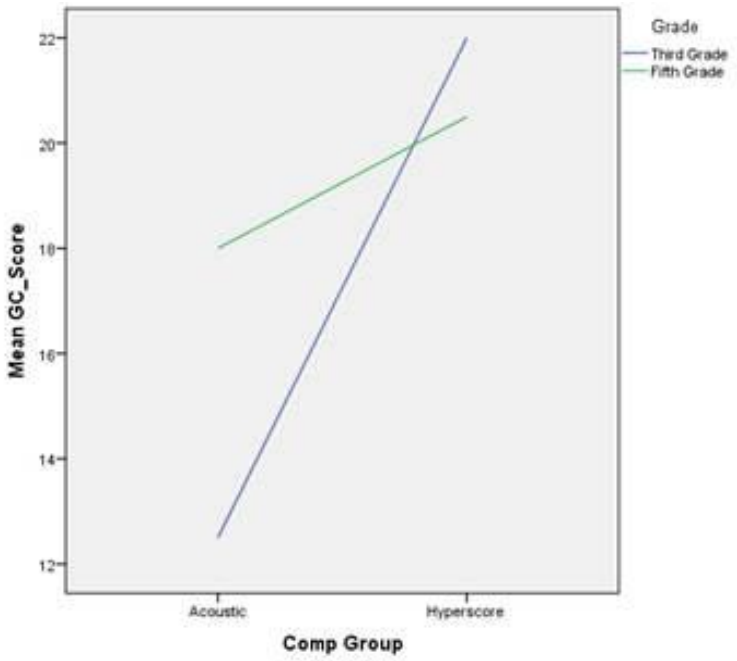
Table 4.1

Means of Composing Group Scores by Grade

Grade	Comp Group	Mean	Std. Deviation	N
Third Grade	Acoustic	12.50	5.880	8
	Hyperscore	22.00	2.138	8
	Total	17.25	6.506	16
Fifth Grade	Acoustic	18.00	3.207	8
	Hyperscore	20.50	2.673	8
	Total	19.25	3.130	16
Total	Acoustic	15.25	5.385	16
	Hyperscore	21.25	2.463	16
	Total	18.25	5.124	32

Figure 4.1

Interaction of Composing Group Scores Acoustic or Hyperscore by Grade



A two-way ANOVA was performed (see Table 4.2) to understand if there were statistically significant findings: (a) for differences between composing group mean scores for groups A and B, (b) for differences between grade level, and (c) for an interaction effects between grade and gender as suspected from Figure 4.1. Both main effects and interaction were found to be significant. Partial Eta squared data reported by SPSS indicated strong effect sizes for the group effect and less so for both grade and the interaction.

Table 4.2

Two-way ANOVA between Composing Group Scores and Grade

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	547.877[a]	3	182.626	17.569	.000	.696
Intercept	7938.472	1	7938.472	763.679	.000	.971
Comp Group A & B	379.735	1	379.735	36.530	.000	.614
Grade	72.567	1	72.567	6.981	.015	.233
Comp Group * Grade	196.076	1	196.076	18.862	.000	.451
Error	239.086	23	10.395			
Total	9571.000	27				
Corrected Total	786.963	26				

a. R Squared = .696 (Adjusted R Squared = .657)

Composing group and gender. Cell means for composing group scores and gender may be found in Table 4.3.

Table 4.3

Means of Composing Group Scores by Gender

Gender	Comp Group	Mean	Std. Deviation	N
Boys	Acoustic	14.33	7.024	3
	Hyperscore	20.75	3.202	4
	Total	18.00	5.774	7
Girls	Acoustic	14.70	5.851	10
	Hyperscore	21.40	2.459	10
	Total	18.05	5.558	20
Total	Acoustic	14.62	5.824	13
	Hyperscore	21.21	2.577	14
	Total	18.04	5.502	27

Through examination of Table 4.4, all cells seem to be consistent with, again, group differences, but no large differences between composing group scores and gender.

Table 4.4

Two-way ANOVA between Composing Group Scores and Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	295.046[a]	3	98.349	4.598	.012
Intercept	6468.596	1	6468.596	302.445	.000
Comp Grp	219.634	1	219.634	10.269	.004
Gender	1.320	1	1.320	.062	.806
Comp Grp * Gender	.102	1	.102	.005	.945
Error	491.917	23	21.388		
Total	9571.000	27			
Corrected Total	786.963	26			

a. R Squared = .375 (Adjusted R Squared = .293)

Results for Question 1

To summarize findings for Question 1, composing group means did suggest a statistically significant difference in favor of the *Hyperscore* group. Data on the role of grade showed a significant difference as well, in favor of the older fifth grade participants, but the result was complicated by a significant interaction between grade and group with the third graders out-performing the fifth graders in terms of the *Hyperscore* grouping. And, gender correlations did not yield statistically significant results. Implications are presented in Chapter 5.

Question 2

MCTM Scores by Composing Groups and Grade

MCTM scores were used as the dependent variable to understand if there were significant differences between MCTM scores by composing group and grade (see Table 4.5). Fifth grade participants who composed with acoustic instruments in Group A scored the highest mean on the MCTM (.1481) and third grade participants who composed with acoustic instruments in Group A scored the lowest (-.5273). Fifth grade participants who composed with *Hyperscore* in Group B (-.5021) scored a higher mean overall (-.1553) than third grade participants (-.2965).

Table 4.5

Means for MCTM and Composing Group Scores by Grade

Composing Group	Grade	Mean	Std. Deviation	N
Acoustic	Third Grade	-.5273	.90957	5
	Fifth Grade	.1481	.82356	8
	Total	-.1117	.88792	13
Hyperscore	Third Grade	-.1317	.99499	7
	Fifth Grade	-.5021	.36899	7
	Total	-.3169	.74611	14
Total	Third Grade	-.2965	.93933	12
	Fifth Grade	-.1553	.71429	15
	Total	-.2181	.80817	27

A two-way ANOVA was performed between MCTM scores and grade to understand if there were statistically significant differences (see Table 4.6). Results indicated that there were not significant differences between group and grade. No interaction was found between composing groups and grade for MCTM.

Table 4.6

Two-way ANOVA between MCTM Scores and Grade

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2.168[a]	3	.723	1.122	.361	.128
Intercept	1.680	1	1.680	2.609	.120	.102
Grade	.152	1	.152	.237	.631	.010
Composing Groups	.106	1	.106	.165	.689	.007
Grade * Composing Groups	1.791	1	1.791	2.780	.109	.108
Error	14.814	23	.644			
Total	18.266	27				
Corrected Total	16.982	26				

a. R Squared = .128 (Adjusted R Squared = .014)

MCTM Scores by Composing Groups and Gender

MCTM scores were used as the dependent variable to understand if there were significant differences between MCTM scores by group and gender. Cell means are reported in Table 4.7. Male participants who composed with acoustic instruments in Group A scored the highest mean (.4027) on the MCTM and higher than females on the MCTM overall (-.1600). However, male participants who composed with Group B *Hyperscore* had the lowest MCTM scores (-.5820). Female participants who composed with acoustic instruments in Group A scored much lower (-.2660) than males on the MCTM but higher on the MCTM after composing with *Hyperscore* (-.2108).

Table 4.7

Means of MCTM and Composing Group Scores by Gender

Composing Groups	Gender	Mean	Std. Deviation	N
Acoustic	Boys	.4027	1.20715	3
	Girls	-.2660	.78276	10
	Total	-.1117	.88792	13
Hyperscore	Boys	-.5820	.37060	4
	Girls	-.2108	.84533	10
	Total	-.3169	.74611	14
Total	Boys	-.1600	.91185	7
	Girls	-.2384	.79342	20
	Total	-.2181	.80817	27

MCTM scores were used as the dependent variable in a two-way ANOVA test to learn if there were statistically significant findings for composing group and gender for MCTM (see Table 4.8). No significant results for main effects or interaction were found.

Table 4.8

Two-way ANOVA between MCTM and Composing Group Scores and Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.383[a]	12	.615	.897	.570
Intercept	.530	1	.530	.772	.394
Gender	.141	1	.141	.205	.657
Comp Grp Scores	5.432	6	.905	1.320	.311
Gender * Comp Grp Scores	3.093	5	.619	.902	.507
Error	9.599	14	.686		
Total	18.266	27			
Corrected Total	16.982	26			

a. R Squared = .435 (Adjusted R Squared = -.050)

Results for Question 2

Question Two wanted to understand if there were statistically significant differences in group process scores and the MCTM, grade, and gender. MCTM and composing group scores were not found to correlate even though fifth grade acoustic Group A participants scored higher on the MCTM and a higher mean overall. No statistical significance was found between composing groups and grade or gender for the MCTM.

Question 3

Findings

Correlations were calculated to determine if there were statistically relationships between process scores, MCTM, and IMMA for those subjects in the treatment groups. While group composing scores were somewhat related to MCTM scores (r = .34), no statistically significant correlations were found between the test scores in this study for the total sample (see Table 4.9).

Table 4.9

Correlations between MCTM Scores, Composing Group Scores, and IMMA Scores (Total Sample)

Scores		IMMA	MCTM
Composing Process	Pearson Correlation	.022	.342
	Sig. (2-tailed)	.904	.081
	N	32	27
IMMA	Pearson Correlation		.259
	Sig. (2-tailed)		.191
	N		27

Tables 4.10, 4.11, 4.12, and 4.13 display similar correlations tables broken down by grade and gender. Results show no significant differences when studied separately for grade and gender.

Table 4.10

Correlations between Third Grade Participants' MCTM, Composing Groups, and IMMA Scores

		MCTM	Group Composing	IMMA
MCTM	Pearson Correlation	1	.388	.534
	Sig. (2-tailed)		.212	.074
	N	12	12	12
Group Composing	Pearson Correlation	.388	1	-.126
	Sig. (2-tailed)	.212		.698
	N	12	12	12
IMMA	Pearson Correlation	.534	-.126	1
	Sig. (2-tailed)	.074	.698	
	N	12	12	12

Table 4.11

Correlations between Fifth Grade Participants' MCTM, Composing Groups, and IMMA Scores

		MCTM	Composing Groups	IMMA
MCTM	Pearson Correlation	1	.237	.018
	Sig. (2-tailed)		.396	.951
	N	15	15	15
Composing Groups	Pearson Correlation	.237	1	.377
	Sig. (2-tailed)	.396		.166
	N	15	15	15
IMMA	Pearson Correlation	.018	.377	1
	Sig. (2-tailed)	.951	.166	
	N	15	15	15

Table 4.12

Correlations between Third and Fifth Grade Male Participants' MCTM, Composing Groups, and IMMA Scores

		MCTM	Composing Groups	IMMA
MCTM	Pearson Correlation	1	.161	.253
	Sig. (2-tailed)		.730	.584
	N	7	7	7
Composing Groups	Pearson Correlation	.161	1	-.461
	Sig. (2-tailed)	.730		.298
	N	7	7	7
IMMA	Pearson Correlation	.253	-.461	1
	Sig. (2-tailed)	.584	.298	
	N	7	7	7

Table 4.13

Correlations between Third and Fifth Grade Female Participants' MCTM, Composing Groups, and IMMA Scores

		MCTM	Group Composing	IMMA
MCTM	Pearson Correlation	1	.410	.261
	Sig. (2-tailed)		.073	.267
	N	20	20	20
Group Composing	Pearson Correlation	.410	1	.141
	Sig. (2-tailed)	.073		.553
	N	20	20	20
IMMA	Pearson Correlation	.261	.141	1
	Sig. (2-tailed)	.267	.553	
	N	20	20	20

Results for Question 3

To summarize findings for Question Three, no statistically significant relationships were found between the Intermediate Measure of Music Aptitude, the composing treatments (Crawford Index of Quality for Composing Groups), or the Measure of Creative Thinking in Music.

Summary

To summarize, *Hyperscore* composing groups, both male and female participants, scored higher overall than acoustic instrument groups in the composing treatment in this study. Both main effects and interaction were found to be significant between composing group mean scores, grade level, and gender, however, no large difference occurred between composing group scores overall and gender.

When compared with MCTM scores, the fifth grade acoustic instrument composing groups scored highest on the MCTM while third grade acoustic instrument composing groups scored the lowest. Also, no interaction was found between composing groups' MCTM scores and grade. While there were no statistically significant outcomes of composing groups and gender, male *Hyperscore* participants scored the lowest on the MCTM while female *Hyperscore* participants scored highest.

Group composing scores were somewhat related to MCTM scores but not statistically significant. No correlations were found between the three measures used in this study.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

Introduction

This chapter discusses the results of the experimental study described in Chapters Three and Four, followed by the presentation of a conceptual framework for teachers and researchers working with child composers that emerged. The chapter ends with implications for music education research and practice through this empirical study.

Discussion

The aim of this study was to observe participants in third and fifth grades as they composed using two types of instruments (i.e., acoustic rhythm and technology-mediated) in groups of four. More specifically, this study investigated the relationships between student composing group scores, musical aptitude (Gordon, 1986), and creative thinking in music (Webster, 1994).

Third grade and fifth grade students from one medium-sized school in a suburban school district took part in this experimental between-subjects factorial design study. All students completed Gordon's Intermediate Measures of Music Audiation (IMMA) at the beginning of the study. More students volunteered than were needed and high and low outlier scores were removed providing the forty-eight students needed.

As a next step, stratified random sampling was utilized to place students into three groups. Students were randomly assigned to two composing groups A and B, and the control

group, C. Group A composed with acoustic rhythm instruments, Group B composed with a graphic computer program, *Hyperscore*. Group C participants took the IMMA and MCTM however, did not participate in the phase two composing treatment.

Results indicated that third grade participants scored higher on the IMMA than those in fifth grade. This finding could be explained in at least two ways. Although there is an idea that musical skills develop with age, Gordon (1986) and others (Zimmerman, 1986) have argued that musical aptitude reaches a plateau at around age ten. Grade differences in IMMA scores found here could be a reflection of learning plateaus. Alternatively, the contrasting scores of third and fifth graders could be related to the relatively small sample size in the current study. It is possible that some of these differences would disappear with a larger sample size.

Interestingly, IMMA scores held no correlations to any of the other measures in this study. That is, children's abilities to compare tonal and rhythmic patterns accurately did not correlate, nor predict, their creative process when working in a group composing experience, nor scores for creative thinking in music. In fact, one low-scoring IMMA student scored extrememly high on the MCTM. This is consistent with previous studies (Kiehn, 2003; Webster, 1988) reinforcing the notion that musical aptitude may be completely separate from creative processes and creative thinking and, therefore, non-predictive. Likewise, no significant gender differences were found for the IMMA scores. Although earlier research has suggested that boys tend to score higher in improvisatory studies of elementary-level participants (Kiehn, 2003) while girls score higher in music testing (Wright, 2001), this was clearly not the case here.

Worth comment, an interesting grade level difference emerged. In the researcher's observations of the groups while they were composing, most students appeared to be equally

comfortable with both acoustic instruments and *Hyperscore*. While fifth grade participants scored higher overall in the composing treatments, there was a grade level difference with regard to acoustic vs. *Hyperscore* scores. While third grade participants scored higher when composing with *Hyperscore*, fifth grade participants scored higher when composing with acoustic instruments. The outcome of third grade students scoring higher than fifth graders when composing with *Hyperscore* may be related to increased use of personal digital assistants (PDAs) from an earlier point in participants' lives, perhaps beginning at age two or three.

The school that participated in the current study was under district mandates to involve students in weekly coding projects, daily use of Google Chrome, consistent use of iPad carts, and use of personal digital notebooks for all grade levels. Consequently, one can speculate that the comparatively larger familiarity with technology of third graders as opposed to their fifth grade peers may have impacted their motivation for using *Hyperscore*. In other words, it was a natural activity. This is merely speculative and merits further examination, and researchers are only beginning to look at the equation of test scores and PDAs as related to public schools. It is possible that in the past five years alone, with the increase of home and classroom use of technology, there may be a shift in how all human beings work with technology from both the perspective of interest and achievement.

The researcher's observations of composing groups further suggest that third grade participants had greater organizational skills for the group computer workspace and greater "sharing of space" for new ideas, inclusion of all in the group, along with a higher capacity for successful intergroup communication than their older peers. Fifth grade composing groups, in turn, appeared to be much more concerned about being quiet, studious, and serious about the

project, and most groups (with the exception of one acoustic instrument group) were not as verbal about completing a first-rate piece of music. That is, fifth graders appeared to more aware of themselves; how they related to the *Hyperscore* tool may have been more related to being observed by the researcher with a video recorder than younger peers. On that note, third grade groups did not seem to care much about demonstrating their capabilities with *Hyperscore*, but fifth grade groups did.

These differences between third and fifth grade participants may be explained both developmentally and culturally. Eccles (1999) identified the conscious changes children make in their learning style, such as an increase in self-reflection, through early learning experiences. This partly explains how fifth graders were more "schooled" than their third grade peers. Once again, further substantiation is required of these substantiations.

This study also interrogated whether there were correlations between the composing groups scores and the MCTM. While male participants composing with *Hyperscore* scored the lowest on the MCTM and highest when composing with acoustic instruments, female students scored higher on the MCTM who had composed with *Hyperscore*. This finding contradicts earlier research suggesting that boys have more interest in technology than girls (Kiehn, 2003; Legg, 2010) and may be a demonstration of increased training of all students in elementary classrooms on a daily basis.

The MCTM scores were highly inter-correlated, with third grade participants scoring higher on the MCTM factor scores than their fifth grade peers. While there were no statistically significant correlations between the MCTM, CIQCG, or grade, (see Chapter Four) there was a significant correlation between CIQCG scores and MCTM factors of Originality and Syntax with

third grade participants; syntax represents Webster's (1994) way of identifying children's ability to organize musical ideas. Once again, these findings reinforce the notion that grade should not be viewed as the determining factor when examining children's creative processes, no matter the type. Children should be given opportunities to work with projects that support the development of musical skills such as composing and improvising, and creative thinking. Opportunities to compose may be extremely important for musical growth, especially in foundational learning at the elementary level.

Another significant correlation of interest was found between group composing scores and Musical Flexibility for both third and fifth graders. In Webster's measure, the Flexibility factor is the total time a student spent responding to the measure questions. It is interesting to note that some students responded with forty-five seconds of musical responses total throughout their MCTM responses while others responded with a total time of up to nine minutes and fifty seconds of response time. This finding aligns with earlier studies (Burnard & Younker, 2008; Ohman-Rodriguez, 2004; Wiggins, 2005) suggesting that comfort makes a difference in the output of students' compositional work.

Although this study counted on a well-defined workspace, consistency of expectations for every meeting, and elements of familiarity in the same classroom with the same tools that participants could count on, individual differences in student responses in the MCTM still emerged. These are consistent with the idea that there are marked individual learner differences in group settings (Eccles, 1999).

Finally, this study also examined whether there were statistically significant correlations between both group composing process scores, IMMA scores, and MCTM scores. While no

statistical significance was found between the three measures, including by grade or gender, a low correlation was found between the CIQCG and MCTM. This may be due to focus on musical exploration in both measures. In both measures, children are invited to create music and the improvisatory nature of the composing treatment and the MCTM may have some commonality, therefore, this finding does not come as a surprise. Future studies conducted with different populations and larger sample sizes could probe further the relationships between both measures.

To summarize, the variables of gender and grade produced several interesting findings. First, it was surprising that boys did not have predominantly higher scorers than girls in any of the measures. Furthermore, girls scored higher when composing music using *Hyperscore*. This contradicts earlier studies, suggesting that male students have greater leadership skills, greater access to technology, and greater creativity than females (Armstrong, 2011; Charles, 2004). Furthermore, Comber, Hargreaves, and Colley (1993) suggested that male students had greater facility and opportunity with technology than girls and therefore educators would have an important responsibility to ensuring girls had equal access to technology. As technology has become a tool used in every classroom, female students may be engaged at the same or at an even higher level than their male counterparts, as seen in the present study. Technology, especially as found in this study appears to not only be useful, but also serves as a source of motivation. Grade, in turn, should not be viewed as completely deterministic, particularly where composing tasks and creative thinking are concerned. That age and grade level may be of lesser relevance to work with creative music-making or composing in music classrooms than previously thought is an important consideration for future work. A thorough examination of divergent thinking at the elementary level, as related to compositional tasks and levels of

communication between participants at different grade levels, may hold important segues to development of creative effort.

This study's results may need to be replicated in similar contexts and with greater numbers of students. Perhaps development of a fifteen-week section of meetings would add greatly to the elements measured in this study in three or four visits.

Connecting Theory and Practice: A Proposed Conceptual Framework

The purpose of this study was to observe how participants in grades three and five would undertake two different types of composing experiences. Experience with students, all unique, as they compose helps to understand whether there are similarities in students or "student types" with relation to creative process during composing experiences in elementary classrooms. Observation of child participants in this study led to the development of an exploratory conceptual framework that other educators may find useful.

Compositionally speaking, in a same classroom, we may find different types of students. Awareness of types of students found in the music classroom as regards composition, offers a clearer understand of student engagement and interest during composing opportunities. This, in turn, may be useful when developing lesson plans or projects for young children. A conceptual

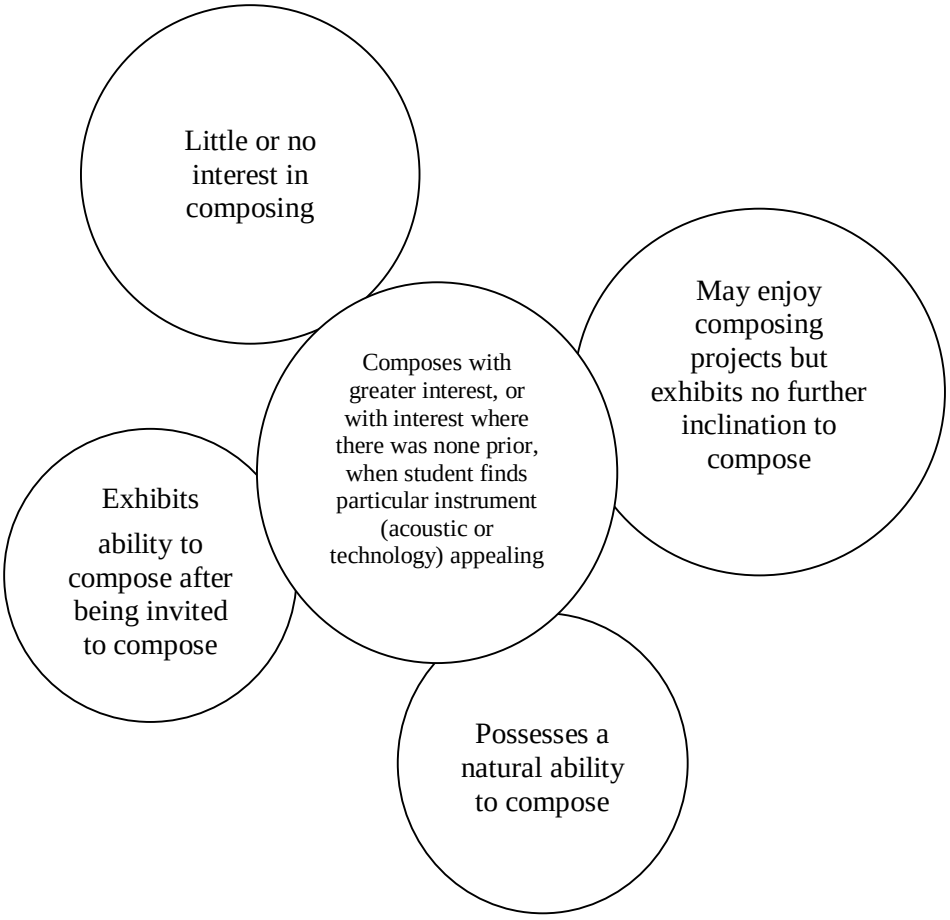
framework was developed for this study highlighting different types of young composers we may find in classrooms. Children:

- may have little to no interest in composing;
- may have not composed spontaneously on their own, but may exhibit the ability to compose after being invited to compose;
- may enjoy composing projects, but exhibit no further inclination to compose;
- may appear to possess a "natural" ability to compose;
- compose with interest (or greater interest) where there was none prior.

Students may navigate between more than one characteristic over the course of time.

Figure 5.1

Crawford Conceptual Framework of Musical Productivity Types of Young Composers



Aside from describing five types of student composers, the proposed conceptual framework takes into consideration three interrelated sources that influence the lives and experiences of young composers, as they work in groups. First, is the *person*, which refers to the characteristics of the individual who comes to the group with prior experiences of learning, music and communication. Second, is *style*, or approach to not only working in a group but one's personal likes and dislikes with music. As musicians in the world, children may not have uncovered what this is by third or fifth grade, but even so, bring in a personal musical style to a group. Finally, there is *environment*. As Bronfenbrenner (1979) has argued, children are often raised in one type of environment and schooled in another. Humans also spend a considerable amount of time in others. The different environments in which children navigate, influence who they are and how they conduct themselves; as well as expectations – theirs and from others. Taken together, these factors directly impact children's ways of being in the world, including their musical experiences.

The proposed conceptual framework may be useful for defining the many social behaviors that perform a role in group music making, including group composing opportunities. The inner workings of leading and following that connect with exploration of creative process may be found within and beyond the observation process. More work is clearly needed to examine this when composing in groups in elementary classrooms, and with greater numbers of participants. Even if this may seem removed from the compositional experience, as the nature of classrooms are reliant on working efficiently with time and space, a clear understanding of what educators might communicate, or how instruction might occur during the process of composing is warranted. This conceptual framework is a model provided by this author leaves for future educators and researchers to apply and test.

Conclusion and Implications

The 40th Anniversary edition of Smithsonian Magazine (Monmaney, 2010) highlights forty things we should all know about the next 40 years. Beyond technological expansion, there is focus on the artist's place in society, brain scans to help us better understand children in 21st century education, and a redefinition of composers and composition. According to the authors, "Composers will no longer be the only people who are capable of composing" (p. 97). This statement suggests that there is an emerging modification to the definition of "composer" and, consequently, call for a change in how music educators view the act of composing. While some may still believe that composers are only those who write music following years of musical training and study, this assertion has been and will continue to be challenged.

Currently, in the most recent *Music Educators Journal*, a special section about composing represents some of the long-time writers from the field of music education on creative work and compositional subjects of interest to this study. From Webster's (2016) discussion of twenty-five years of creative thinking study to Jorgenson's (2016) article on the joy, pleasure, and celebration found through composing, the subjects of technology, process vs. product, songwriting, and popular music continue. As compared by earlier works, many of which are found in this study (Barrett, 1995; Burnard & Younker, 2010; Coulson and Burke, 2013; Doig, 1942b; Finney, 2012; Paynter, 2000; Ruthmann and Herbert, 1999; Seddon & O'Neill, 2003), there is still much study to be done on the subject of creative process.

In this study, participants were assigned to compose a piece of music with tools they were assigned in a group they were randomly assigned to be a part of. What they did next was completely their choice, and unrelated to any previously assigned framework. Some researchers

have viewed group composition as an approach. Understandably, this may be true as we initiate opportunities to compose at the elementary level where some students have limited musical experience, some have none, and still others take private lessons garnering them greater experience all together. In sum, fifth graders, third graders, and even younger students, may be very capable of compositional exploration as demonstrated by the results of the present study, no matter what they are assigned to do, or the tools they are assigned to use.

Fifth grade participants had a higher level of interest in studiousness, perhaps a different type of focus that was not seen in the third grade groups, but one that reflects an important aspect of composing as students get older. The ability to connect ideas, an even greater concern for how one "looks", may constitute an important aspect of composing, and is, perhaps, one of the major developmental differences between fifth grade students and their younger peers (for a discussion see Eccles, 1999).

This study offered participants an opportunity to compose without restrictions, with the exception of a suggestion to include a beginning, middle, and end to the work, and, to consider the use of silence. Participants may have thought they were accomplishing this, but there was no discussion of either, except in one fifth grade group that was using acoustic rhythm instruments. Perhaps the concepts did not seem to apply, in their minds, or to their work. This fact in itself reinforces the purpose of studying composition processes as opposed to simply focusing on final products. Fewer restrictions at an earlier stage are perhaps more beneficial to students' compositional processes. As children get older, restrictions may serve a different purpose. Furthermore, stepping back and not intervening is an approach that teachers may wish to consider when working with students at all grade levels.

Another issue of central importance is the nature of interactions between students in group composing. Leadership roles may change over the course of time. For example, one third grade group of participants composing with acoustic instruments, three females traded off as "directors" and the male participant stayed in the background. As composing progressed, leadership became more constant amongst all members of this group. Another example of student interactions when composing in group settings is as follows. In a fifth grade *Hyperscore* group, a male participant was rarely removed from the mouse at the computer. He managed most of the exploration during the group's first meeting until another participant said he could "go next". The male participant originally on the mouse became unengaged without control and returned to the mouse in the second visit. The researcher removed the chairs in front of the desk and noted this gave all students equal access to the mouse. They completed their composition rapidly by truly listening closely to all members' ideas with all voices guiding the process.

In other words, higher communication levels during individual and group process led to higher scores in the composing treatment. When participants had more established musical knowledge, they often served as "early leaders" in the composing process. This does not mean, however, that these participant's ideas were not rejected or, at least, questioned. Consistently in one fifth grade *Hyperscore* group, a male participant rejected a female leader's ideas. As well, the other members of the group noted that the other two were making decisions that they were not part of. Interestingly, fifth graders spoke more openly about this type of communication than did third grade groups.

Additionally, it was noteworthy that "jobs" were designated in some groups. Some students were "notaters" of the scoring process, while others were "discoverers" of sounds. Sometimes there was one overall leader; commonly there was someone in charge of "correcting"

the compositional choices being made. In only one group were the challenges so great, where communication was never well-established, and where no leader came forward, and, no participant understood what their job was, and the composition was not achieved, or at least to the opinion of the group. These observations, which are relevant for music education, are also consistent with notions of communities of practice and legitimate peripheral participation (Wenger, 2000).

Technology played an important role in children's composing processes, yet composing with acoustic instruments was equally engaging. This may be an indicator that composing opportunities must begin very early and music teachers should not shy away from providing opportunities to compose, no matter the instruments used, acoustic and technology-mediated. Teachers may also find relief that it is clear composing with acoustic instruments in the music classroom is still a vital option, especially if there is no access to computer technology. As well, music educators may be interested in the outcome of successful experiences of group composing opportunities found in this study where one-on-one teaching is nearly impossible in elementary music education.

While this author is a composer, and is comfortable presenting opportunities to compose, the first work to be done by music educators who have yet to compose, is to develop compositional experiences that produce a feeling for that aspect of musicianship for oneself. Developing weekly session time may be translated into opportunities to compose with students. Music teachers who begin to do this may find themselves becoming active composers, songwriters, and producers of music.

To conclude, while there is some study of creativity as applied to K-12 music education, decades of study of the measurement of creativity related to intelligence and aptitude, studies related to creativity and composing processes of young children, and study of creativity and the use of technology, there is little study of how creativity is found through composing in general music in K-5 classrooms. Few studies have observed or measured the process of children when they compose together in groups. Without this type of study, how does our profession know where to begin in developing skill with creative process? The answer is to begin composing music, even if it hasn't been explored before, and to research it in systematic ways.

In order to have a clearer connection with children's creative processes when composing, it is necessary to consider the nature of children's musicality. For example, whether students are tested to understand their musical aptitude, observed to understand their creative process, or measured to understand their level of creativity in musical thinking, students generally exhibit specific characteristics in their compositional abilities. No matter what instruments are used or tasks presented, children's musicality unfolds, as they are natural music makers. Opportunities to compose may be less common in some schools than others, but when they happen with consistency, they may provide necessary opportunities for students to develop their own musicality, to experiment, to express emotions of many types, and to learn to communicate more fully.

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APPENDICES

APPENDIX A: Informed Consent for Non-Medical Research

University of Southern California
Flora L. Thornton School of Music
Music Education Department
Los Angeles, CA 90089-0851

INFORMED CONSENT FOR NON-MEDICAL RESEARCH

COMPOSING IN GROUPS: CREATIVE THINKING PROCESSES OF THIRD AND FIFTH GRADE STUDENTS

Your third/fifth grade child attending School Elementary is invited to participate in a research study conducted by Lisa Crawford, under the direction of faculty advisor, Dr. Biatriz Ilari at the University of Southern California.

Your child's participation is voluntary. Please read the information below, and ask questions about anything you do not understand, before deciding whether to allow your child to participate. Please take as much time as you need to read the consent form. You may also decide to discuss participation with your family or friends. If you decide to allow your child to participate, you will be asked to sign this form and your child will be asked to sign an assent form. You will be given a copy of this form.

PURPOSE OF THE STUDY

The purpose of my study is to understand more clearly the following three questions:

1. Are there significant differences between the sub-scores and total scores of the Measure of Creative Thinking in Music (MCTM) of children who undergo two distinct forms of group composition (computer-based versus acoustic instruments)?

2. Are there gender differences in children's sub-scores and total scores in the MCTM following the different treatments?

3. Are there grade differences in children's sub-scores and total scores in the MCTM following the different treatments?

STUDY PROCEDURES

Third and fifth grade students are invited to participate in this study. If your child volunteers to participate in this study, he or she will be asked their grade level, gender, and prior musical experience and to participate in some or all of the following:

Measurement of student potential for musical achievement (Intermediate Measure of Music Audiation, Edwin Gordon). This takes 30 – 40 minutes and is a listening experience.

Depending upon your child's score, s/he may be invited to participate in another activity in one of three groups of four students to create a piece of music using a computer program or, acoustic classroom instruments. The children will be randomly assigned, much like tossing a coin, to groups of four in the same grade level and will work together three times for up to an hour and a half, or until their composition is completed. Your child will be videotaped; if you do not wish to allow your child to be videotaped, or your child doesn't want to be video-taped, he/she will not be able to participate in the study.

Measurement of creativity of each student (Measure of Creative Thinking in Music, Peter Webster); this is anticipated to take approximately 30 minutes for individual students to complete.

POTENTIAL RISKS AND DISCOMFORTS

There are no anticipated risks in this study. Your child may not enjoy giving up after school time.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

Your child may not directly benefit from his/her participation in this study. It is hope that this study will help researchers understand the importance of musical composition and the creative collaboration of children.

CONFIDENTIALITY

We will keep your records for this study confidential as far as permitted by law. However, if we are required to do so by law, we will disclose confidential information about you. The members of the research team and the University of Southern California's Human Subjects Protection Program (HSPP) may access the data. The HSPP reviews and monitors research studies to protect the rights and welfare of research subjects.

The data/information from the video-tape will be transcribed by the researcher and/or a professional transcription company and then destroyed. The data, including tapes, transcripts, and measures, will be stored on a password protected computer and/or in a locked office. All

identifiable data will be stored separately from identifiable data. The data will be destroyed three years after the study has been completed.

When the results of the research are published or discussed in conferences, no identifiable information will be used.

PARTICIPATION AND WITHDRAWAL

Your child's participation is voluntary. His or her refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your consent at any time and your child may withdraw his/her assent, and discontinue participation without penalty. You are not waiving any legal claims, rights, or remedies because of your participation in the research study.

ALTERNATIVES TO PARTICIPATION

Your child's alternative is to not participate in this study; his/her grades will not be affected, whether or not s/he participates in this study.

INVESTIGATOR'S CONTACT INFORMATION

If you have any questions or concerns about the research, please feel free to contact the Principal Investigator: Lisa Crawford, (310) 863-6422, lisa.crawford@usc.edu or the Faculty Advisor: Dr. Beatriz Ilari, (213) 821-5513, ilari@usc.edu.

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION

If you have questions, concerns, or complaints about your rights as a research participant or the research in general and are unable to contact the research team, or if you want to talk to someone independent of the research team, please contact the University Park Institutional Review Board (UPIRB), 3720 South Flower Street #301, Los Angeles, CA 90089-0702, (213) 821-5272 or upirb@usc.edu

SIGNATURE OF RESEARCH PARTICIPANT

I have read the information provided above. I have been given a chance to ask questions. My questions have been answered to my satisfaction, and I agree that my child may participate in this study. I have been given a copy of this form.

Name of Student who will participate: _____ Grade _____

Name of Parent of Participant

_____ _____

Signature of Parent of Participant Date

APPENDIX B: Assent Form to Participate in Research

University of Southern California

Flora L. Thornton School of Music, Music Education Department

ASSENT FORM TO PARTICIPATE IN RESEARCH

C**OMPOSING IN GROUPS: CREATIVE PROCESSES OF THIRD AND FIFTH GRADE STUDENTS**

Dear Student,

I am completing a study about kids who write music together. I would like to learn more about how you think creatively when you compose music together in groups. One way to learn about this is to do a research study; the people doing the study are called researchers.

Your school, Lee Elementary, has told me I may talk to you about my study. You also can talk this over with your mom, dad, or caregiver. It's up to you if you want to take part, you can say "yes" or "no". No one will be upset with you if you don't want to take part.

If you do want to take part, you will be asked to compose music with three other students in your grade. You will work with musical instruments or a computer music program. There will be a video camera to support the work but you might not even notice that it is in the room.

Researchers don't always know what will happen to people in a research study. Most of our time together will be working together right after school, but you might not like working after school. Your group will work together three times.

Your answers will not be graded. Only I will see your work.

If you have any questions, you can ask the researcher.

If you want to take part in the study, please write and then sign your name at the bottom. Your parents will complete a consent form for you to participate. You can change your mind if you want to. You can tell me anytime. I hope you will want to be a part of this study. Thank you!

Lisa Crawford

_____

Name of Participant

_____ _____

Participant's Signature Date

_____

Name of person consenting

_____ _____

Signature of person consenting Date

APPENDIX C: IRB Approval Letter for this study

UNIVERSITY OF SOUTHERN CALIFORNIA
UNIVERSITY PARK INSTITUTIONAL REVIEW BOARD
FWA 00007099
Exempt - Flex

Date:	Nov 05, 2014, 08:47am
Principal Investigator:	Lisa Crawford THORNTON SCHOOL OF MUSIC
Faculty Advisor:	Beatriz Ilari THORNTON SCHOOL OF MUSIC
Co-Investigators:	
Project Title:	Composing in Groups and Creative Processes USC UPIRB # UP-14-00590

The iStar application and attachments were reviewed by UPIRB staff on **11/5/2014** .

The project was **APPROVED**.

The study has been reviewed and determined to qualify for exemption under the USC Human Research Protection Program Flexibility Policy. The study is not subject to 45 CFR 46 including informed consent requirements and further IRB review, unless there is modifications to the study that increase risks to subjects or the funding status changes.

Funding Source(s):
No Funding Sources

If there are modifications that increase risk to subjects or the funding status of this research is to change, you are required to submit an amendment to the IRB for review and approval.

The following documents were reviewed and approved:
Certified Parental Permission Form, dated 11-04-2014
Certified Child Assent Form, dated 11-04-2014

Minor revisions were made to the application (sections 9.2, 10.2, 10.3.1, 22.1, 22b, 24.1, 24.8, 24P.6, 26.2, 26.5, 26.5.1, 26.7, 27.1, 27.2, 28.4 & 28.4.1), assent and parental permission forms by the IRB Administrator. The IRBA revised documents and instruments/measures have been uploaded into the relevant iStar sections. If revisions are made to the application, and changes are required to the documents, please create an amendment, at which time the IRBA revised documents will become available to the study personnel. All current changes must be accepted using the track changes feature in Microsoft Word and the changes saved. The study personnel can then revise the documents, including the date in the footer. The PI/study staff revised documents must then be uploaded into iStar using the "upload revisions" function; thereby replacing the obsolete documents. Please do not remove the obsolete version from the application.

The finalized documents are available under the 'documents' tab in the iStar application.

Researchers are reminded that school personnel cannot conduct any study related activities unless they are listed in section 2.1 or 2a and are CITI compliant. This includes the consent process and/or collecting/analyzing data.

Social-behavioral health-related interventions or health-outcome studies must register with clinicaltrials.gov or other International Community of Medical Journal Editors (ICMJE) approved registries in order to be published in an ICJME journal. The ICMJE will not accept studies for publication unless the studies are registered prior to enrollment, despite the fact that these studies are not applicable “clinical trials” as defined by the Food and Drug Administration (FDA). For support with registration, go to www.clinicaltrials.gov or contact Jean Chan (jeanbcha@usc.edu, 323 442-2825).

To access IRB-approved documents, click on the “Approved Documents” link in the study workspace. These are also available under the “Documents” tab.

Researchers are reminded that some schools require permission to conduct research even if the research is exempt from IRB review.

Sincerely,

RoseAnn Fleming, CIP

Funding Source(s):

No Funding Sources

This is an auto-generated email. Please do not respond directly to this message using the "reply" address. A response sent in this manner cannot be answered. If you have further questions, please contact your IRB Administrator or IRB/CCI office.

APPENDIX D: Observations of All Composing Treatment Groups

1A3-(1-4)

Visit 1 Students begin by individually exploring instruments. After about 8 minutes of this, the researcher reminds the group of the instructions to compose—write a piece of music. Six minutes later, exploration of instruments continues. Several minutes more go by and the researcher speaks again to the group about how all participate in notating on the paper. Students as about instrument names. Several minutes more and a student asks what to call an instrument (egg shaker; fish block-guiro). The researcher stopped answering questions about instrument names. The researcher invited one student (male) to stand up and participate with the others. Super odd interactions with each other; never saw it again in any other group.

Visit 2 This is my first group of Section II. I worried that, because of their interaction style, the composing Section II without assistance from a teacher might be worthless. The other groups proved to be very different than this group today. Today, with no changes in their style of working together, low-level communication techniques, no excitement at all, and missing creativity with the task, this group is the same as Day 1 and I wonder if they will finish their composition.

During visit 2, there was an improvement; the group began to get a definite groove. Participant 1A3-4 imposed directions to participant 1A3-2 who put his head back in frustration. Participant 1A3-2 served as director during the second meeting.

The researcher stops the video and invited the group to talk together, have conversation. You are a group composing. I think you can go farther than exploring instruments. Would you like to communicate anything to me? [No replies] The interaction increased. They began talking together. The independent instrument exploration continues. Participant 1A3-1 is challenging for the other participants to work with.

Now we are finding that groove again. Participant 1A3-1 joins with the group. Participants look to me for approval; researcher smiles but says nothing.

Thoughts as they are working: no use of pitched instruments was good especially for this group because it relieved the responsibility for participants to be concerned with developing melody. For this group, it would have been even more challenging!

Visit 3 Participant 1A3-4 is absent today but I still allow the group to work together. I know they will return again anyway. The researcher gave a warm welcome and reviewed the project parameters. This was unnecessary for other groups.

Participant 1A3-1 still works today with the same drum as the prior two visits. 1A3-2 asks 1A3-1 if she still likes that drum.

Communication is better today. Each student does well with individual instruments and they find a groove. Rehearsal however, is individual rather than group.

Collaboration is very very limited in this group. No leader, however 1A3-1 exhibits some leadership today in the absence of 1A3-3.

This group, without any form of a composition, is still exploring instruments today. Their group process is very challenged; they are extremely quiet every meeting.

There is no sense of urgency in this group to complete a composition. The tendency for quiet is overwhelming for me. Have rarely observed this tension. 1A3-2 becomes the leader today. He makes comments about the group's behavior and begins to write ideas on the score paper.

I am thinking about evidence of creative thinking, even in this challenged group.

The researcher announces that the group has completed half of their time. Video off. I ask if they have notations on their score representing what you will play in your composition. Do you need a new piece of paper? The researcher attempts to reboot the workings of the group. With explanation of what a score is, the researcher gives 7 minutes to complete the score. OF course they do not finish, and a fourth visit is scheduled.

Visit 4 The group chooses to communicate today very quietly. However, the group is working "together". Fully collaborative today. 1A3-1 is again choosing very quiet communication/interaction. 1A3-4 begins working on a new piece of score paper.

There is less "trying" of instruments with no visible reason which actually wasted time in prior meetings, but not today. This group does not know what to do.

15 minutes in and disagreements begin. These guys are back to the way they began—off focus. 1A3-3 displays positive leadership. 1A3-1 displays off-topic leadership. Conversation becomes about disagreements, so getting nothing done.

Researcher reminds group this is their last meeting. Students are reminded to speak so the camera can hear what is being said. Very direct communication from me—no reason to whisper. Be LOUD! You may ask for help after disagreements but you must figure out what to do. This is your project. This actually changes their interaction and helps.

No composition is completed.

2A3-(5-8)

Visit 1 The group begins with exploration of instruments. So thankful to see their interaction and so much more talking than group 1A3. Working together on a rhythm begins after about five minutes.

The group determines they need to work on the middle now.

From the beginning, participant 2A3-6 self-determines as leader. 2A3-5 is not participating and no one invites him. The researcher asks 2A3-6 to assist 2A3-5. Ideas come from all three participants (girls) except 2A3-5; they understand the task at hand. 2A3-5 seems less clear about process. 2A3-6 asks everyone to "try it". Actually really cool piece (in beginnings). So much further along than group 1A3 ever reached—is this because no one took a true leadership role?

2A3-6 develops a cool rhythm that everyone works off of.

Notation is the challenge; how to make this more interesting in script.

Leadership amongst the three girls becomes more evenly spread out. 2A3-5 not talking to the girls – is this shyness?

Rehearsal phase continues. Researcher reminds group that 10 minutes remain and they may wish to think about notation again.

This is an improvisation group. They try, omit, add.

Process of this group is to verbally communicate, others respond, try, decide.

A new rhythm is introduced.

Visit 2 The group begins with exploration of instruments. The researcher stops the video and reviews the strategic direction from the script.

Communication increases.

The meeting considers previously selected rhythms from first visit.

Visit 3 The researcher begins with the idea that I'd like you to complete your project today.

The group is greatly collaborative today. They are working on performance today!

Highly communicative group with lots of suggestions. Lots of "oh I missed that".

2A3-7 reviews how score works and number of times something happens. Then there is complete silence. Then she says "places". Also counts off for beginning.

As rehearsal and working on performance continues, 2A3-6 says "no more changes, no more changes". 2A3-8 suggests "this should be done". No one disagrees with her.

Very organized with instruments and having fun!

Organization of the score is very strong. 2A3-7 and 2A3-8 are both directors. 2A3-5 still remains held back today. 2A3-6 puts forward new ideas. 2A3-7 says "okay everyone-places".

Number of instruments is quite nice. What is originally chosen seems to stay in the score. Score sounds the same every time it is performed. "Yay! We know the whole song! Yay!

2A3-7 says, "Last time- make it the best time".

Students ask who they will perform the piece for.

2A3-6 wants to make a change in the score - all girls directors – 2A3-5 still quiet.

Performance is on video.

1B3-(9-12)

Visit 1 Students seem happy to be working together and learning a new program.

Working together on white board is time consuming because interactive is fun.

Visit 2 Participation and collaboration are effective tools for this group. There is little imitating, but lots of leading and initiating.

Quite even discussion from each group member. Comments are made when someone attempts to control another—"let him do what he wants" and "sounded good - better in the end".

This group is experiencing a much fuller experience with the technology thant acoustic instrument groups have so far. They are enjoying exploring what the technology actually does.

They have strong organizational skills of their workspace.

Evidence of creative thinking is all about the creating.

Communication level is extremely high and is maintained throughout the meeting. "I haven't had a turn to touch it."

Impact of the environment is interesting to observe as students discuss the difficulty in creating straight lines in the score.

Students are challenged by having to choose one composition. The group decides on one, but it is hard to do,

This group wrote three scores and they want to perform 2 of the 3.

"Want to dance to it – come on!"

1B3-10 very proud and says, "I particularly made that by myself".

Lots of discussion of what sounds horrible and performance choices.

Composition/s are completed. What a great group!

2B3-(13-16)

Visit 1 Group 2B3 works for a full hour today in their first visit. They are a very quiet group.

This group is explorative in a different way than fifth graders. This group needs no more instruction than fifth graders.

This is the most creative group of "Bs" so far! They are playful with the program. The group has understanding of how to do tasks with the program [such as make work area larger or smaller]. Finding great enjoyment with making squiggly lines.

This is the first group to explore the program beyond the researcher's foundational instructions of the script.

Visit 2 Change to the workspace has included removal of chairs in front of desk and computer. Working well. This group is now working on the Smart Board only. All four members are working together. Sometimes there is goofing off with improved access.

New road to navigate that may take too much time. Asked students if they thought they were focused on the white board rather than their composition. They agreed. So sent them back to focus on composition.

These are "getting along" type people. They are talking together well.

There is evidence of creative thinking through theirs being the "coolest" work I have hear so far.

Their focus has turned to precision and how that makes the piece come off.

Visit 3 Participation and collaboration remain high. There is strong group process, for example, trying a sound, choice of how to make it work, verbal identification of a rhythm, discussion of how what will work.

Interaction with the technology tool through investigation of enlarging the screen and interest in using the Elmo/white board/Smart Board screen.

Evidence of creative thinking is also found in the group's choices of designing elements of their composition.

In the future with this program, a larger screen would be helpful [not possible with this computer].

The group reached a point when everything stopped. Research stopped the video and helped group return to the work area and sound source to continue forward movement.

I think this is an incomplete score but the most this extremely creative group could do for now.

1A5-(1-4)

Visit 1 Fifth graders are well-prepared for sound design as an experience that is creative and positive. Also, one male much better at working with three females than third graders so far.

This group is amazingly focused. Individual participation is collaborative, leading, initiating, creative thinking, communicative, and participatory.

This group has a "notator" while others "discover" sounds

1A5-4 is most commonly the leader in this group. 1A5-1 often initiates "corrections".

Half way through this one-hour meeting, the group attempts a performance. 1A5-4 expresses light frustration.

This group places the students they will use for performance on the floor, away from tables holding instruments.

1A5-4 gives instructions; other members of the group do not seem compelled to disagree

Highly collaborative group with 1A5-4 as the director. Accomplished musician and performer.

Additional organization of instruments for better performance

Return to exploring more instrument sounds.

1A5-4 asks, "What do we want to name this thing?"

All, "We're not done.

1A5-4 says, "we're not done?"

Group begins to perform final work.

Visit 2 Group returns with careful review of earlier notation to organize instruments.

After 1A5-4 gets things going, there is even distribution of leadership.

Further exploration of instruments.

"Rehearsal" is understood to be very important by this group.

There are differences of opinion more commonly today. For example, "You wrote it, so you know what you're doing."

A final rehearsal appears to be occurring. Questions include some improv, notation, length.

Piece seems nearly complete.

Visit 3 Eager re-entry into organizing instruments for rehearsal and performance. Immediate into rehearsing sections and organizing precision.

Noticing third version of observation protocol is much easier now than version 2.

1A5-1 is notating during this third visit to finalize the score.

Imitating seems to follow what one student likes.

Especially in this third visit, 1A5-4 is leading and initiating, especially in organizing the rehearsal and solidifying the final score. This has been true for all visits. All seem responsive to 1A5-4 leadership. Even though students were grouped by random selection, all four of these students are form the same class.

The impact of the environment for A groups is about plenty of space. Movement has not been considered (so far) in the compositional approach.

There is some separation today between 1A5-2 and 1A5-3 & 1A5-1 and 1A5-4.

Several things about communication. 1A5-1 rejects 1A5-4's counting off idea. 1A5-2 asls 1A5-4 "why" about issues in the composition organization. 1A5-4 checks in with 1A5-1 to see if he needs more help with score notation. 1A5-1 rejects another one of 1A5-4's ideas.

1A5-3 notes that 1A5-1 and 1A5-4 have made decision about the score that they are not a part of. There is no resolution or even an attempt to resolve this.

1A5-4 asks, "Want to run through it now?" 1A5-3 says, "No. We haven't don the ending chie thing." 1A5-4 pushes several more times then says, "Ok, we have two minutes to run this through twice." 1A5-2 says, "It doesn't take a minute to run through it."

Performance #1 is really strong! Also, probably best notation of all groups. Very strong focus toward doing this well, correctly, etc.

2A5-(5-8)

Visit 1 While this group immediately displays great communication. Participation, collaboration, imitating, creative thinking, and great communication, there are interesting characteristics in the individual participants: 2A5-7 is the quietest and a follower. 2A5-6 is very on-task. 2A5-8 is somewhat of a goof-off. And 2a%-5 only wants to work on the drums and has the lowest collaborating style with endless playing of the same rhythm.

Having noticed this, participation is strong. However, the collaborative strengths as demonstrated by Group 1A5 are not a part of this group. I wonder if the key to this group work is the strong leadership 1A5-4 created for her group that produced excellent collaborative spirit and environment.

Additional new instrument sounds are introduced in rhythm with what is already happening.

Collaborative atmosphere continues but when one person does not take a leadership role, what happens? Several minutes go by and what develops is a groove – making music together using repeated rhythm and performing different rhythms together

A leader appears! 2A5-6 becomes a conductor. In their excitement, they decide on the name of their piece, "African Line Beat"!

Visit 2 Today there is further exploration of instruments. 2A5-5 and 2A5-7 are most active but I wonder if this is playing vs working?

Accidentally put out a box of ethnic instruments and these are engaging for students.

2A5-6 organizes who will notate score.

2A5-5 and 2A5-7 continue playing drums.

2A5-5 provides leadership via ideas about how to arrange three sounds. Another 15 minutes of group exploring sounds and trying more instruments. 2A5-5 continues to play his same drum rhythm,- is this boredom? Vs taking a leadership role in composing the piece and performing it? He had asked at the beginning if he could be in the technology group but I stayed to the random selection. At one point he plays with mallet on 2A5-8's hand

2A5-6 takes leadership of hwo should notate and presents ideas for how to proceed next.

2A5-6 appears hooked in with 2A5-5 and adds a second part to what 2A5-5 has continuously repeated,

2A5-8, not a "tryer" on instruments, stops 2A5-5 from endlessly playing his drum rhtyhm. She is collaborative with 2A5-5 while the two others have been much less involved.

2A5-5 responds that this is why they should have written everything down in the first meeting. Continues with his repetition of the drum and rhythm.

Visit 3 Today the researcher invites the group to see if they might finish their composition.

Today is about rehearsal. This group is much less challenged by self that the third graders and much more verbal.

The actual completed piece is repetitious, short, but goes on and on with one segment. I consider it an interesting approach with their strong interlocking rhythms.

1B5-(9-12)

Visit 1 Quiet group but collaborative. Their exploration of the program is faster than I had imagined. Time goes much faster with technology What is this??? Fun??? Or???

Very quiet students. 1B5-9 handles entry and most exploration.

More than half way through this first hour, sti8ll the group is very quiet but explorative.

Strange to observe more sounds [melody windows] are not added at the same time. A few minutes later, the group clears their page. 1B5-9 is the first on the mouse and stays on the mouse, but 40 minutes through the hour, tells 1B5-10 that he can go next.

Researcher shifts group to no chairs providing students with ability to move around. All are sooooo quiet. Absolutely no goofing off.

1B5-10 is unengaged without control of the mouse. He reintegrates himself by standing with 1B5-10 and 1B5-11 (two females).

Visit 2 1B5-9 once again on the mouse.

Researcher removes all chairs and says, "all students have equal access to the mouse." This works and students change around, shift positions, try ideas.

15 minutes in they ask what to do when they are finished. Researcher explains they may go back to class when they feel their composition is completed.

This group is fascinating. And interesting. They behave differently—get to hear everyone's ideas, not just using their own ideas. This was good.

Future of other group work projects—make students comfotable as this gave them such a different perspective and developed confidence for others in the grup who were slower to leadership.

2B5-(13-16)

Visit 1 This is a very quiet group.

Even trade-off with the mouse.

Researcher told this group they could talk, laugh, communicate in their own way.

This group has developed the best sounding drum track ever--- someone should be a music producer.

This is the most fun of ALL the groups. 1 mouse is a challenge for them. How to change that?

Visit 2 Second visit, no chairs for even access to mouse.

All eyes are on the computer all the time.

Excellent flow, participation, collaboration, initiating.

Even involvement with suggesting ideas.

Imitation not really a part of the *Hyperscore* experience.

Ideas are tried and used.

All seem very comfortable.

Lots of interactive try out--- many colors on same palette.

Sections are different for computer program than acoustic instruments.

Not as directed to "complete an awesome piece".

These guys have a lot of fun together with the program.

2B5-14 very much the director but each member of the group has their leading and initiating moments.

I keep thinking about how this experience affects the future of group work. Hel with communication with others? Some very distinct instructions could be given rather than the researcher keeping out of the way. Can make music out of any sound. The practice of work, as a group.

Visit 3 No notations really for the third visit.

They complete their piece.

Interesting experience for me.

APPENDIX E: Measure of Creative Thinking in Music (Webster)

Measure of Creative Thinking in Music

Text and Directions

Procedures for Administration

Procedures for administration follow. The suggested text is in boldface type and general directions are in regular type face. As the tasks are described, note that some are scored (see Scoring Summary) and some are not. *The text for those tasks that are scored are indicated in italics.*

It is extremely important that the administrator's tone of voice and reinforcement remarks be consistent from person to person. It may be necessary to practice on a few individuals and study the video tapes to make sure that you are consistent. Also remember to avoid providing "models" of how you want the child to respond, except in those cases where indicated.

Warm-Up

Hi. We are going to play some games. Let me show you some things which we will be using. Have a seat here in front of your keyboard. Let's all speak into our mics. Hello. My name is _____. What is your name? (child responds) How old are you? (child responds) Now try making sounds in the mic that are not words. It can be anything! (child responds) Can you think of another sound? (child responds)

If the child hesitates, the administrator may need to give an example of a sound to get things started. The sound supplied should be short and as plain as possible, perhaps a whistle or a clicking sound. Did you hear that echo?

Ok! Now let's look at these temple blocks. Take the mallet and hit them. (child responds) Hit all of them many times! (child responds)

Good. Now try making some sounds by playing the piano with your sponge ball! (child responds) I bet you've never played the piano this way before! Try playing several places on the keyboard.

Part I Exploration

Let's try playing a game. Pretend that you are outside when it begins to rain. You are sitting on the ground next to a metal bucket when the raindrops just begin to fall. Can you make sounds on the temple blocks that would sound like raindrops in the bucket? (child responds)

Now pretend that you are next to the bucket during a raging thunderstorm. What would the rain in the bucket sound like then? (child responds)

The hope here is to have the children produce slow, then fast raindrop sounds on the temple blocks. It may be necessary to work with some children for a moment to get them to demonstrate their understanding of this, although most will do it automatically. For those that need a little help, try to be as non-directive as possible.

Task 1

Now let's pretend that you are sitting next to the bucket for the whole storm. The raindrops begin to fall and little by little the storm begins to gather and get stronger until the rain is coming down quickly and heavily. What would that sound like? (child responds)

Let's play a game with the piano now. Use the sponge ball and show me how the piano would sound if it talked in a low, “growly” voice. (child responds)

How would it sound if it talked in a high, squeaky voice? (child responds)

Task 2

Now suppose that you were going for a ride on a magic elevator. When you get onto the elevator your voice will be very low and gruff and then as the elevator goes up the floors your voice gets higher and higher and squeakier and squeakier. How would that sound on the piano with the sponge ball? (child responds)

Place the sponge ball next to the child and turn attention to the microphone. Now let's play a game with the microphone. Pretend you hear a truck that is very far away. Can you make a sound in the mic with your voice that would sound like the truck? (child responds)

Now let's pretend that the truck is right in front of your house. What would it sound like then? (child responds)

Task 3

Now pretend that you are listening to the truck coming at you from very far off. First you just hear it in the distance and then it gets closer until it is right in front of you. Can you make some sounds into the mic with your voice that would sound like that truck? (child responds)

Part II Application

Now let's pretend that you are a robot from another world! Can you make some robot sounds into the mic with your voice? Don't use words like you and I might use, because comes from another world. Try making some high, squeaky sounds and then some low, growly sounds. (child responds)

Good. Now try making some loud sounds and then some very soft robot sounds. (child responds)

Now can you make some fast and slow robot sounds? (child responds)

Task 4

Gee, I like those robot sounds. Now, I wonder if we could make up a robot song!?! I want you to pretend that you are the robot and that you are singing a song in the shower!! Now, don't use words, because your robot does not know any words like you and I use, just use sounds like what a robot might use from another world! You may use any of the sounds you just made, or make up some new ones. You may put them together in any way you like to make up your song. You can have high robot sounds or low sounds, fast or slow, or loud or soft. Now, I want you to think about your song and when you think you're ready, then go ahead and sing it! (child responds)

As with other tasks which are similar to this that follow, it is important to (l) remind the child of the musical parameters and (2) allow time to think through the music before beginning.

The administrator should move to the rear and to the side of the child during performance so that the child will not be tempted to seek approval from the administrator for the various parts of the composition.

After this task is completed, move to the temple blocks. There should be two mallets placed by the blocks. The administrator should take one and the child the other. At the conclusion of the block tasks, the mallets should be returned to their place. In future tasks that might use the blocks, the child should be allowed the opportunity to use both mallets if desired.

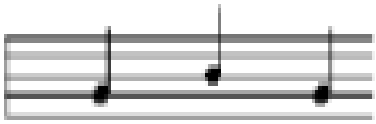
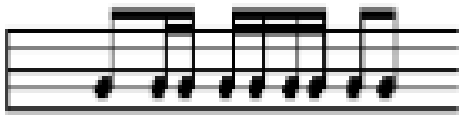
Task 5

Let's play a game now with the temple blocks. In this game, we are going to talk to each other on the blocks. You are to listen as I play first. When I stop, it will be your turn to play to me. You do not have to play the same thing that I play. You may play something different if you want to. You can make sounds that are high or low, loud or soft, or fast or slow. Are you ready?

OK. Listen to me, then you play.

(child responds after each stimulus)

There are six stimulus patterns in all. Each pattern is 3 pulses in duration, with a fourth beat of silence during which time the administrator should point to the child to cue him/her to begin the response. The administrator should choose in advance which blocks are going to be played for each stimulus pattern and keep that consistent for all children measured. A variety should be chosen. Notated patterns and relative dynamic and tempo levels are indicated below for each stimulus:

Pattern	Dynamic and Tempo Level
1. 	Loud, slow
2. 	Soft, slow
3. 	Loud, fast
4. 	Soft, slow
5. 	Loud, fast
6. 	Soft, slow

Task 6

OK! Now you play some sounds to me and I will play some back to you. You can play anything you like. (child responds)

The administrator should imitate the child's pattern as closely as possible. Allow for seven interchanges.

Task 7

Now move to the piano and the sponge ball. (Show the picture of the frog jumping.)

What is happening in this picture? (child responds) Can you show me with your hand the way a frog moves? (child responds)

Using this sponge ball on the piano, can you make up some frog music that begins soft and little by little, gets louder and louder? (child responds)

Now can you make some smooth, rolling sounds with the ball? (child responds)

Great! Now it's time to make some more frog music! I would like you to make up a piece of music that has jumpy sounds and smooth sounds, soft and loud sounds, and fast and slow sounds. Feel free to use all the keys on the piano and to make your piece as long as you want. Now think about your frog music for awhile and when you think you're ready, I would like to hear it. (child responds)

The administrator should move to the rear and to the side of the child during performance so that the child will not be tempted to seek approval from the administrator for the various parts of the composition. After this task is finished, proceed immediately to the concluding set of tasks by placing the first space picture on the piano music stand.

Part III Synthesis

Boy, I liked your frog music. Now, we are going on a trip to outer space. I am going to show you some pictures that you might see. Look at this picture, first. (Show the space creatures picture.) Look at this picture of outer space creatures.

Task 8

Can you think of some sounds that they might make? Use your voice in the mic to make up as many sounds as you can. (child responds)

The administrator should always stand behind the child during the time of response, both in this task and those that follow. This discourages the child from looking to the administrator for approval for the sounds produced. The response is over when the child turns around and acknowledges completion. Put up the picture of stars in space.

Can you use your voice in the mic and the sponge ball on the piano to make some sounds that go with this picture? (child responds)

Put up the space battle scene.

Here is a big space battle! Using your voice in the mic, the sponge ball on the piano and the temple blocks, can you make some sounds that go with this picture? (child responds) Thank you! I really liked your sounds!

Arrange the pictures in the following order: (l) space ship taking off, (2) space creatures, (3) star scene, (4) space battle, and (5) space ship crashing.

Task 9

Now let's make a sound story out of these pictures. Let's imagine that we take off, talk to some outer space creatures, fly through space, get into a space battle and then crash.

(Administrator should point to each picture as this is explained.)

Now, I'm going to close my eyes so that I cannot see the pictures. I want you to tell me this story using sounds. Pretend that you are in this space ship and that you are telling me this story through the music you make. You can use any of the instruments that we have been using. You can make high sounds and low sounds, fast and slow, high and low. It can be as long as you want. Now I want you to think about your sound story and when you think you are ready, I will give you a count down.

(Administrator should wait until the child is ready.)

Are you ready to take off? OK, here is your count down, 5...4...3...2...1...blast off! (child responds)

OPTIONAL:

You might want to record the space story and have the child listen to their work while pointing to the pictures. This might help when rating syntax, however this does add more time to the administration of the measure. If you decided to add the recording, see the directions that follow. Otherwise, go on to Task 10.

Administrator should turn on the cassette tape recorder in order to record the sound story. This should be done without the child knowing it if possible.

Great! That was quite a sound story! Now I recorded your story on tape. Let's go back and listen to it. As you listen, I want you to point to the picture that fits with the sounds that you make.

(Administrator should now re-wind tape and play the story back. Child responds by pointing.)

Task 10

Now, I have one more game for you. We don't need the pictures because you are going to make up your own story with sounds. The only thing I ask is that it have a beginning, a middle, and an end.

(Administrator should put up the three blank pieces of paper as this is said.)

You can use all the instruments in any way you want. Remember, you can use high sounds and low sounds, fast and slow, and loud and soft. It can be as long as you want. Just remember that it

should have a beginning, a middle and an end. Now think about the music you would like to make and when you are ready, let me know.

Once the child indicates readiness, the administrator should let the child begin.

OPTIONAL

You may want to record this composition on video recorder as well, asking the child to listen to their music and point to the blank pieces of paper. If so, do the following. Otherwise, skip to the last “thank you.”

Now let's go back and listen to this. As you listen, point to the section that you are in, whether it is the beginning, middle or end.

(Administrator should now re-wind tape and play the story back. Child responds by pointing.)

Thank you very much. I enjoyed your music!