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Examining the Effect of a School-based Creativity Program on Divergent Thinking and Academic Achievement in Middle School Students

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ACCEPTANCE

This dissertation, EXAMINING THE EFFECT OF A SCHOOL-BASED CREATIVITY PROGRAM ON DIVERGENT THINKING AND ACADEMIC ACHIEVEMENT IN MIDDLE SCHOOL STUDENTS, by LAUREN ELYSSE GARBER ROWE, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education & Human Development, Georgia State University.

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EXAMINING THE EFFECT OF A SCHOOL-BASED CREATIVITY PROGRAM ON DIVERGENT THINKING AND ACADEMIC ACHIEVEMENT IN MIDDLE SCHOOL STUDENTS

by

LAUREN ELYSSE GARBER ROWE

Under the Direction of Martin Norgaard

ABSTRACT

This study aimed to investigate the potential transfer effects of domain-specific creativity training on domain-general divergent thinking indices of divergent thinking and investigate the potential effects of the school-based creativity program on the development of creativity in a middle school in the southeast region of the United States. The school-based creativity program is an initiative that uses literacy standards to position students as content creators, connecting directly to student interests. The creativity program includes capstone projects, such as songwriting, theater, dance, video game development, inventions, marketing, and design. In the 2020–2021 school year, 55.17% of the program's capstone projects were music-related (2019–2020: 63%). I assessed online 75 sixth-, seventh-, and eighth-grade students. Of the seventh and eighth graders, one half of the students were partially in the school-based creativity program and

the second half were not involved in the program. All sixth graders were enrolled in the program and considered one group, which I labeled as Full Creativity-Sixth Grade.

Four types of data were collected and analyzed for this study: the Runco Creativity Assessment Battery, Georgia Milestones Achievement Scores (GMAS), music-based capstone projects, and interviews with the administrator and program coordinator from the creativity program. Quantitative results revealed that grade level did affect divergent thinking, with lower grades scoring less. However, the participants in the Full Creativity program had virtually no transfer effects, which was expected based on the extensive training literature. These results may have been influenced by the way divergent thinking was measured and the testing schedule, in which testing fatigue may have influenced the posttest results. To measure academic achievement, participants were divided into two groups based on their GMAS test scores for English/Language Arts (ELA) and Math (Low Achieving and High Achieving). There were no significant interactions between divergent thinking pre-and posttest scores and GMAS test scores in ELA or Math. After completing a content analysis of the students' music capstone projects, two overarching themes were present: musical creativity and emotional expression.

This dissertation describes the creativity program in detail and discusses how it relates to music education. Contributions, limitations, implications, and directions for future research address the effect of school-based creativity programs on divergent thinking and academic achievement.

INDEX WORDS: Creativity, Divergent Thinking, Student Achievement, Middle School, Project-Based Learning, Creativity Training

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in

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in

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2023

DEDICATION

This dissertation is dedicated to my grandfather Dr. Arthur L. Harris. Thank you for inspiring me to get my PhD and to always strive for more in life.

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Personal Motivations

The motivation for this study stems from my personal experiences as an educator. The teacher is the ensemble's driving force, which brings an authoritative approach to student learning. At my previous teaching assignment, the fine arts department made up 75% of the school's population. The music classrooms were ensemble-driven, which meant the teachers focused on the performance (i.e., concert and competition preparation). However, in my graduate years of schooling, my professors stressed the need to implement creative classroom activities. Some of the ways to include creativity is through the use of music technology and composition. Thus, I began to integrate creative activities into my lesson plans. Based on my students' reflection responses, they enjoyed the creative activities in my classroom. Throughout my tenure at this school, teacher and student accountability continued to be a hot topic in education. During professional development, my administrator wanted more tasks that could help students focus on accountability. Soon, I wondered if creative music activities could help students in their school subjects and overall human development. According to Cohut (2018), creative thinking helps the human brain learn new concepts by creating stronger neural connections. A student may become better equipped to their academic potential by increasing their creativity and divergent thinking skills. Did creativity affect their school achievement? Did it help students think outside of the box when dealing with daily tasks?

In 2018, I began my doctoral studies and helped analyze data for Dr. Martin Norgaard. One of the projects was to investigate the effects of a school-based creativity program at the middle school level. At that point, I began to learn more about creativity and divergent thinking. In Spring 2020, I took over the investigation and began to see how my initial inquiries from professional teaching aligned with the current study.

PROLOGUE

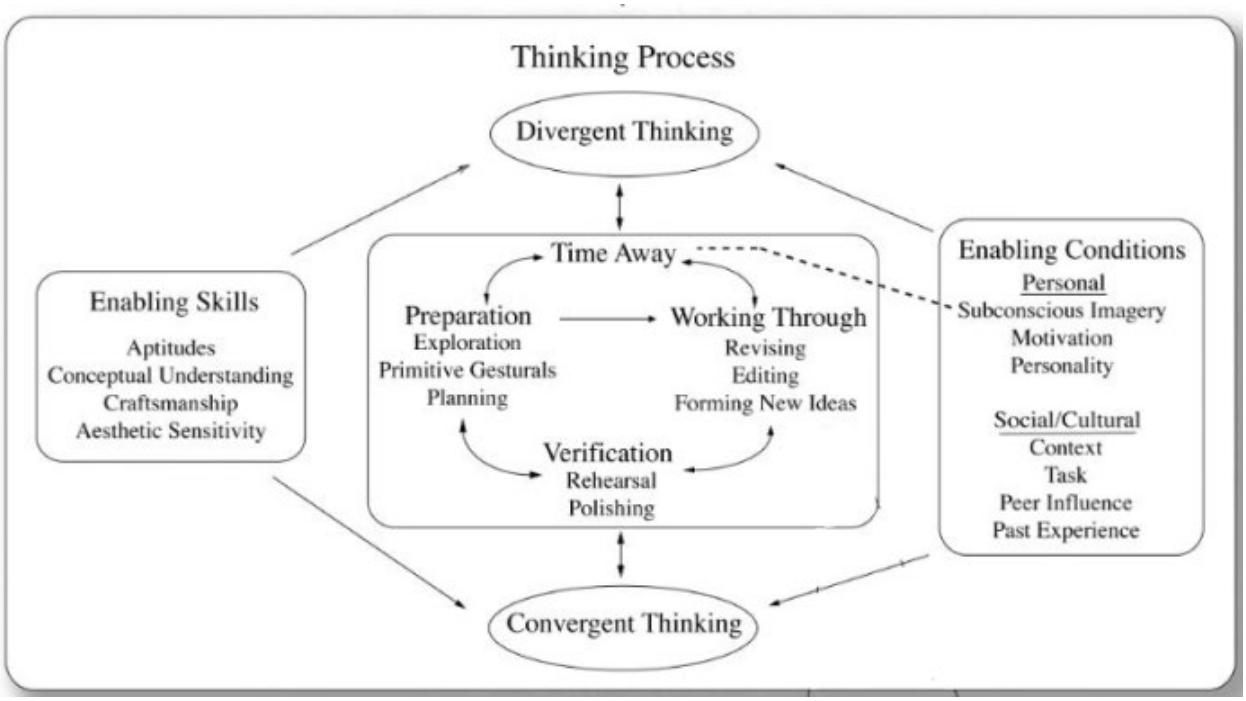
I found it important to investigate the potential effects of a school-based creativity program on the development of creativity, because the majority of the creativity program's capstone projects were music-related (Pilot study: 63%; Current Study: 55.17%). Many teachers try to incorporate creative activities in the classroom, but school culture, academic achievement, and lack of understanding on the subject of creativity cause them to think twice about promoting it in their lessons, which is why it made sense to look at a creativity program outside of music classes to study how creativity can be taught inside the music class. I found it important to discuss how creativity relates to music education in a prologue and an epilogue chapter within this dissertation. The prologue will describe the definition of creativity in music education, as well as incorporate the history and recent research in the field. The epilogue will include potential effects of the school-based creativity program on the development of creativity in music.

Defining Creativity in Music Education

Based on the extensive music education literature, creativity has been viewed as important in music education throughout the 20th and 21st centuries (Coleman, 1922; Gruenhagen, 2017; Tan & Sin, 2020). Peter Webster (1990), scholar-in-residence at the University of Southern California Thornton School of Music and researcher in creative thinking, theorizes creativity as a process guided by creative thinking. Webster (2002) defined creativity as "a dynamic process of alternation between convergent and divergent thinking, moving in stages over time, enabled by certain skills (both innate and learned), and by certain conditions, all resulting in a final product" (p. 11). Figure 0.1 presents a model of the creative thinking process based on research in the creativity field (Webster, 2002).

Figure 0.1

Model of the Creative Thinking Process (Webster, 2002)



Webster (2002) included four stages that guide the creative thinking process: Preparation, Time Away, Working Through, and Verification. According to Cropley and Cropley (2010), students or musicians will regularly move through each stage and revisit different stages throughout the process. Throughout each stage, the person will use convergent and divergent thinking.

Brief History of Creativity in Music Education

Creativity in music education has been historically prevalent throughout the 20th and 21st centuries. In 1922, music educator Satis Coleman wrote one of the first books about creative music for children. Coleman's book, *Creative Music for Children*, included various creative activities, like dancing, singing, making and playing instruments, and writing poetry. The author's objective was to get a wider teacher audience to implement creative music learning activities into their classroom so that all public-school students would have access to creating. In

1990, the *Music Educators Journal* published its first focus issue dedicated to creative thinking in music. From the journal came Peter Webster's article about "Creativity as Creative Thinking," which focused on the process of convergent and divergent thinking concerning music education. In the 21st century, music educators recognized the importance of creativity by adopting the 2014 Core Music Standards (NAfME, 2022).

Recently, creative research studies and practitioner journal articles have been abundant in music education because of the 2014 National Standards. In the last five years, teachers have written how to incorporate creative activities into the music ensemble classroom (Gruenhagen, 2017; Norgaard, 2017; Tan & Sin, 2020). Historically, instrumental and general music educators have used different assessments to gauge student proficiency throughout the school year. Assessment use can determine a student's strengths and weaknesses on a given learning objective (Russell, 2014). However, there is not much research on the assessment of creativity in music ensemble classrooms. Instead, music educators have used various assessments to focus on the progression and acquisition of the student and ensemble, rather than creativity. In music education, the subject of assessment has been researched through a variety of lenses: rating scales (Saunders & Holahan, 1997; Zdzinski & Barnes, 2002), instrumental students' musical knowledge (LaCognata, 2010; Russell & Austin, 2010), self-assessment (Burrack, 2002; Criss, 2011; Hewitt, 2011; LaCognata, 2010; Shuler, 2011; Wells, 1998; Zimmerman, 2005), peer assessment (LaCognata, 2010; Russell & Austin, 2010), portfolios (Barkley, 2006; McQuarrie & Sherwin, 2013), impact on a student's psychology and motivation (Willingham, 2005; Vispoel & Austin, 1993), technology (Buck, 2008; LaCognata, 2010), and standardized measurement (Boyle & Radocy, 1987; Colwell & Hewitt, 2011; Watkins & Farnum, 1954).

Over the years, music education publications have included many practitioner articles on creativity in the music classroom. For example, in 2017, *Music Educators Journal* came out with their third issue devoted to musical creativity. In the special focus issue, articles included teaching for creative expression in performance (Strand & Brenner, 2017), developing creativity through improvisation (Landau & Limb, 2017; Norgaard, 2017), development of creative listening skills in students (Kratus, 2017), and developing musical creativity through reflective and collaborative practices (Gruenhagen, 2017).

Creativity in Music Education Literature

Opportunities for creative learning have long been found in music education classrooms. The exploration of creativity includes the advancement of theories and strategies that could foster music creativity for all students and teachers. Creativity in music education had continued to incline since the United States moved toward more creativity-driven learning when the Core Music Standards launched from the National Association for Music Education, NAfME. The Core Music Standards utilize creative terminology (i.e., creative ideas, choices) into their learning. More creative opportunities could help give students a more well-rounded curriculum (Kladder & Lee, 2019). Although the last decade lacked published literature on the 2014 Core Music Standards, creativity researchers are conducting more studies on student and teacher perceptions of creativity in the music classroom (Kladder & Lee, 2019; Langley, 2018), self-concept (Nazario et al., 2021; Mawang et al., 2019), creative processes regarding large ensemble and general music settings (Beegle, 2010; Latifah & Virgan, 2021), and musical expertise (Palmiero et al., 2020).

Student and Teacher Perceptions of Creativity

Researchers and critics have found it challenging to develop a universal definition for *creativity.* Music researchers are currently determining how teachers and students interpret the term (Kladder & Lee, 2019; Langley, 2018).

Kladder and Lee (2019) investigated music teachers' perceptions and definitions of creativity across the K–12 and university settings. The researchers emailed a questionnaire to music teachers from all grade levels. The questionnaire included 32 questions consisting of 22 Likert-style, four open-ended, and one multiple-choice. The remaining questions were about the teacher's demographic information. Kladder and Lee (2019) found that teachers believed the classroom environment played an essential role in students' creative process. It is important to create a classroom design that welcomes collaboration. For instance, a classroom could include a circle or group of chairs that allow students to work together to solve problems.

Langley (2018) conducted a mixed-methods study on students' and teachers' perceptions of creativity in middle and high school choral ensembles. In a sampling of 11 teachers and 314 middle and high school students across three school districts in the southeastern area, they gathered data from focus groups. Students and teachers also completed the Measures of Creativity Perceptions Assessment (MCPA). The MCPA included ratings for each question. Langley's (2018) findings suggested that teachers were not incorporating creativity into their lessons. Instead, the teachers created more performance-driven lessons to help prepare the ensemble groups for concerts. Langley posited that the lack of creativity-driven lessons resulted from a need for creativity-based professional development.

Musical Self-Concept and Creativity

Self-concept is an individual's perception of their behavior. Musical self-concept, like perceptions of creativity, lack defined parameters such as mutually agreed on terms and

characteristics. Mawang et al. (2019) and Nazario et al. (2021) investigated the relationship between musical self-concept and creativity. These investigations could lead researchers to understand what personality traits and individualized thoughts align with creativity.

Nazario et al. (2021) investigated the broad and strict senses of creativity and their potential influences on the self-concept of 37 university-level music students and eight volunteer musicians. The goal for this research study was to find out how an individual defined different attributes of creativity and how it influenced their self-concept of creativity. A broad sense of creativity is "seen as a phenomenon that is transcendent to a human being, and it is generally associated with the adaptation process and the very origin of life" (p. 1687). A strict sense of creativity means that "creativity is related to the creation of a new external reality from an internal reality" (p. 1687). The mixed-methods research study was broken up into two groups. The first group was open to students who completed a music course at the university. Each individual completed an open-ended questionnaire after completing a specific music course about what they claimed to be "necessary for musicians to express themselves creatively in music" (p. 1692). The second group was open to non-regular music students enrolled in an extension course through the university. The researchers found that the individual's broad sense of creativity gave them a positive self-concept. However, their definition of a strict sense of creativity could potentially cause the individual to have a negative self-concept if they did not measure up to their rigid idea of creativity.

Mawang et al. (2019) investigated the relationship between musical self-concept and creativity among 201 high school seniors in Kenya. The goal was to identify the best predictors of musical creativity. The researchers used two assessment forms: Music Self-Perception Inventory—Version 2 (MUSPI—Version 2) and Consensual Musical Creativity Scale

(CMCAS). The MUSPI is an assessment using a six-point Likert-type scale that evaluates student perceptions of their musical ability in singing, instrument playing, reading music, music composition, listening skills, dancing, sense of rhythm, and global music self-concept. The CMCAS is a rating scale measuring a person's musical creativity. The rating scale was adapted from Amabile's Consensual Assessment Technique (CAT). Students composed compositions and were then rated based on their creativity. The rating was based on a five-point scale by experts. Based on the findings, males scored significantly higher than females on assessments. However, there was not a significant difference in participants' musical creativity based on their age.

Creative Processes in General Music and Performance Classrooms

Creative processing is a category of music creativity lacking in most research studies. Many researchers who wrote in practitioner journals delved into improvisation topics and creation in a large group and general music setting in the physical classroom (Edmund & Keller, 2020; Higgins & Mantie, 2013; Norgaard, 2017) and virtual setting (Cayari, 2021). Beegle (2010) and Latifah and Virgan (2021) investigated the creative process and music learning.

Beegle (2010) investigated children's music improvisation through student interactions with their group members. The study aimed to shed light on their creative processes through musical, verbal, and nonverbal interactions during the planning and presentation stages. The participants for this study were two groups of fifth-grade general music classes. The groups were separated into experimental and control. Each class was split into six groups of four (n = 48) within the two groups. The study was a pre-test/posttest design that spanned 12 weeks. The students in the experimental group received hands-on learning through improvisation instruction. The control group received the same instruction but was not able to create improvisation. Each pre- and posttest consisted of two playing opportunities. The groups had to play one minute of

improvisation for the first round. The second time, the researcher asked the group to play a different improvisation. Data collection consisted of performance videos, weekly focus group interviews, and class lesson observations through field notes and videos. The researcher found that all students utilized a similar planning method. Also, students' social roles were correlated with their music roles and relationships.

Latifah and Virgan (2021) investigated the collaborative learning process of 28 high school students who were rhythmically inclined. The researchers divided the students into two groups. Each group completed a pre-test, which was ex post facto score data. The pre-test was students' rhythmic results from the previous semester, which comprised of clapping and leg movements to the national song of Indonesia. After the pre-test, the first group was trained in collaborative learning for four months. After the training, the students completed a posttest consisting of a series of call-and-response rhythmic motives, collaborative work test scores, and creating four rhythmic motives based on the guidelines. The results indicated a significant increase in rhythmic scores after the collaborative learning treatment.

Musical Expertise and Creativity

Some music creativity researchers are currently trying to find links between musical expertise and creativity by incorporating divergent thinking tasks into their method because it is a quick way to gain knowledge about creative thinking (Weisberg, 2006; Runco & Acar, 2012; Palmiero et al., 2020; Abrahan et al., 2021).

Abrahan et al. (2021) investigated the influence and relationship between musical expertise and gender on creativity. The study sample was 158 musician and non-musician participants between the ages of 18 and 50 (Musicians = 87 and non-musicians = 71). Verbal and visual tasks were used to evaluate each participant's creativity. The individuals' responses were scored on Fluency, Flexibility, Originality, Elaboration, and General Creativity. Based on the

analysis of the scores, there were statistically significant differences in music expertise in both tasks. The results showed that musical expertise had a positive impact on creative performance.

Palmiero et al. (2020) investigated the relationships between musical expertise and verbal and visual divergent thinking in expert, self-taught, and non-musicians. The researchers administered three forms of assessment to measure musical, verbal, and visual divergent thinking. However, the non-musicians did not complete the musical divergent thinking task. All participants completed two sections of the Torrance Test of Creative Thinking (TTCT). Each participant had 10 minutes to complete the visual and verbal divergent thinking task. The visual task was a picture-based exercise that required the participant to add details to the given shape to form pictures and create titles for each drawing. The verbal task required the participant to name as many unusual uses as possible for a cardboard box. The musical task required experts and self-taught musicians to develop as many unique melodies as possible to the first six notes of the song "Happy Birthday." The musicians had to include titles for each melody they created. Expert musicians could notate the melodies on staff paper, while the self-taught musicians could perform their melodies in place of writing in musical notation. Fluency, flexibility, and originality were the terms used to score the divergent thinking tasks. Three judges evaluated each participant's compositions for the musical task. The scores were as follows for the musical task: fluency was the number of compositions created, flexibility was the amount of melodic/rhythmic categories in all works, and originality was calculated by strength (0–2 points). The researchers found that musical expertise enhanced both musical and verbal divergent thinking. The researchers stated that this effect is supported by formal music training. Formal music training is defined as regular, systematic, and orderly (Miya et al., 2007).

Current Issues

Recently, creative research studies and practitioner journal articles have been abundant in music education because of the 2014 National Standards. In the last five years, teachers have written how to incorporate creative activities into the music ensemble classroom (Gilbert, 2016; Gruenhagen, 2017; Tan & Sin, 2020). However, there is a lack of creativity in the ensemble classroom because of political influences and within-field traditions. Teacher accountability and music performance evaluations are practices that go against the creativity model (Wall, 2018).

Teachers are held to specific standards that are heavily evaluated by administrators every year (Henriksen et al., 2019). For teachers, they are evaluated based on a set of teaching standards. For example, in Georgia, the Teacher Keys Effectiveness System is a tool that evaluates teacher performance through observations, professional development, and student assessments. The rigid evaluation tool confines the educator to orderly classrooms and to teach to the standardized test, which is contrary to creative pedagogy teachings (Henriksen et al., 2019). Two imperative factors when conducting creative activities in the classroom are taking intellectual risk and accepting failure. According to Henriksen et al. (2019), general teachers were nervous about failing in the classroom because of the evaluation. Teachers were afraid to relinquish any control in the classroom.

Another way of holding teachers accountable is through performance evaluations (formally State Contests). A performance evaluation is an end-of-year performance that evaluates public and private school ensembles by professional adjudicators. The music ensemble teacher must choose pieces of music from the approved repertoire list. The music groups are then evaluated based on a rubric format that judges ensembles on specific criteria (i.e., intonation, rhythm, and musicianship). Standard choral, band, and orchestra performance evaluations do not evaluate the group on creativity. Instead, the music ensembles could receive a lower score if they

decided not to play the piece as written. The ensemble is rated on a five-point scale for each category: I. Superior, II. Excellent, III. Good, IV. Fair, and V. Poor. At the end of the evaluation, each judge gives the musical group an overall score between Superior and Poor. Some local districts may incorporate that score into a teacher's overall evaluation (Kos, 2018).

Many ensemble teachers are not incorporating creativity into their classrooms based on teacher accountability and performance evaluation rules and regulations. Teachers are afraid to fail in the classroom, especially during an observation (Henriksen et al., 2019). Due to these issues in accountability and performance evaluation, a lack of creativity could be inhibiting the child's need to explore (Wall, 2018). This dissertation does not address the issue directly but investigates the development of creativity through a school-based creativity program. The student's music capstone projects were used to look at the potential effects of the school-based creativity program on the development of creativity.

1 INTRODUCTION

"The principle [*sic*] goal of education in the schools should be creating men [and women] who are capable of doing new things, not simply repeating what other generations have done—men [and women] who are creators, inventors, and discoverers."

The above statement is a direct quote from a seminar on cognitive research by Swiss psychologist Jean Piaget (Duckworth, 1964). Piaget put forth the idea that teachers should create classroom environments that do not focus only on the coursework but produce students who can take the knowledge a step further. The teacher should have their students use what they have learned from the basic curriculum by providing them an outlet that facilitates ingenuity and creative thinking. Throughout his career, Piaget understood that cognitive development could be categorized as a creative process. A child's cognitive development changes as they mature, which Piaget divided into four stages: sensorimotor (birth to 18–24 months), preoperational (2 to 7 years), concrete operational (7 to 11 years), and formal operational (12 and up). The educator's changing role in the twenty-first century urges teachers to consider children's early creative development alongside conceptual growth and intelligence (Robinson & Lee, 2011). Mixing creative thinking into children's educational practices provides rich foundations for children to build future worlds. How educators construct curriculum has the potential to either stifle or stimulate creativity. Therefore, teachers should incorporate creative thinking activities into their curriculum framework.

It was important to note that creative activities and creativity are two different terms. "Creative activities" are things people do that involve developing new ideas or forms of production, while "creativity" is defined as original and useful ideas. For this dissertation, I will be looking at both, creative activities and creativity.

Creative thinking, a form of creativity, is the driving force of society because it helps individuals look at problems and situations, such as in technology and business, through new perspectives (Barbot et al., 2013; Paul & Elder, 2019; Resnick, 2008). In just the last 20 years, creative thinkers have built businesses that led to our society's advancement in the United States. In 2019, LinkedIn, the world's largest professional network, named creativity as "the most important skill in the world." For example, the prevalence of the internet, social media, and technology at our fingertips has changed the way society learns new knowledge and stays connected. In a *Forbes* article, Kelly (2020) claimed that advancing technologies are responsible for the loss of 60 million jobs in the United States. For example, manufacturers are cutting costs in assembly lines and factories with robots and automated machinery replacing or eliminating human positions. However, technology has a critical flaw. A computer cannot be imaginative, but humans can think creatively and dream up a vision for the future.

Human beings have the ability to apply tools, such as critical thinking and imagination, into their daily lives. The evaluation tools could help individuals come up with new and innovative ideas. There are three modes of thinking that help individuals generate the right kind of ideas: convergent, divergent, and lateral (Guilford, 1950). Convergent thinking, also known as critical thinking, refers to the ability to give one correct answer. Convergent is not factual. It is that there is only one solution, but it can still be creative. In science, it can be creative. Divergent thinking or creative thinking is the ability to explore and develop multiple solutions for a given problem or situation. Lateral thinking, also known as horizontal thinking, uses both convergent and divergent thinking to come up with a solution. The purpose of lateral thinking is to investigate a wider array of concepts and come up with unpredictable ideas (de Bono, 1967).

Since innovation is critical in the job market, convergent and divergent thinking should be part of the school curriculum.

I believe that creativity and creative activities should be goals of education and that the goal is at odds with current and persistent practice in general education. The federal and state governments hold teachers accountable for the teaching and learning that is going on in the classroom. Teachers are held to specific standards that are evaluated by administrators every year. For teachers, they are evaluated based on a set of teaching standards. For example, in Georgia, the Teacher Keys Effectiveness System is a tool that evaluates their performance through observations, professional development, and student assessments. Standardized testing has been part of United States education since 1845 (Kaukab & Mehrunnisa, 2016). After implementing the No Child Left Behind Act (NCLB) in 2002, annual standardized testing skyrocketed in all 50 states (NEA, 2020).

In education, each state evaluates teachers based on different set criteria. However, all teachers are evaluated on two categories of teaching: Teacher Growth and Student Growth. Recently, in the United States, standardized assessments have negatively impacted creative thinking because teachers are worried about their evaluation rating in Student Growth (Henriksen et al., 2019). In Georgia, the Student Growth assessments are comprehensive summative assessments for K through 12th grade. In Georgia, all K through 12th grade students enrolled in public school must take a computerized or paper and pencil assessment for most of their academic courses throughout the school year (i.e., math, English/language arts, writing). The assessments consist of multiple-choice, constructed responses, and a writing component. Each summative assessment is taken as an end-of-course assessment. The average student will take seven state or district-level summative assessments to meet the Student Growth measurement

criteria (Georgia Department of Education, 2022a). Student growth measurement aims to ensure that educators are doing their jobs in the classroom through a checks and balances system (Hernandez, 2019). The standardized summative assessments were created to measure a student's scholastic ability in all courses. These tests determine where a student falls on the spectrum of performance ability (i.e., high and low performers). The tests serve to identify struggling students who need help or extra extension in the classroom. In addition to measuring student growth, the standardized assessments measure teacher effectiveness and determine if the educator is struggling in teaching parts of the course content. Based on the purpose of standardized assessments, the testing battery has strengths and weaknesses, affecting a teacher's evaluation score. The rigid evaluation tool confines the educator to have orderly classrooms and teach to the standardized test, which is against creative pedagogy teachings (Henriksen, Creely, & Henderson, 2019). Two factors that are imperative when conducting creative activities in the classroom are intellectual risk-taking and accepting failure. According to Henriksen et al. (2019), teachers were generally nervous about failing in the classroom because of the evaluation. Teachers are afraid to relinquish any control in the classroom.

General education publications have included a variety of articles on creativity in the classroom, primarily through the lens of middle school students. Gong (2020) identified that the middle school stage for students is the "most rapid developmental period" for their critical thinking and problem-solving skills (p. 137). Recently, articles about middle school students included creativity in the accession of computational thinking (Hershkovitz et al. , 2019), teaching for the development of creativity (Kaplan, 2019), mathematical creativity (Bicer et al., 2021), creative problem solving (Gaglione, 2021), pottery making approach on creativity and

engagement (Guan et al., 2021), and the effectiveness of STEAM design processes on creativity (Ozkan & Umdu Topsakal, 2021).

While the incorporation of creative practices has been recognized in music education and education research, there is a significant disconnect between creativity and the classroom (Henriksen et al., 2019; Patston et al., 2021). Many general and music ensemble teachers are not incorporating creativity or creative activities into their classrooms due to various factors, such as teacher accountability and performance evaluation rules and regulations. Teachers are afraid to fail in the classroom, especially during an observation (Henriksen et al., 2019). How can all teachers incorporate creativity in the classroom while meeting the school's and education needs?

Rationale for the Study

Many K–12 educators are reconsidering policies and reviewing what an effective education should look like in the classroom setting. Based on previous research, creativity and creative activities can help humans increase their divergent thinking skills (Sternberg, 2012; Mann, 2009). However, creativity in general education and arts education has been a major debate throughout the past decade (Dwyer, 2011; Warwick Commission, 2015). There is a significant amount of evidence identifying creativity benefits and the importance of bringing creative activities into the classroom (Cohut, 2018; Winner & Vincent-Lancrin, 2013).

Throughout the twentieth and twenty-first centuries, most theories on creative thinking have been defined as generating novel ideas and evaluating them to produce new ideas (Smith et al., 1995; Guilford, 1956; Howard-Jones, 2002). For this study's purpose, the researchers studied divergent thinking because it is closely tied to creativity (Runco & Acar, 2012). Divergent thinking is the ability to solve problems in which many different solutions are possible (Jung et al., 2013). Performance is measured by the number of responses and the uniqueness of those responses. Previous research has shown that more creative individuals produce a higher number

of responses to divergent thinking problems and that their responses are more varied and unique (Runco & Dow, 2004).

This study was focused on the effect of place (creativity teams v. not) on the creative person, process, and product. Previous research identified the importance of divergent thinking in education programs (Marcos et al., 2020; Pásztor et al., 2015; Van de Kamp et al., 2015). Furthermore, there is evidence comparing divergent thinking in middle school students (Mann, 2009; Gong, 2020; Hinkle et al., 1993; Zuo et al., 2021). However, there remains a need for research that compares middle school students' divergent thinking to music education and academic achievement.

Purpose of the Study

This study aimed to investigate the potential transfer effects of domain-specific creativity training on domain-general divergent thinking indices of divergent thinking in a middle school in the southeast region of the United States. This study contributed to the existing body of research on divergent thinking in education. Additionally, I investigated the potential effects of the school-based creativity program on the development of creativity (see Epilogue chapter).

Research Questions

1. How does divergent thinking vary across grade levels of middle school students as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game? It is important to note that grade level was used as a proxy for age.

   Hypothesis: Older participants will achieve higher divergent thinking scores than the younger participants.

2. How does a middle school student's engagement in a school-based creativity program affect divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game?

   Hypothesis: Participants in the school-based creativity program will achieve higher divergent thinking scores from Time 1 to Time 2.

3. Is there a relationship between students' divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game and academic achievement scores as measured by the Georgia Milestones Achievement Test?

   Hypothesis: Participants with higher standardized achievement scores will have higher divergent thinking scores.

Significance of the Study

By analyzing the students' scores on divergent thinking, I hoped to find changes in divergent thinking across grade level and within group involvement in the school-based creativity program. Additionally, the relationship between generative processes used in a school setting and academic achievement. Since divergent thinking is essential for a number of human endeavors, this study may be significant for understanding the development of creative skills within middle school students.

Delimitations

This study was limited to the middle school setting. While the research study was limited to the middle school population, findings may likely be similar in scope if conducted with elementary, high school, and higher education students. The study was limited to the middle school setting because the school-based creativity program is in its initial stages. The school district chose to pilot the school-based program at a specific middle school in the United States' southeast region. The sample consisted of students in the fine arts and general population.

Organizing of the Following Chapters

The remainder of this dissertation is organized into four additional chapters, epilogue, references, and appendices. In chapter 2, following a discussion of search techniques, the review is divided into four sections. First, I provide an overall description of creativity and the different methods of measuring the creative process. Second, I will discuss how divergent thinking is related to creativity and provide a review of the types of divergent thinking testing instruments and their advantages and disadvantages in validity and reliability. Next, an analysis of strengths and gaps in creativity training programs. Then, an analysis of the literature regarding creativity and academic achievement. Last, I provide an analysis of creativity in schools through the lens of music education. The literature review will provide a synopsis of classroom methods related to United States' public schools. Chapter 3 outlines the methodology section, including a synopsis about the creativity program and reasoning for the research design. The chapter will include a detailed description of participant selection criteria, study procedures, data collection methods and analysis, and a pilot study overview. Chapter 4 will present the data sources' findings, including the pre/posttest, content analysis of the students' music capstone projects, and student academic achievement analysis. Chapter 5 will summarize the findings of the research questions posed in chapter 1, as well as present a discussion for the field of general education, researchers'

reflections, and future directions for this research. The epilogue outlines my reflection and what this study means for music education. The document concludes with a bibliography of references and appendices.

Definition of Terms

Creativity

"Unconventional thinking over a considerable span of time on a vague or ill-defined problem in which the results is a 'eureka' moment and can be expressed in novel ways, producing a result that has application value" (McNair et al., 2009).

Creative Activity

"The human act of creating" (WordNet, n.d., p. 1).

Creative Potential

"Ability to raise expression of individual creative abilities and creative performance through creativity training" (McNair et al., 2009).

Creative Process

"A succession of thoughts and actions leading to original and appropriate productions" (Botella et al., 2018).

Creative Product

"A product or response will be judged as creative to the extent (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" (Amabile, 1996, p. 35).

Creativity Training

"a pre-defined and structured program consisting of one or multiple sessions, with the main purpose of increasing the creativity of one or multiple participants" (Valgeirsdottir & Onarheim, 2017, p. 432). "Creativity training should be subject to revision and extension as we develop a better understanding of creative thought and better understanding of the approaches that might be used to enhance creative thought" (Scott et al., 2004, p. 383).

Divergent Thinking

"A kind of thinking often associated with creativity which involves the generation of varied, original, or unusual ideas in response to an open-ended question or task" (Pritzker & Runco, 2011, p. 404).

Ideational Flexibility

"The number of themes or categories within an examinee's or respondent's ideation" (Pritzker & Runco, 2011, p. 400).

Ideational Fluency

"The total number of ideas given on any one divergent thinking exercise" (Pritzker & Runco, 2011, p. 400).

Ideational Originality

"The unusualness or uniqueness of an examinee's or respondent's ideas" (Pritzker & Runco, 2011, p. 400).

Training Effects

Three criteria are used to guide the design process and verify the effectiveness of creativity training programs. "The three criteria pertain to: (1) pre- and post-testing, (2) the use of an attention-placebo control group, and (3) having a sufficient sample size of both experimental and control group." Previous research identified successful creativity training programs, but researchers are unable to answer, "exactly what makes one effective program better than the other remains unanswered" (Valgeirsdottir & Onarheim, 2016, p. 437).

2 REVIEW OF THE LITERATURE

This research study investigated the potential transfer effects of domain-specific creativity training on domain-general divergent thinking indices of divergent thinking in a middle school in the southeast region of the United States, as well as how this study could help music education. In order to understand how divergent thinking was assessed, I examined the two most popular survey instruments that incorporate divergent thinking tasks, as well as the reliability and validity of survey instruments. Additionally, this literature review aimed to explore the contexts of the creative process, divergent thinking assessments, limitations of divergent thinking and general tests, history of domain-specific creativity training, transfer effects caused by creativity training, and the relationship between creativity and academic achievement. These topics provided a general understanding of the overall aims of this research study.

This review does not include all literature related to creativity and divergent thinking. However, the review does include seminal work that serves as examples for related research. The first section will provide an overall description of creativity and the different methods of measuring the creative process. Secondly, I will discuss how divergent thinking is related to creativity and provide a review of the types of divergent thinking assessments and survey instruments, their advantages and disadvantages in validity and reliability, and the limitations of general tests. Next, an analysis of creativity training programs' strengths and gaps, as well as transfer effects. Lastly, an analysis of the literature regarding creativity and academic achievement.

What Is Creativity?

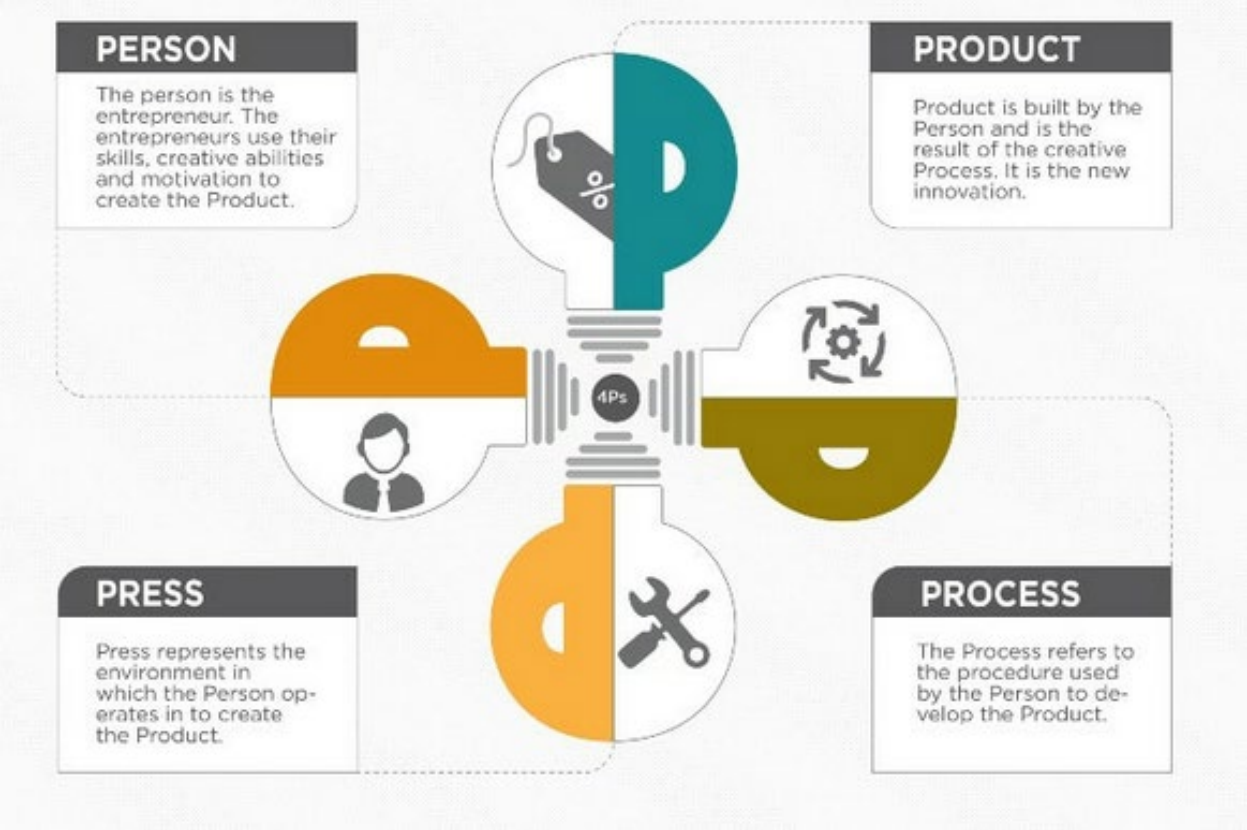
According to Oxford Languages (n.d.), the term *creativity* is defined as "the use of skill and imagination to produce something new or to produce art." Over the years, researchers have

argued that there is no universal or agreed on definition for the term *creativity* (Runco & Dow, 2004; Kaufman, 2016; Treffinger et al., 2002). Barbot et al. (2019) proposed that the issue may lie mainly in the broadness of the construct and the variety of behaviors that aligned with the term *creativity*. Treffinger (1996) reviewed and analyzed creativity literature from the mid- to late 20th century and presented more than 100 different definitions for this term. In a technical sense, many distinct aspects make up the word creativity. For example, previous experiences, cognitive processes, and characteristics are just a few factors that play a role in *creativity* (Treffinger et al., 2002). However, most researchers typically define the term by one or more strands from Rhodes's (1961) Four Ps (Thompson & Lordan, 1999; Tinio, 2019; Zeng et al., 2011).

Rhodes (1961) investigated different definitions of the word *creativity* and noticed that the content intertwined four lenses needed for defining the term. Based on the strands, he created a taxonomy model called the *Four P's of Creativity*, which categorized the measures by person, process, product, and press (i.e., environment; see Figure 2.1). The term *Person* was defined as any information concerning personality, intellect, temperament, physique, habits, or attitudes. *Process* referred to the motivation, perception, learning, or thinking characteristics of an individual. The term *Product* was when the idea became a tangible form (i.e., words, a material, a performance). *Press* applied to the relationship between the person and their environment. For instance, the Person or entrepreneur used their creative abilities and skills to create the product. Process was the procedure used to create that product. As a result of the creative process, the product was created by the person. The press, or environment, was where the person operated to create the product.

Figure 2.1

Rhodes's 4 P's Model. Retrieved from Frameworks in Creativity (2019)



Several definitions of the term, *creativity*, aligned with Rhodes's (1961) taxonomy. Fromm (1955) emphasized the Person in their definition by stating that the primary focus of creativity was the characteristics of highly creative people. Gordon (1961), Guilford (1950), Mednick (1962), Torrance (1962), Treffinger (1988), and Wallas (1926) indicated the cognitive process of creativity by stating the primary focus was the skills involved in creative thinking and problem-solving. Maslow (1976) and Rogers (1959) asserted the person's personal development by stating that personal growth, self-confidence, and self-actualization made them creative. Gardner (2011) and Khatena (1987) emphasized the Product by stating that creativity was the results or accomplishments of someone. Amabile et al. (2018) and Rhodes (1961) believed that creativity was about the interaction of person, process, and press within specific contexts. For

example, an individual's environment and self-concept could impact their motivation or learning of a concept.

Since there is not a universally accepted definition of the term, an individual's definition of creativity is determined by the characteristics they consider essential to the understanding of creativity for that particular individual. Over the years, a variety of creativity assessments and surveys were created around Rhodes 4 P's. For this literature review, I will look at creativity as a person, product, press, and process, and the related types of assessments and surveys.

Creative Person

Behavioral factors, such as perseverance, problem-solving, self-efficacy, and openness, are necessary personality traits that align with creativity (Kirsch et al., 2021). The Khatena-Torrance Creative Perception Inventory and Runco Ideational Scale (RIBS) are two measurements to assess the creative personality levels. On a scale from strongly disagree to strongly agree, the Khatena-Torrance tool is a self-assessment that measures creativity personality traits, like artistic inclination, imagination, self-confidence, inquisitiveness, and awareness of others (Khatena, 1987). On a scale from strongly disagree to strongly agree, the Runco Ideational Scale is a self-report measure that taps into creative ideas (Runco, 2014).

Creative Product

Amabile (1982) proposed the idea to measure creativity based on the product. The idea was further developed and turned into the Consensual Assessment Technique (CAT) tool by Amabile and other researchers (Baer, 1994; Kaufman et al., 2008). The tool's purpose is to evaluate a person's physical work, whether it be a performance, sculpture, essay, or research design. The CAT instructions are split into two parts: the creation by the subject and expert evaluation. It is important to note that the evaluators are experts in a specific field. For instance, if the subject presented an orchestra composition, the experts may be composers, conductors, and

instrumentalists. However, the CAT is not based on a specific theory. The idea is that a product birthed from a creative process recognized by the public is closely aligned with Csikszentmihalyi's (1999) viewpoint, useful meaning of creativity. The CAT showcases creative qualities through the products that evaluators can understand because it aligns with their fields.

The CAT scoring is vastly different from the previous Guilford Model because the expert evaluator must score the product based on a 1.0 to 5.0 scale. There is not a rubric or explanation as to determine why an evaluator chose a specific rating. Instead, evaluators are instructed to rate the product's creativity compared to the other subjects within the group. A caveat is that the evaluators are forbidden from giving similar grades to the subjects but show a full range of scores. This process means the evaluators cannot consistently alternate between 4s and 5s or 1s and 2s. The CAT is a model that is used in all academic areas, even music.

Creative Environment (Press)

Creative press is the relationship between the person and their environment (Rhodes, 1961). The environment does not directly affect the creative outcome but can affect the variables related to the creative process (Gruszka & Tang, 2017). Amabile (1983) argued that all humans could be creative, however, the environment is a significant factor in whether creativity can be fostered or stifled. For instance, the role of teacher accountability plays on the classroom dynamic can stifle the learner's creativity. Amabile et al. (1996) posed the argument that a supportive and encouraging environment could lead to more creativity. Past and recent publications on press focused on the physical, social, and cultural conditions where creativity takes place. An environment could be, but is not limited to, the classroom, the workplace, culture, or friendships (Runco & Pagnani, 2011; Csikszentmihalyi, 2014).

There are two notable instruments used to measure an environment that promotes creativity: KEYS: Assessing the Climate for Creativity and CCQ: Creative Climate

Questionnaire. Amabile et al. (1996) created the KEYS: Assessing the Climate for Creativity, which identified five contextual components that connect to creativity: encouragement, freedom/autonomy, resources, pressures, and organizational practices that impede creativity. Ekvall (1996) created the CCQ, which measures the organizational climate and conditions that can help grow or stifle creativity. Ekvall (1996) identified 10 climate dimensions that can affect creativity in the workplace: challenge, dynamism/liveliness, playfulness/humor, freedom, risk-taking, idea time, idea support, trust/openness, debate, and conflict. Both tools, KEYS and CCQ, are used to evaluate the work environment for creativity quantitively.

Creative Process

The creative process is displayed in a variety of ways for each individual. Botella et al. (2018) described the creative process as two levels: macro and micro. The macro-level refers to the various stages of the creative process, and the micro-level explores the two cognitive approaches associated with the creative process (i.e., convergent and divergent thinking).

Stages of the Creative Process

According to Wallas (1926), the creative process was to develop an idea into its ultimate form through the evolution of thoughts and behaviors. The creative process is associated with problem-solving skills and creative thinking. Creative individuals, such as cinematographers and composers, typically go through steps to bring their ideas to fruition (Wallas, 1926). Wallas suggested four major stages for the creative process: preparation, incubation, illumination, and verification. However, multiple researchers have added to the Wallas structure. This literature review will look at additional researchers' ideas about the creative process stages based on Wallas's four-stage structure.

According to previous research, orientation is the first step of the creative process, in which the individual identifies the problem (Osborn, 1963). The orientation step has also been

coined as sensitivity to problems (Guilford, 1956) and a problem selection stage (Segal et al., 1980). Torrance (1962) referred to problem-finding as the process of sensing gaps. An example of orientation occurs when an individual sees a big hole in the middle of a hiking trail.

The preparation stage involves prep work and idea generation (Wallas, 1926). The individual will define the problem by brainstorming through research and gathering materials that could potentially illuminate an interesting idea (Carson, 1999). In this part of the process, the brain relies on its memory bank to draw on past experiences and knowledge to generate original ideas. Before Wallas's next step, some researchers added analysis (Osborn, 1963) or ideation (Segal et al., 1980) before incubation. The analysis occurs when the individual looks at the relationships between different ideas and each idea's importance. Ideation occurs when the individual wants to develop alternative ideas (Botella et al., 2018). Keeping with the hiking scenario, an example of ideation during the preparation phase is when the individual comes up with various ideas. For example, the individual may come up with three ideas: they could walk around the hole, make a bridge out of long sticks, or climb down into the hole and then climb up on the other side.

The next stage is incubation, which allows the individual to step away from the idea so the brain can work at a subconscious level (Osborn, 1963; Shaw & Runco, 1994). The individual needs to walk away from the problem so that the brain can incubate the idea before fleshing it out. After incubation, the illumination stage, also known as the "aha" moment, will occur in the individual. During this stage, the brain will create new connections, and all of the material gathered during the preparation stage will help provide a solution to the problem (Wallas, 1926; Carson, 1999).

After the brain has come up with a solution, previous researchers stated that the individual's evaluation stage would occur (Osborn, 1963; Runco & Dow, 1999). The evaluation stage is placed between the illumination and verification stages. During the evaluation stage, the individual will reflect and assess if the new solution is worth the pursuit. For example, the individual may alter the solution a bit after talking to their supervisors or peers to make it more transparent. The individual may rethink their idea or continue to the final stage. For instance, the individual chose to make a bridge out of long sticks during the illumination stage. However, the individual realized they could not carry the long sticks by themselves. During the evaluation stage, the individual decided to tie small sticks together and slide them to the other side to form a longer stick.

Wallas (1926) believed the last stage of the process was verification, allowing individuals to begin transforming their idea into a final product. The final product could be anything that the individual sets out to create. During this phase, the idea will come to life. In the hiking scenario, the end product may be a long bridge that connects from one side of the hole to the other.

Cognitive Approaches Associated with the Creative Process

In 1956, Guilford came up with two cognitive approaches that would be used to help an individual solve a problem by looking for an innovative solution. These cognitive approaches are called convergent and divergent thinking. Convergent and divergent thinking are used throughout the preparation, incubation, and illumination stages.

Convergent thinking is linear and systematic. It takes pieces of information, like a question or data, that then help the person converge around a solution. Convergent is not factual. It is that there is only one solution, but it can still be creative. In science, it can be creative. For instance, a math problem has multiple pieces of information to help the person arrive at one

answer. Convergent thinking is analytical and focused on the best possible solution. However, divergent thinking is the complete opposite.

Divergent thinking is open-ended and encourages the individual to take creative risks. This cognitive approach requires the person to generate many answers based on a given prompt instead of narrowing it down to one solution. An example of a divergent thinking prompt could include the following: How many alternative titles can you find for the film *Frozen*? Tell me a story about a tree. The use of divergent and convergent thinking together utilizes creativity and critical thinking skills. For example, using a nail to open a window lock recognizes both convergent and divergent thinking. Divergent thinking occurs when the person uses the nail in a new way. The convergent thinking occurs by identifying the lock and nail and using the nail at a certain angle in the lock to push the window up to open it.

Recently, many creativity researchers favored divergent thinking tasks for their methodology because they are a quick way to gain knowledge about creative thinking (Weisberg, 2006; Runco & Acar, 2012). According to Benedek et al. (2019), divergent thinking research accounted for over 50% of the research methods on creativity, with the bulk being about divergent thinking assessments used to measure an individual's creative potential.

Domain- General Divergent Thinking Tasks

In 2010, Runco created the Runco Creativity Assessment Battery (rCAB), a wide-ranging battery that consists of divergent thinking assessments and an ideation survey for measuring creative potential. For my research study, I will be using the rCAB to measure middle school students' creative potential. In order to grasp a greater understanding of divergent thinking assessments and ideation surveys it is important to look at the history of divergent thinking assessments, potential problems of divergent thinking tasks, description of ideation surveys, and the reliability and validity of survey instruments.

Divergent Thinking Assessments

Since the 1950s, divergent thinking assessments have been incorporated into research investigations that measure a person's creative potential. For this literature review, I will look at the two most widely used divergent thinking assessment designs: the Guilford Model and Torrance Tests of Creative Thinking. The Guilford Model and TTCT are two assessment designs used to evaluate divergent thinking and measure creative potential in the individual.

Guilford Model

Guilford (1950) investigated the differences between convergent and divergent thinking to determine how both work together. The American psychologist stated that creativity is not synonymous with divergent thinking. Instead, creativity occurs when divergent thinking is measured against specific criteria and standards (i.e., number of solutions or original responses). The psychologist believed that divergent thinking could be practiced and improved over time, translating the assessment to a pre- and posttest format.

Divergent thinking tasks are often used to research creativity (Weisberg, 2006; Runco, 2014). Divergent thinking is a thought process that generates many ideas on different mental tasks. The objective of divergent thinking is to come up with many different ideas about specific topics or categories. According to Plucker and Renzulli (1999), divergent thinking was the best candidate for the foundation of measuring creative ability.

The Guilford Model is a test that measures the creative potential of an individual. The person is expected to generate all possible uses for a specific item (i.e., pencil or piece of paper). The scoring is based on four categories: fluency, flexibility, originality, and elaboration. Fluency is the number of responses generated by the person. Flexibility is the number of categories based on the response. For example, the object is a pencil. The responses could be a tool for cursive, a poker for poking a person, and a shading tool for a picture. The fluency score would be three

because there were three responses. However, the flexibility score would be two because a tool for cursive and shading would fall under the same category, writing utensil, and a poker would be in a different group.

The originality score is based on the number of original or unique responses the person could create for the object. It is important to determine if a response is original by cross-checking with other participant answers for the specific prompt. When the divergent thinking assessments were first created, if two or more people chose the same response, they would not receive a point for that answer. However, over time, researchers have changed the way scores evaluate original responses because they were biased to smaller sample sizes. For example, it is easier for an individual to have original responses if the study sample is small. However, if the sample size is 100 individuals, it will be more challenging to generate original ideas. The Runco Scoring Guide attempted to alleviate the sample size and original answers issue by allowing the rater to use a sample percentage and give originality points based on a specific score. For example, if a sample is over 50 participants, then the rater can give an originality point to an individual if 5% or less of the sample have responded with the specific answer.

Elaboration is based on the detail of the response. For example, if the person added specific details to a response, they would receive a higher score. For the pencil example, a person may write, “A poker for poking a person to make them sad, because they took my ice-cream.” The response was detailed because the participant gave a reason as to why they chose the response. Some studies do not include elaboration scoring but will incorporate fluency, flexibility, and originality scores.

Wallach-Kogan Creativity Test

Wallach and Kogan (1965) created an assessment of creativity comprised of several divergent thinking exercises, such as the Similarities and Instances Tests. The Similarities Test requires an individual to identify as many similarities as possible for two objects. An example from the test is to list as many similarities as possible between a car and a bike. Another divergent thinking exercise is the Instances Test, which asks the individual to list as many items as possible that contain a specific component. For example, list all round things. Like the Guilford Model, the responses for the Similarities and Instances Tests are evaluated on fluency, flexibility, originality, and elaboration.

Runco Creativity Assessment Battery

The Runco Creativity Assessment Battery (rCAB) is based on the Guilford Model. The test comprises four divergent thinking tests: Figural Divergent Thinking, Titles, Realistic Presented Problems, and Realistic Problem Generation. Individuals completing the assessment must come up with as many solutions as possible. The scoring of the solutions is the same as the Guilford Model and Wallach and Kogan (1965) divergent thinking tests. Each response is scored by fluency, flexibility, originality, and elaboration. A more in-depth description of the rCAB will be presented in Chapter 3, *Assessment/Survey Tools.*

Torrance Tests of Creative Thinking

Since Guilford's introduction to his measurement model, some researchers expanded the psychologist's test to create a battery of divergent thinking creativity assessments (Torrance & Ball, 1984; Creativity Testing Services, 2021). In 1960, Torrance created a test that consisted of a battery of tests that assessed a child's divergent thinking and problem-solving skills from kindergarten to college. The psychologist created the *Torrance Tests of Creative Thinking*, which

evaluates four of the six aptitudes from Guilford's Problem-Solving model: fluency, flexibility, originality, and elaboration through verbal and visual divergent thinking tasks.

The tests prescribe open-ended activities. While the TTCT-Verbal requires verbal responses, the TTCT-Figural involves responses that are drawing or pictorial in nature. The four categories of fluency, flexibility, originality, and elaboration remain the backbone skills of divergent thinking. However, as Torrance became dissatisfied with these scoring criteria, some changes occurred.

On the TTCT-Figural, Torrance was concerned about the high correlation between flexibility and fluency scores and the failure to measure additional creative attributes that individuals demonstrated (Cramond et al., 2005). In 1984, Torrance changed the scoring to be more streamlined by including five norm-referenced scores and 13 criterion-referenced creative strength measures. Torrance removed flexibility and added titles and resistance to premature closure.

Virtual Games to Assess Creativity

In the past decade, digital games have become more apparent in creativity research (Hall et al., 2022; Chuang et al., 2015; Krebs et al., 2020; Shute & Rahimi, 2021), but they are still considered in their early stages (Rafner et al., 2022). Digital game-based tests are a nontraditional evaluation tool that moves from the standard pencil-and-paper-based version to a virtual assessment. Examples of digital games used to evaluate creativity are *Minecraft* (Voiskounsky et al., 2017) and education games, such as *Thinking Paradise* (Xiong et al., 2022). Participants may be required to create worlds or build objects that are then evaluated on creativity. The use of virtual games as an alternative to a traditional test allows the testing atmosphere to become more casual and can increase engagement levels (Rafner et al., 2022).

Potential Problems with Tests

Divergent thinking tests are well studied and are often used as the standard when creating new creativity tests (Rafner et al., 2022). However, limitations of divergent thinking and general tests are apparent, as well as problems with the scoring of the tests.

Limitation of Divergent Thinking Tests

Previous research has criticized divergent thinking tests based on the following limitation: they cannot provide generalizable results (Runco et al. 2016). According to Runco et al. (2016), most previous research using divergent thinking tests relied on one or two sections of a test versus the entire battery. Divergent thinking tests were not the same, which limited generalization. Additionally, each test had their strengths and weaknesses, which can cause a skew in scores. Runco et al. (2016) investigated seven divergent thinking measurements to determine which test caused the highest originality score. The tests used for the study were Figural, Titles, Realistic Presented Problems, Realistic Problem Generation, Instances, Uses, and Similarities. Titles and Realistic Problem Generation tests produced the highest mean originality scores, while Realistic Presented Problem received the lowest scores. The study confirmed that one test cannot provide generalizable results.

Limitations of General Tests

Testing is a significant factor in a student's life. According to the Council of the Great City Schools (2015), the average student will complete about 112 mandatory standardized assessments between pre-kindergarten to twelfth grade. The score is limited to only standardized assessments, which are state-mandated tests not created by the teacher, such as the Georgia Milestones Achievement Scale or GMAS. The above number did not include teacher-made tests, such as weekly spelling tests or math quizzes.

Testing fatigue, also known as cognitive fatigue or student burn out, is a significant concern, given the number of tests students must take in school. Mullette-Gillman et al. (2015) defined cognitive fatigue as "a ubiquitous human condition, the result of sustained cognitive engagement that taxes our mental resources" (p. 2). Since test-taking occurs weekly or sometimes daily, students tend to feel tired and disengaged from the assessments, which are symptoms of testing fatigue. Previous research looked at testing fatigue concerning the time of day and test anxiety (Sievertson et al., 2016).

Sievertson et al. (2016) investigated how time affects academic performance on their nation's computer-based standardized assessment, the National Tests, in all children attending Danish public schools in 2009–2010 and 2012–2013. A correlation analysis was used to determine the relationship between the time of day and the student's test score. The researchers found that as it became later in the day, the test performance lowered. Students became more fatigued as the day progressed because they had been in class completing various assignments and attending lectures in their other courses.

Richardson et al. (2012) defined testing anxiety as a "negative emotionality relating to test-taking situations" (p. 357). According to Cassady (2010) and Huberty (2009), 25–40% of students experience testing anxiety throughout their schooling. Students are regularly tested in a standardized assessment, final exam, chapter test, or small quiz. The results from the assessments are used to evaluate their ability levels and determine their trajectory in life, which can add a level of pressure and high stress (Salend, 2011). Test scores can be negatively impacted when a student is feeling anxious, which can cause inaccurate results. Previous research found that testing anxiety can affect a student's attitude and performance (Huberty, 2009). For instance, if a

student is feeling anxious, they may not do well on the test, which can cause a negative attitude and outlook on schooling.

Additionally, testing anxiety can impact academic achievement (Richardson et al., 2012). Richardson et al. (2012) conducted a meta-analysis on the relationship between psychological traits and the academic performance of university students, which spanned from 1997 to 2010. The researchers found 29 studies on testing anxiety: combinations with cumulative GPA (n = 12) and with course GPA (n = 17) showed that there was a small, negative correlation between GPA and test anxiety (r = -.24, 95% CI [.29, .20]).

Scoring of Divergent Thinking Tests

Scoring divergent thinking tasks is a complex process for evaluators. The potential problems with scoring divergent thinking tasks are the uniqueness of scoring, issues with larger samples, relying on personal and social experiences, and a lack of appropriate responses. Silvia et al. (2008) identified that the uniqueness of scoring is a significant problem between raters because the flexibility category is subjective. The flexibility score is made up of the number of categories for each presented task or problem. Category selection is relative and left up to each judge. Based on the previous pencil responses in the last paragraph, one judge may state that the flexibility score is two, while another rater may argue that each of three responses could be separated into three categories. Unfortunately, there is not a clear-cut answer when evaluating each person's flexibility scores.

Another issue is that larger sample sizes can lower the uniqueness rating. Silvia et al. (2008) explained that if a researcher has a larger sample size, there will be fewer opportunities for participants to have original answers. For instance, Group A has a sample size of 10, and Group B may have 100 participants. Potentially, Group A will have higher originality scores

versus Group B because there are fewer people. Fewer people means that there will be a smaller chance of repeated answers among the sample pool.

Additionally, divergent thinking tasks rely on the test taker's personal and social experiences (Runco & Acar, 2010; Hong et al., 2013). Hu et al. (2010) investigated the developmental trend of creative scientific problem finding of elementary, middle, and high school students. The researchers found that students' originality scores were higher when asked questions based on their personal experiences versus coming up with an imaginary answer.

The final problem with divergent thinking tasks is that there is a lack of appropriate responses. Silvia et al. (2008) identified that participants are more inclined to write random responses than solutions that could answer the presented task. The divergent thinking tasks are open-ended, giving participants the freedom to write down any answer they would like without any parameters. For example, a wrong answer for using a pencil would be to use the object like a straw. Since it is impossible to drink from a pencil, the evaluators would not score this answer under fluency.

Survey Instruments

For decades, survey research has been a popular mode of obtaining an individual's information. Check and Schutt (2011) defined survey research as the information collected from a specific group of individuals' responses to questions. Survey research can use quantitative and qualitative research strategies. Quantitative survey research uses questionnaires with Likert scales or scoring options (Singleton & Straits, 2009). Qualitative survey research is the use of open-ended questions, which allows the researcher to identify and organize passages by attaching labels to the individual's response, called codes (Gibbs, 2007).

Pinsonneault and Kraemer (1993) posited that survey instruments are a mode of data collection used in research as a means for gathering information on the action or characteristics

of a large population. The surveys can range from asking the individuals a few targeted questions to obtaining personal information. The Runco Ideational Behavior Scale, RIBS, is a survey design "used as a criterion of creative ideation" (Runco et al., 2001, p. 393).

Runco Ideational Behavior Scale

The Runco Ideational Behavior Scale is a survey that includes questions about actual behaviors associated with ideation, a process that helps individuals come up with original ideas (Runco et al., 2001). According to Runco et al. (2001) the RIBS survey is based on the perception of ideas being products of original and divergent thinking. The purpose of creating the RIBS was to find the most appropriate criterion that captures the different sides of divergent thinking (e.g., originality, fluency, and flexibility). Currently, the chosen criterion is used to study the predictive validity of divergent thinking tests. The items on the survey "describe actual behaviors that clearly reflect an individual's use of, appreciation of, and skill with ideas" (Runco et al., 2001, p. 393). RIBS statements include, among others, "I change what I want to do as a career," and "I see better ways of doing boring things."

Strengths of Survey Instruments

Throughout recent decades, survey research has been a popular method for acquiring individual responses from participants. For divergent thinking surveys, online or face-to-face are the two main mediums for conducting the research. There are three significant strengths of survey instruments: a broad range of data, anonymity, and generalizability.

A broad range of data can be collected from the survey participant. For instance, the research could obtain attitudes, opinions, beliefs, values, and behavior from one survey. The amount of data obtained from one survey could result in correlations between various variables (Shaughnessy et al., 2011). However, the correlations do not imply causality. Instead, the correlation evidence can help the researcher identify potential causes of behavior. Another

strength of the survey design is that the participants can be completely anonymous. A person may tend to be more truthful and honest if they know that the researcher does not know they are taking the survey.

The final benefit of survey research is that it is generalizable and can be used to extend research findings. Mauldin (2020) posited that most survey research caters to a large sample size. The larger the sample population, the more one can generalize the results. For example, Western classical musicians generalize that everyone plays the violin with a curved left hand. However, if we try to generalize this assumption to other settings, such as fiddle music, we will be making an assumption. Thus, we do not expect our generalizations to operate the same way in every circumstance. We can make predictions about human behavior with enough evidence, yet we must simultaneously recognize that our assumptions are based on statistical probability.

Issues with Validity of Survey Instruments

Slack and Draugalis (2001) defined internal validity as to how well a research study established a causal relationship based on the measure, setting, and research design between treatment and outcome. There are five internal validity issues of survey research: maturation, instrumentation, selection bias, social interaction, and attrition.

Maturation is the outcomes that occur throughout the study as a result of natural time. For example, if a researcher has a pre- and posttest survey design, the participant could be tired, hungry, or older between time one and time two. The changes in behavior could affect the results.

Instrumentation can be a significant internal validity issue because the researcher may choose to incorporate different measures for one of the testing phases. For example, the pretest may encompass a Likert-scale design, and the posttest may change the measure by including

criterion-specific ratings. Based on the assessment change, the researcher will be unable to evaluate the two testing formats side-by-side, and they will be unable to come up with any conclusive evidence.

Selection bias is introduced by researchers when they select a group that is not representative of the population. Selection bias can occur when researchers use improper procedures for selecting a sample population. Selection bias is a significant validity issue because the sample is not representative of the population. For example, since the 2000s, music education has advocated for music in schools. Americans for the Arts (2011) stated that music and high academic achievement were linked. However, recent articles showed that there was a significant systematic difference between music and nonmusic students, such as gender (Hedges & Nowell, 1995), race (Card & Rothstein, 2007), and socioeconomic status (Zwick & Green, 2007). According to Elpus (2013), the music advocacy literature results may have suffered from selection bias because multiple outside factors could have skewed the results.

Another internal validity issue is social interaction. Since surveys tend not to be monitored, participants from different groups may work together to complete the survey. For example, if Group 1 and Group 2 collaborate on the survey, the results will not be an accurate representation of the group. Additionally, attrition is a major issue in regard to internal validity. Attrition occurs when participants leave or dropout throughout the study. Loss of members could affect the results of the specific group. The participants who stay versus those who leave cause the study to have bias (Keeney et al., 2001). For example, a researcher may conduct a medical pre- and posttest survey to measure the participants' quality of life. The researcher had a treatment (n = 50) and control group (n =50). Throughout the study, 20 people dropout of the treatment group (n =30). After reading the surveys from all participants, the researcher analyzed

no difference in the participants' quality of life. However, the surveys do not indicate why the 20 participants left the study, which could significantly impact the survey's analysis.

Issues with Reliability of Survey Instruments

A survey is reliable if it yields consistent results (Patten & Newhart, 2017). However, some survey instruments can have issues with reliability. A significant issue is creating and using a new survey without testing and retesting it. The lack of retesting causes the survey to be unreliable and inaccurate. It is essential to test and retest before stating that the survey instrument is reliable.

A further issue is that the respondent may not understand how to answer a question. If the survey is not monitored, then they are unable to ask for clarification on the questions. Another reliability issue with survey design is that the survey question answer options could lead to unclear data. Unclear data may occur because specific answer options may be interpreted differently by each respondent. For instance, the answer option "somewhat agree" may represent a different meaning to each respondent.

On the other hand, it can also be an issue if the survey has just "yes" or "no," instead of a range of Likert-scale options. The lack of range in answers could cause the respondent to choose "no" over "yes" inaccurately. For instance, the respondent may be more inclined to say "no" to a question if they have only done an action once or twice.

Another reliability issue has to deal with the length of the survey. An extended survey can lead to inaccurate results because the respondent may inaccurately complete the survey by skipping questions or randomly choosing answers. Data errors can occur if some participants choose not to skip questions, which could create bias. Another issue with a long survey is that respondents may not be fully aware of their reasons for choosing a specific answer because they

are disengaged or bored. Lastly, respondents may feel uncomfortable providing answers that unfavorably represent themselves. For example, if a middle school survey says, “I get into fights with my family,” the respondents may choose “never” or “once a year” because they do not want the researcher to judge their actions.

Domain-Specific Creativity Training

As outlined in chapter one, the United States has moved away from a Knowledge Age and toward an Innovation Age, which we can see through the advancement of technology and the increasing drive to create the new and latest thing (Ritter et al., 2020). In order to keep with demand and create new products, individuals need to use and generate knowledge creatively. Businesses and organizations have adopted creativity training programs to help promote innovation in their workers. The goal is for businesses to give their employees creative tools and skills to incorporate them into their jobs (Birdi, 2016).

In K–12 schools, children expand the literacy skills needed to help toward continued success in learning. According to Ritter et al. (2020), creativity stems from knowledge. However, teachers are not teaching how existing knowledge can help students develop creative ideas and solutions to problems. Cotter et al. (2016) investigated the relationship between university applicants’ creativity, academic achievement, and extracurricular activities, incorporating creativity skills into the lessons. The results identified that students enrolled in the creative activities positively predicted their creativity.

Creativity Training, also known as Creativity Intervention Program, is described as an instructional program that develops an individual’s capability to generate novel and potentially practical solutions to complex problems (Scott et al., 2004). The purpose of creativity training is to help individuals generate novel and original ideas. An intervention program could include, but is not limited to, objectives that teach problem-solving, questioning, idea generation, risk-taking,

building resilience, and self-efficacy. The strengths of creativity training programs are that they can increase ideation skills and cognitive flexibility (Ritter et al., 2020), promote children's imagination (Alfonso-Benlliure et al., 2013), and improve figural and visual creativity (Ozkan & Tospakal, 2021).

Ozkan and Topsakal (2021) developed a STEAM design process program for 7th grade students to help build their figural and visual creativity. The purpose of the study was to measure the effectiveness of the program on middle school students. The research study was 11 weeks long with a pre- and posttest method. Before the program, the researcher administered a pretest that incorporated divergent thinking tasks from the Torrance Tests of Creative Thinking, TTCT. After the pretest, the students were divided into two groups, experimental and control. The experimental group was taught through the STEAM program, while the control group learned from the standard science curriculum and textbook. After the analysis, the researcher found that the students from the experimental group increased their verbal and figural creativity.

Valgeirsdottir and Onarheim (2017) conducted a research study that analyzed previous research on creativity intervention programs. The researchers outlined three criteria that should be used to study these types of programs. Creativity training program research should include experimental and control groups, a pre- and posttest format, and the actual training should be detailed.

The gaps of creativity training programs are that (1) empirical evidence on the effectiveness of training programs is often lacking, and the literature on the subject primarily comes from a philosophical, anecdotal, or critical lens (Ritter et al., 2020; Davies et al., 2013), (2) the research on school-based creativity training is primarily associated with preschool or higher education, and (3) lack of transfer effects of creativity training on divergent thinking.

Davies et al. (2013) completed a systematic review of 210 studies, such as educational, policy, and professional research related to creative environments for learning in schools, including creativity training. The researchers found that there was a lack of research studies on creativity training. Davies et al. recommended that future research in the area needs to provide clear evidence on the effectiveness of creativity training and the impact of the programs.

Similarly, Valgeirsdottir and Onarheim (2017) concluded from their meta-analysis that creativity training might be a valuable addition to the regular school curriculum. However, the majority of recent research on the subject is not on middle school students. Researchers should include creativity training programs if they investigate the potential changes that may be attributed to a school-based creativity program.

Earlier in this chapter, I discussed the lack of generalizability among divergent thinking tests. This argument holds true to the lack of transfer effects of creativity training on divergent thinking. Scott et al. (2004) analyzed creativity training research and its effectiveness. The researchers found that "well-designed creativity training programs typically induce gains in performance" (p. 361). However, creativity will not increase if a program is not detailed or organized.

Previous research proposed that successful creativity programs should focus on realistic exercises and the growth of cognitive skills (Hennessey & Amabile, 2010; Kaniel, 2013: Scott et al., 2004). Kaniel (2013) posited that four factors would help the development of transfer and creativity: (1) a well-organized curriculum; (2) teaching models that incorporated process learning, differentiated instruction, integrated approach, and feedback; (3) a learning environment that strengthens transfer and creativity by incorporating feedback, lack of time restrictions, collaboration, and actively engaging individuals through discussions and problem-

solving activities; and (4) training the instructors how to teach and model transfer and creativity (Maciejovsky & Budescu, 2007, p. 23).

Creativity and Academic Achievement

Academic achievement is an outcome of learning, which is based on classroom grades and assessments and district and state standardized tests. Hattie (2009) found that academic achievement correlates with various factors, such as social and individual. For example, cognitive abilities (Deary et al., 2007), self-concept (Marsh & Hau, 2004), and motivation (Di Domenico & Fournier, 2015) correlated with academic achievement. However, previous literature on creativity and academic achievement offers contradictory findings (Gralewski & Karwowski, 2012). Some of the studies indicated a slightly negative relationship (Olatoye et al., 2010) and no significant relation (Anwar et al., 2012; Getzels & Jackson, 1962) between creativity and academic achievement. However, other investigative studies indicated a weak or strong positive relationship between creativity and achievement (Ai, 1999; Arora, 2022; Freund & Holling, 2008; Krause, 1972, 1977; Dhatrak & Wanjari, 2011).

Gajda et al. (2017) created a meta-analysis of 120 research studies examining the relationship between creativity and academic achievement to clarify the mixed findings. The research studies referenced in the analysis were conducted between 1960 and 2016. The researchers found that the average correlation between creativity and academic achievement studies had a modest but significant positive association ($r = .22$). However, the magnitude of the relationship ($r = .22$) raised questions about why the observed association was extremely low.

On the other hand, Gajda et al. (2017) found a significantly more robust relationship between creativity and academic achievement when creativity was measured with tests ($r = .23$, 95% CI [.20, .26]). This aligns with the idea that cognitive characteristics relevant to creative ability, such as fluency and originality, play a significant role in the learning process. Also, the

researchers found that when the criterion of achievement was GPA, the effect was significantly weaker (r= 19, 95% CI [.16, .22]) compared to when achievement was measured using standardized achievement tests (r = .28, 95% CI [.22, .34]). Elliott and Strenta (1988) found that the difference may reflect the low reliability of school grades compared to standardized achievement data.

Gralewski and Karwowski (2012) found contradictory findings between academic achievement and creativity. The researchers investigated the relationship between 589 high school students' academic achievement and creativity, while controlling for gender and intelligence. The creativity test used for this study was the Test of Creative Thinking-Drawing Production, TCT-DP. Also, academic achievement was measured by students' grade point average. The results showed that creative abilities and GPA are not correlated. However, the researchers found that students enrolled in large schools had a relationship between creative abilities and GPA.

In summary, it was important to take away from Gajda et al.'s (2017) meta-analysis that the "Previous research has, on average, demonstrated a positive (albeit modest) relationship between creativity and academic achievement, which is significantly moderated by the types of measures used to assess creativity and academic achievement" (p. 291). Academic achievement can be assessed looking at class grades and standardized testing. Typically the latter is used due to the large variability in grading procedures. Moving forward, researchers should include standardized tests and creativity measures if they are investigating the relationship between creativity and academic achievement.

Standardized Tests

Standardized tests are comprehensive summative assessments for K through 12th grade. Although it may vary by state, the majority of students in the United States are required to take a

computerized or paper and pencil assessment for specific courses they take throughout the school year, such as English/language arts and math (Miller & Hicks, 2022). For example, in Georgia, the Georgia Milestones Assessment System, GMAS, consists of multiple-choice, constructed response, and a writing component (Georgia Department of Education, 2022b). Each summative assessment is taken as an end-of-course assessment. The standardized summative assessments were created to measure students' scholastic achievement in specific academic courses. It is a test to determine where a student falls on the spectrum of performance ability (i.e., high and low performers; Miller & Hicks, 2022). The tests serve as a means to identify struggling students who need help or extra extension in the classroom. In addition to measuring student growth, the standardized assessment can be used to measure teacher effectiveness and determines if the educator is struggling in teaching parts of the course content (Georgia Department of Education, 2022a). Based on the purpose of standardized assessment, there are strengths and weaknesses of the testing battery.

Strengths of Standardized Tests

Currently, standardized assessment is a critical piece of information that is used to measure a child's learning ability. Standardized testing can provide benchmarks, identify problem areas, curriculum guidelines, and prevent grading bias (Fisher, 2008; Hernandez, 2019; Rivkin et al., 2005; Shuler, 2011).

First, the standardized assessment provides benchmarks for teachers, as well as parents (Shuler, 2011). After the student completes their assessment, they will receive a print-out that identifies their standardized score compared to other students in the class, school, and state. A comparison of scores across the country is dependent on the type of standardized test, such as the SAT and ACT. Since all students in the state are taking the same assessment, the test can compare student ability to the state curriculum (Shuler, 2011). It is a tool that can identify if the

student is a low or high performer in a particular area, such as math or English/language arts. The benchmark can be used as an aide to support if the student needs gifted or remedial classes, as well as determine if the student is ready for the next grade level (Shuler, 2011).

Second, standardized testing gives the teacher an idea of the problem areas where the student is struggling. The standardized test is a representation of the learning standards and objectives that the students need to master before moving on to the next grade level. A student's score sheet would identify if the student understood each area of the standards. For example, in Georgia, the score sheet will have an Exceptional, Proficient, Needs Development, or Poor rating next to each standard. The score sheet will include a score for each content area and identify any areas of weakness (Georgia Department of Education, 2023). For instance, in math, a student may receive a Needs Development on Standard One due to errors in calculating the area and perimeter of shapes.

The structure for the curriculum is meant to be rigid to ensure that students are learning what the policymakers in the state Department of Education expect each student to master before grade promotion (Miller & Hicks, 2022). For new teachers the structured curriculum can help them get used to teaching in the classroom setting without feeling overwhelmed (Shuler, 2011). Also, a structured curriculum can ensure that all teachers of a specific course are teaching the students the same content (Russell & Austin, 2010). If a student moves to another district within the same state, then they will not feel behind or confused because they are learning the same thing. However, according to Ballotpedia (2022), there is no guarantee that all states within the United States are learning the same curriculum.

Issues with Standardized Testing

The issues with standardized testing are the abundance of stress, single test performance, and limiting the scope of learning that can negatively impact a student and teacher (Aronson et

al., 2016; Dee & Jacob, 2010; Hoque, 2016; Knoester & Au, 2017; Shuler, 2011). Students are reminded daily of the importance and impact that a summative standardized test has on their future (Aronson et al., 2016). For example, grade promotion and the test are a determinant of what classes the student is allowed to take in the following school year. The word *testing* can create a feeling of pressure and stress, which can take a toll on the student's mental health. Stress and anxiety can cause a child to have physical, cognitive, and emotional problems, which can negatively affect their performance on the standardized assessment (Almon, 2001). For example, excessive fear of testing can cause students to have a lack of concentration, as well as a struggle to recall specific facts for the exam. Negative emotion, stress and anxiety can cause a person to feel depressed as well as have low self-esteem.

There is a significant amount of emphasis placed on the standardized summative assessment, which can negatively impact a student's educational life. According to the Georgia Department of Education (2022a), if a student does not pass the state assessment, then they must take summer school, regardless of the grade the student has in the class. If a student receives a B on their report card, it does not count because the student failed one test. According to the Georgia policy, a single test can determine if the student is gifted or needs remediation (Georgia Department of Education, 2023). What if a student does not perform well on tests or is not feeling well? The student's life is not factored into their test performance because they are judged on that single test.

Another weakness of standardized testing is that it limits the scope of the learning material if the teacher teaches to the test and the assessment was not good (American University School of Education, 2020). The state assessments are measuring certain areas of each course subject, which places less emphasis on specific objectives and topics. For example, if the

assessment is going to include World War II, but not the Cold War, then the teacher may not teach the latter topic. Also, the makeup of the test is factual-based, which does not incorporate creativity (Georgia Department of Education, 2022b). The lack of creativity can cause students to lose focus throughout the lesson (Giroux, 2017).

Georgia Milestones Assessment

The Georgia Milestones Assessment System, GMAS, was chosen as a measure for academic achievement for this research study because it is a valid and reliable tool (Georgia Department of Education, 2022b). The GMAS is a standardized summative assessment students in grades 3 through high school complete at the end of each school year.

According to the Georgia Department of Education (2022b)

> The Georgia Milestones assessments are criterion-referenced assessments that are designed to measure how well students have acquired the knowledge and skills across the full achievement continuum as described in the Georgia-mandated content standards. They are intended to provide a consistent and coherent signal about student preparedness for the next level, be it the next grade, the next course, college, or a career. (p. 15)

GMAS measures a student's proficiency level of the Georgia standards in math, English/language arts, social studies, and science. Sixth through eighth grade students complete the math and English/language arts portions of the exam. Additionally, eighth grade students complete social studies and science sections. The Georgia Department of Education personnel check for validity and reliability on an annual basis, which is then reported in their annual operational technical report (Georgia Department of Education, 2022b)

Sullivan (2011) defined validity as how well the assessment measures the outcome. The Georgia Department of Education personnel evaluated the GMAS on test content and response processes. The test content aligns with the Georgia Performance Standards for each grade level.

Based on the Georgia Department of Education (2022b) technical report, "the assessments have been designed to measure the knowledge and skills across the full achievement continuum described in the content standards and that the assessments are fair for all students at all levels of proficiency" (p. 29). Initially, Georgia educators created a blueprint that ensures that the same content standard is evaluated each year the test is administered to a grade level. Throughout the test development process, Georgia educators helped in the first revision stage to ensure that the standardized test questions were an accurate depiction of the standards. For response processes, the GMAS revision stage consisted of multiple rounds of changes to item questions to remove inapplicability, bias language, and error. After the first revision stage, select students of various backgrounds complete the assessment in a field test. Next, a committee of Georgia teachers review the test with the data provided from the field test to determine bias toward a specific group of students. The GMAS document is then kept the same or altered based on the review.

Sullivan (2011) defined reliability as the ability to yield the same results through the test and retest process as long as the same environment and type of subjects are used in the study. Cronbach's alpha reliability coefficient was used to test the reliability of the GMAS test questions. Georgia Department of Education (2022b) identified that the average reliability indicators for sixth, seventh and eighth grade English/Language Arts was 0.90-0.91. The average reliability indicators for sixth, seventh, and eighth grade math were 0.92–0.93. Based on Cronbach's alpha reliability coefficient, the Georgia Milestones assessments provide consistent results.

Limitation of Previous Research in the Field

After combing through the creativity and divergent thinking literature that aligned with middle school students, there was a significant amount of literature on creativity in general education courses, such as mathematics and science (Mann, 2009; Gong, 2020). Mann's (2009)

study aimed to find a more straightforward way to evaluate students' creative potential in mathematics. Gong (2020) investigated the importance of cultivating creativity in middle school science education. The researcher stressed the importance of teachers implementing creativity into their lessons. However, there has not been a recent study that combines middle school creativity training, pre- and posttest divergent thinking, and academic achievement. Additionally, there has not been a study that used the Runco Creativity Assessment Battery on middle school students before and after creativity training. Moving forward, my research study will help alleviate this gap, as well as add to the existing body of literature on creativity and academic achievement.

Conclusion

A thorough review of the literature highlighted creativity and divergent thinking, potential problems of divergent thinking assessments, the reliability and validity of survey instruments, creativity training programs, and creativity and academic achievement. Creativity is a multidimensional term that has no agreed-upon definition. The creative process is an important characteristic that is associated with problem-solving skills and critical thinking. Divergent thinking, the cognitive approach associated with creative processing and encourages risk-taking and open-ended responses. The Guilford and Torrance tests use divergent thinking tasks in their tests to measure creative potential. The Runco Ideational Behavior Scale utilizes a survey instrument to measure the student's creative potential, which may solve the contradictory research between creativity and academic achievement. However, it is vital to use a valid and reliable tool. Also, it is essential to use standardized tests to measure academic achievement instead of GPA (Elliott & Strenta, 1988).

This study aimed to contribute to the existing body of research regarding divergent thinking and education and become the first study incorporating the Runco Creativity

Assessment Battery on middle school students before and after creativity training. Also, the study aims to contribute to the existing body of research in creative processing and general education. The effect of a school-based creativity program on divergent thinking and academic achievement will be quantitively measured on students' creative potential.

3 METHODOLOGY

As laid out in chapter 2, previous research indicates that divergent thinking assessments and survey instruments could be used to identify students' creative potential in K–12 schools. The previous chapter reviewed research outlining the benefits of teaching divergent thinking skills in the classroom. Students' and teachers' perceptions of creativity have been extensively researched (Kladder & Lee, 2019; Langley, 2018). However, the majority of literature on creativity training literature comes from a philosophical, anecdotal, or critical lens (Davies et al., 2013). The current study was designed to address this limitation. The purpose of this study was twofold: 1) to investigate potential transfer effects of domain-specific creativity trainings on domain-general divergent thinking indices of divergent thinking in a middle school in the Southeast region of the United States and 2) to investigate the potential effects of the school-based creativity program on the development of creativity.

The following research questions guided this study:

1. How does divergent thinking vary across grade levels of middle school students as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game? It is important to note that grade level was used as a proxy for age.

   Hypothesis: Older participants will achieve higher divergent thinking scores than the younger participants.

2. How does a middle school student's engagement in a school-based creativity program affect divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game?

Hypothesis: Participants in the school-based creativity program will achieve higher divergent thinking scores from time 1 to time 2.

3. Is there a relationship between students' divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game and academic achievement scores as measured by the Georgia Milestones Achievement Test?

   Hypothesis: Participants with higher standardized achievement scores will have higher divergent thinking scores.

Research Design

The methodology used to complete this study was a quantitative and qualitative approach. A pretest-posttest design and content analysis were used as the models for this study. In November 2020, all groups took a pretest on divergent thinking, but only one group attended the full school-based creativity program (Full Creativity-Sixth Grade). After the program, in May 2021, all groups were posttested to measure the degree of change in each group. After the posttest, I studied the analysis to identify within group changes from time 1 to time 2.

A pretest-posttest model was used to compare participant groups and measure the degree of change occurring as a result of the program (Zientek et al., 2016). A content analysis was used to look at the students' creative products in music to identify interesting features and elements that do or do not align with characteristics associated with creative products as described in previous music research.

Conceptual Framework for Content Analysis

As outlined in chapter 2, this research study was based on Rhodes's (1961) 4 P's model, which categorized the measures of creativity by Person, Process, Product, and Press. A content

analysis was included to investigate the development of creativity through the school-based creativity program. Since a portion of the study investigated how this research could help music education, it was essential to look at the music capstone projects completed by the students in the program. The analysis aimed to identify any relationships between the creative projects and existing literature about creative Products.

Elliot (1995) defined music creativity as engaging in a creative process to generate a product, like improvisation or composition. Kratus (1990) believed there was a need for clear goals and objectives to effectively focus creative learning and assessment based on Rhodes's (1961) 4 P's. In terms of creative Product, Kratus posited that "students will apply an understanding of musical elements (e.g., rhythm, melody, timbre, dynamics) and musical principles (e.g., repetition, development, contrast) to the production of created music" (p. 34).

Amabile (1982) proposed the idea of measuring creativity based on the product. The idea was further developed and turned into the Consensual Assessment Technique (CAT) tool by Amabile and other researchers (Baer, 1994; Kaufman et al., 2008). The tool aims to evaluate a person's physical work, whether it be a performance, sculpture, essay, or research design. The CAT instructions are split into two parts: the creation by the subject and expert evaluation. It is important to note that the evaluators are experts in the specific field. For instance, if the subject presented an orchestra composition, the experts may be composers, conductors, and instrumentalists. However, the CAT is not based on a specific theory. The idea that a product birthed from a creative process recognized by the public is closely aligned with Csikszentmihalyi's (1999) viewpoint useful meaning of creativity. The CAT showcases creative qualities through the products that evaluators can understand because it aligns with their fields.

Based on previous literature, many empirical studies utilized Amabile's CAT tool when evaluating music Products (Eisenberg & Thompson, 2003; Hickey, 2001; Toups, 2008; Mawang et al., 2019). A musical adaptation of the CAT is the Consensual Musical Creativity Scale (CMCAS). The CMCAS is a rating scale measuring a person's musical creativity. The CMCAS consists of five categories: musical craftsmanship (how well the music was "put together" or how well it demonstrated skill), musical syntax (how well the music was organized), musical originality (is the music new), aesthetic sensitivity (how "pleasing" the composition was), and musical creativity (overall). For the content analysis, the CMCAS was used as a qualitative tool to find potential similar or unique elements between the creative Products (music compositions) and the five categories from the CMCAS.

Selection of Site

The School

The school-based creativity program began as a pilot from 2018 to 2019 in a southern middle district. The name was changed for anonymity. Currently, three schools within the district are incorporating the school-based creativity program into their academic curriculum. The researcher chose the pilot middle school for this project because it was the first to incorporate the school-based creativity program. The chosen school integrates student experiences that intertwine literacy and the arts throughout all ELA courses and other academic classes. The experiences allow students to explore music, technology, design, and storytelling to fuel their imaginations.

The school divides the experiences into five adaptations:

1. Passion projects in student's interest area with the guidance of faculty and industry mentors.
2. Arts Integration and/or STEAM (Science, Technology, Engineering, Arts, Math) activities.
3. Installation of school collaboration/ performance spaces.

4. Exploration of creative careers through career modules and development of student e-portfolios.
5. Cross-departmental projects and immersive experiences involving guests from community organizations, higher education, and industry. (School-Based Creativity Program, 2020, p. 1)

The school-based creativity program is an initiative that uses literacy standards and the arts to position students as content creators, connecting directly to student interests. Students develop creative literacy skills, such as reading, writing, and reflecting, with tools other than just a pencil and paper. The creativity program was administered through a specific group of academic teachers called the Creativity Teams. Students enrolled in the program were placed on a Creativity Team. The school-based creativity program was implemented as an extension activity of literacy class for students on the Creativity Teams. The school-based creativity program mindset builds an ecosystem that is student-driven, exploration-centered, flexible, and collaborative (see Figure 3.1).

Figure 3.1

School-Based Creativity Program Principles (School-Based Creativity Program, 2020, p. 1).

Component	Portrait of a Graduate Competency	Mindset	Portrait of a Leader Guiding Principles
Student Driven		• Starts with curiosity • Connects interests to learning, personal development & purpose • Encourages student freedom with multiple ways to express & engage in learning • Facilitates critical & independent thinking • Builds inclusive opportunities for all students	
Exploration Centered		• Persists through failure • Promotes a risk-friendly environment • Values originality • Is hands-on, minds-on • Creates new ideas, solutions, & content • Connects to real world relevance • Imagines, creates, plays, shares, & refines as part of problem solving process	
Flexible		• Reorganizes physical spaces • Believes that learning is the constant; time is the variable • Encourages & supports immersive learning opportunities • Promotes a growth mindset • Embraces activity & movement	
Collaborative		• Shares ideas effectively with others • Values multiple perspectives • Transfers and applies knowledge across subjects • Connects to community/ world outside the school • Encourages questioning and continuous reflection • Develops a conscious design with an intentional plan	

Structure of the Program

Before moving forward on the research study, it was important to investigate the school-based creativity program by answering two questions: 1) Were the students engaging in divergent thinking throughout the program; and 2) what did the program cater to?

Were the Students Engaging in Divergent Thinking Throughout the Program?

All students enrolled in the creativity program completed online modules that incorporated divergent thinking lessons with check for understanding tests. Figure 3.2 is an overview of the online modules the students completed throughout the semester.

Figure 3.2.

Creativity Modules Overview SY 2020–2021

Modules 2020-2021 School Year

Dates	Grade Level	Modules	Descriptions
October- December	Sixth, Seventh, and Eighth Grade	Gig Project Modules	Gig Project Descriptions Gig Project Survey Selection Gig Project Briefs
January- February	Sixth, Seventh, and Eighth Grade	Invention Project Modules	• Invention Examples • Invention Brainstorm • Prototype Design & Cost Analysis • Invention Logo & Slogan • Invention Commercial Script • Invention Commercial Due featuring functioning prototype
March- May	Sixth and Seventh Grade	Podcasting Project Modules	• Podcasting Overview and Assignment • Analyzing Podcast Structures • Brainstorming Podcast Topics • Using the Digital Audio Workstation (DAW) SoundTrap for Recording & Music Creation • Telling Your Podcast Story • Writing/ Recording Your Script • Rough Draft Review & Feedback • Final Draft, Editing, and Album Cover Artwork
March- May	Eighth Grade	Capstone Project Modules	• Identifying Areas of Passion/Interest • Collaborating with Community Partners • Developing a Capstone Project Proposal • Capstone Timeline Check-Up • Meeting with Faculty Advisor and Feedback • Meeting with Industry Advisor and Feedback • Faculty and Industry Review of Completed Project • Sharing Your Work- Poster Presentation and Project Commercial • Evaluating Impact

The program's primary purpose was to have the students get into the creative process for each module by listing out several ideas (divergent thinking), but then narrowing them down to get them to an overall destination. The overall destination was to create one product (student project) that was the convergent thinking aspect for this program. For instance, a sixth grade student was asked to brainstorm as many inventions as they could. After they made a list of invention ideas, the student narrowed down the list to come up with their project.

What Did the Program Cater to?

The researcher looked at the modules and interviewed the program coordinator and administrator to answer the above question. The school-based creativity program is deeply rooted in project-based learning. PBL is a teaching method in which students learn by actively engaging in real world and personal projects (PBL Works, 2022). Based on the interviews and

modules, there are three essential components that are taught in the school-based creativity program: problem finding, collaboration, and reflection.

At the beginning of each module, students were asked to find and solve a problem individually or through a collaborative group effort. For instance, the students created an invention that could help their peers or the community. Students were required to brainstorm and come up with as many original ideas as they could before moving on to the next section of the module. Throughout the process, there were modules that each of the students stopped to reflect on their project. The reflection modules gave the students time to look at what they accomplished up until a certain point. Students were given a questionnaire that had them reflect on their strengths and what they should change before they continued in the process.

Two limitations came from investigating the program. The first limitation to the study was that the divergent thinking exercises were presented to them in an online module format and that I did not measure the program's quality or student learning outcomes after completing the modules. Another limitation was that the sixth grade teachers were trained on PBL but it may not have been effective due to them learning the program through online training during COVID-19. Sixth grade teachers facilitated the creativity program projects, while the program administrator did the facilitation of projects in seventh and eighth grade.

Student Projects

Students created passion projects, called gig and capstone, through project-based learning. A Gig project is a small body of work that sixth, seventh, and eighth graders will complete throughout the year. Eighth graders in the program had to complete a capstone project, which is an in-depth project the students complete throughout their final year of middle school. The difference between a gig and a capstone project is the length and amount of time spent on the project. The gig projects tie to a variety of student interests, including songwriting, graphic

design, animation, fashion design, interior design, coding, 3-D printing, and video editing. In each project, students create content for a specific need in the school or community. For example, students recycled clothing for a local thrift store, made a historical walking tour app for the local historical society, or created podcasts for the school's radio station. The capstone project is a large body of work that summarized the eighth-grade students' academic and intellectual experiences throughout the school year, allowing them to use outside mentors. An outside mentor is a person who is in the same field as the student's project. For example, if the student wants to create a composition for a community event, they may choose a music teacher to help mentor them throughout the process. Capstone is a long-term investigative project that turns into a product or performance. For instance, a student researched the music education industry and created a business plan for a proposed company that was then pitched to a panel of local music education leaders.

The school-based creativity program's passion projects help students learn key concepts from their academic learning objectives and problem solve throughout the process. For example, the students learned about World War II and were asked to create a film on the subject. The students were tasked with choosing a director, script supervisor, virtual reality editor, makeup artists, composer, musicians, actors, set designer, props master, and creative designer on this project. The students decided on the concept and the information that should be presented in the film. In addition, each student decided how their role would be represented in the making of the film. For instance, the composer may look at the film and decide how they will create the musical score. If there is an action scene, they may choose to create a fast and intense composition. If the scene is sad, the composer may choose to have a slow and lyrical piece of music.

The school-based creativity program helps align performance and creation. For example, a student may choose to create a dance performance for a community event. The student will need to choose a piece of music that aligns with the event. After choosing the composition, the student will create a dance performance that will be performed out in the community.

In 2019–2020, my committee chair, Dr. Martin Norgaard, and I conducted the pilot study. During the pilot study, eighth-grade students showcased their capstone projects at the end of the school year. Below is the breakdown of completed eighth-grade capstone projects from the 2019–2020 school year. Highlighted in yellow are the projects that incorporated music or audio editing as part of their project. Based on Table 3.1, about 63% of eighth-grade students in SY 2019–2020 created capstone projects that incorporated a musical element (i.e., composition, audio editing, film score).

Table 3.1

Eighth-Grade Students Completed Capstone Projects from SY 2019 to 2020. Highlighted in yellow are the projects associated with music.

Categories	Number of Completed Capstone Projects (n = 40 Eighth-Grade students)
Songwriting	6
Tech Theater	1
Aviation	1
Dance Therapy	1
Virtual Reality	1
Creative Writing	1
Inventions	7
Marketing & Design	3
Photography	1
App/Game Development	5
Animation	3
Website Development	5
Film with Music	5

Pilot and Current Study Test Battery and Scoring

Assessment/Survey Tools

A multi-section testing battery, which consisted of divergent thinking tasks and surveys that quantitatively measured the creative potential for the pre- and posttest was chosen for this

research study. The quantitative data included a survey featuring Likert-style items (Runco Ideational Behavior Scale, RIBS), Figural DT, Titles, Realistic Presented Problems, and Realistic Problem Generation tests from Runco Creativity Assessment Battery. The rCAB was chosen as the assessment because it was a comprehensive assessment battery for divergent thinking and Dr. Norgaard and I received written permission to use the testing battery during the pilot study (Creativity Testing Services, 2021). Additionally, the testing battery has been used repeatedly in prior research (Oztunc, 2013; Richard et al., 2017; Sharma et al., 2021). The rationale for using the Divergent Thinking Tests and RIBS was that previous creativity research had shown the battery to be a reliable and valid measure of a person's creative potential. For example, in Oztunc's (2013) study, the Divergent Thinking Tests had an alpha reliability of 0.91 and the RIBS had an alpha reliability of 0.90.

Ideation is the formation of ideas or concepts. Those ideas can be treated as the products of original, divergent, and even creative thinking. Divergent thinking tests assess ideation (Guilford, 1967; Runco & Albert, 1986; Plucker & Renzulli, 1999). Runco et al. (2001) stated, "The only way to access the validity of those assessments is with a criterion that focuses as much as possible on ideation" (p. 394). Runco created the RIBS as a tool to collect self-report data of divergent thinking behaviors. The RIBS is a behavioral scale that consists of 28 Likert-style questions that focus on behaviors that reflect the individual's use, appreciation, and skill with ideas. An example of a RIBS question is: "I take my time exploring various options and alternative solutions when faced with a problem." After reading a question, the participants will answer on a scale from 0 to 4 (0 = Never, 1 = Yearly, 2 = Monthly, 3 = Weekly, and 4 = Daily) (see Appendix A and B).

The second portion of the test battery was a section taken from the rCAB, which consisted of four tasks. The purpose of the divergent thinking tasks is to measure creative potential and predictions of future creative accomplishments. The first task, Divergent Thinking: Realistic Problem Generation, consists of two, three-part questions. For the first part of the question, the participant created a list of problems impacting a given topic. The student should not limit themselves and came up with as many problems as possible. In the second part of the question, the participants chose one problem from their first section list. The third part of the question was for the participant to list possible solutions to that problem. An example of a realistic problem question is to list problems that could impact a community (including homes and neighborhoods) due to the COVID-19 pandemic (see Appendix A and B).

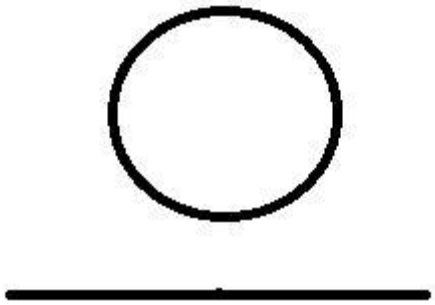
The second task, Divergent Thinking: Realistic Presented Problems, consists of two questions. The participants read about two problems that may occur at school and home. After reading the problem, participants wrote down as many solutions as they could for each question. An example of a present realistic problem is "You are attending a class online through a Zoom with your teacher. You keep getting distracted by various things on your computer; surfing other websites, messaging other students, and watching YouTube. You were distracted and missed a really important part of the class and know you do not know the content covered for the upcoming quiz. What should you do? How would you solve this problem?" (see Appendix A and B).

The third task, Divergent Thinking: Titles Game, consisted of three questions. The participant listed as many alternative titles as possible for a specific movie, play, or book. For instance, the participant created possible titles for the movie *The Lion King* (see Appendix A and B).

The last divergent thinking activity was a Figures Task. The participant looked at a figure and listed as many things as possible that the drawing may represent. For example, “Look at the figure below. What do you see? List as many things as you can that this figure might be” (see Figure 3, Appendix A, and Appendix B).

Figure 3.3

Image of a Figure Task Question.



Potential answers include a ball, half of a division sign, and horizon.

Scoring of the Test Battery

The Likert-scale section of the test battery, RIBS survey, was ordinal and did not need to be assigned a score by the researcher. Section two of the test battery, divergent thinking problem scenarios, and word-choice were quantified by ideational fluency, flexibility, and originality. Based on Runco’s *Scoring Guide*, fluency is the number of responses generated by the person. Flexibility is the number of categories based on the total number of responses. The categories are determined by comparing all the participant’s responses to the question. Using the same example from Chapter 2, the object is a pencil. The responses could be a tool for cursive, a poker for poking a person, and a shading tool for a picture. The fluency score would be three because there were three responses. However, the flexibility score would be two because a tool for cursive and shading would fall under the same category, writing utensil, and a poker would be in a different

group. The originality score is based on the number of original or unique responses the person could create for the object. It is important to determine if a response is original by cross-checking with other participant answers for the specific prompt. According to the Runco *Scoring Guide* (2020), once a lexicon of original ideas is set, the rater can use a percentage and give originality points based on a specific score. For a sample of over 50 participants, decided ideas only used by 5% or less will receive an originality point. Examples of these procedures are given in the *Scoring Method* subsection.

Assessing Academic Achievement

I decided to use Georgia Milestone Achievement Scores to assess academic achievement, because previous research showed a more positive relationship between standardized tests and creativity measures as opposed to using class rank (Gajda et al., 2017). Although standardized testing does have limitations, see chapter 2, the Georgia Department of Education (2022b) identified that the Georgia Milestones assessment is a reliable and valid tool to evaluate student academic achievement. Since the sixth through eighth grade students took the GMAS, I was able to compare academic achievement within each grade level. The GMAS is the most widely used standardized assessment across the state of Georgia. Any sixth, seventh, or eighth grade student attending a Georgia public school must take the GMAS. The standardized assessment is a comprehensive summative assessment that gauges a student's proficiency level. The purpose of the GMAS is to measure a students' level of preparedness for the next grade level. The assessment is designed to identify information about how well a student is mastering state-level standards in the four core areas: English/language arts, math, science, and social studies. However, some grade levels only take two core sections: English/language arts and math. For this study, I will only look at math and English/language arts, because all middle school grade levels take those specific sections of the test.

The Georgia Milestones Assessment Guides included the structure of the questions for each grade level. Each test includes four levels of Depth of Knowledge (DOK) questions. DOK refers to the level of cognitive demand needed to complete a question. Levels 3 and 4 utilized divergent thinking descriptors (i.e., analyze, critique, synthesize, design; Georgia Department of Education, 2021). The score sheets included two overall scores for each test (math and language arts). The handbook includes a percentage of how many questions were at a specific level for each test (see Table 3.2).

Table 3.2

Georgia Milestones DOK Questions for Math and Language Arts (Highlighted are the levels that utilize divergent thinking descriptors)

End of Grade Language Arts: Sixth Grade

Depth of Knowledge	Approximate Number of Points	Approximate Percentage of Test
Level 1	3 to 9	5% to 15%
Level 2	21 to 27	35% to 45%
Level 3	15 to 21	25% to 35%
Level 4	6 to 12	10% to 20%

End of Grade Math: Sixth Grade

Depth of Knowledge	Approximate Number of Points	Approximate Percentage of Test
Level 1	15 to 20	25% to 35%
Level 2	26 to 32	45% to 55%
Level 3	9 to 15	15% to 25%
Level 4	Not Applicable	Not Applicable

Pilot Study: SY 2019–2020 Overview

In SY 2019–2020, Dr. Norgaard and I conducted a quantitative pilot study with seventh- and eighth-grade participants at the Southern Middle School ($N = 68$). Following permission from the cooperating school-based program onsite administrator and the Georgia State University Institutional Review Board, we were approved to collect data at the Southern Middle School. The primary purposes of the pilot study were:

1) to adapt the rCAB to meet the language and content needs of the students
2) to implement a procedure of scoring divergent thinking responses and checking for feasibility

3) to check inter-rater reliability between the divergent thinking scoring of the main rater and an outside evaluator.

The goal for the initial pilot study was to conduct a pre and post-assessment on divergent thinking, as well as examine the students' achievement scores from the Georgia Milestone Achievement test. In January, I was able to collect pretest scores from all participants. Unfortunately, due to the disruptions to school activities associated with COVID-19, I could not collect post-scores. Also, students did not take the Georgia Milestones.

Dr. Martin Norgaard received permission from an expert in creativity, Mark Runco, to use his tests, RIBS and rCAB, on divergent thinking. An onsite school administrator from the Southern Middle School helped the researchers adapt the RIBS and rCAB tests to a 6th-grade reading level. The test was adapted into one assessment and printed in a paper/pencil format (see Appendix A). In December of 2019, a recruitment letter was sent out to all seventh- and eighth-grade students. Interested students received parental consent and student assent forms.

Participants and Groups

I collected responses ($N = 68$) in January 2020 from students in three groups: Group 1 ($n = 31$; 13 seventh graders and 18 eighth graders) was made up of students enrolled in the school-based creativity program. Students were selected randomly by lottery until program spaces were full in one of four areas—Music & Recording, Film & Animation, Art & Design, Technology & Engineering. Group 2 ($n = 20$; 12 seventh graders and 8 eighth graders) consisted of students not enrolled in the school-based creativity program. However, Group 2 students were placed on the Creative Teams to balance class sizes with school-based creativity program students. Group 3 ($n = 17$; 5 seventh graders and 12 eighth graders) students were not enrolled in the school-based creativity program and were not placed on the Creative Teams.

Data Collection

I hypothesized that group 1 students would score higher on the divergent thinking measures over groups 2 and 3.

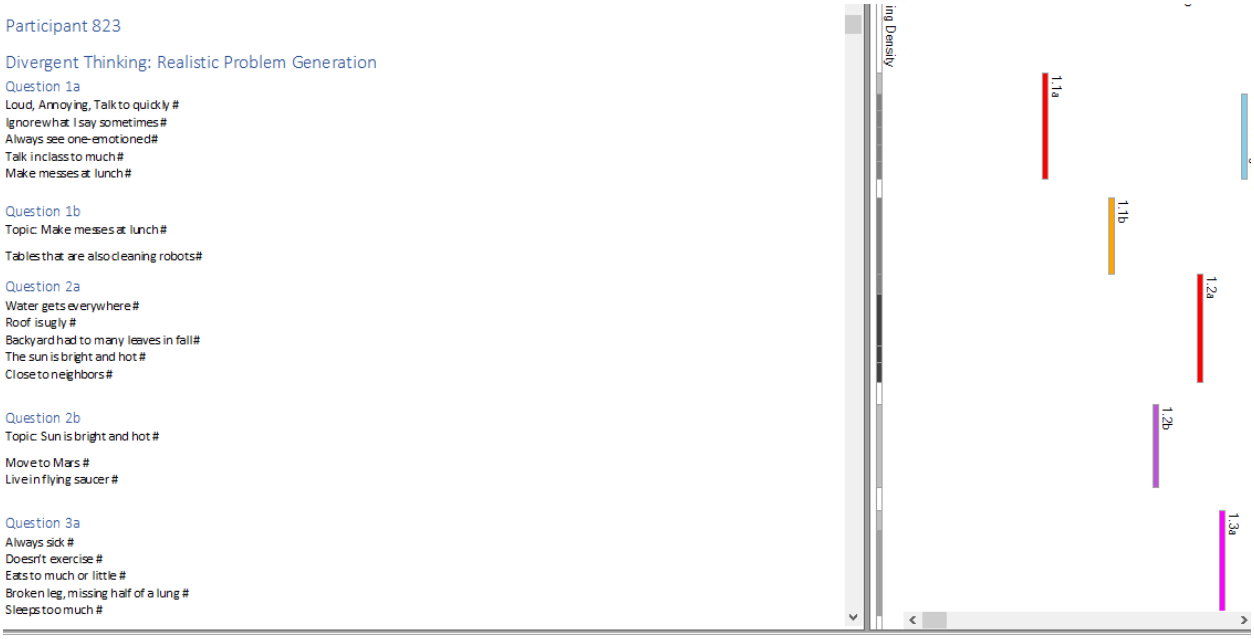
Scoring Method

In January 2020, the onsite school administrator administered the pretest, which consisted of divergent thinking tests and surveys, to each student during the school day. The school administrator collected all pretests and sent them to Dr. Norgaard for analysis. I scanned all participants' pretests into the computer and created a PDF version. Once the PDF version was created, I separated each participant by participant number, group, and grade level. Then, I transferred the RIBS into SPSS, v. 26. Each response was recorded as the aligning Likert-scale rating. For the RIBS survey, students chose a response that the researcher aligned with a number. For example, 0 = Never, 1 = Yearly, 2 = Monthly, 3 = Weekly, and 4 = Daily. For example, a student may answer question one with a score of two, meaning monthly. I recorded the two in SPSS under RIBS question one.

I typed all written responses of the participants' divergent thinking answers into a Microsoft Word file for all divergent thinking tasks. Three headings categorized all answers: (1) Participant Number, (2) Title of the Test, and (3) Question Number. Then, the file was imported into NVivo 12 (see Figure 3.4). The aim was to access all participants' responses on fluency, flexibility, and originality.

Figure 3.4

NVivo 12 File of Participants Answers with Category Coding Labels



Once the responses were imported into NVivo 12, I could begin to rate each participant's responses. All scorings were based on Runco's *Scoring Guide* (2020) for fluency, flexibility, and originality. The fluency score is the number of appropriate responses to the given question. If an answer was duplicated in the same question or the response did not align with the question, the participant did not receive a point.

For rating flexibility, I read all responses for a specific question. Then, I created specific categories that aligned with the participant's responses and coded each answer (see Figure 3.5). Codes only refer to a specific question. Each response is coded with an idea code. If there were similar responses, they would be the same idea code (i.e., "Ignore what I sometimes say" and "Not listening when others are talking directly to them" were coded with the same idea code). Idea codes were coded into categories, such as "Ignore what I say" was coded "Friends—

Negative." After the category coding was completed, I counted how many categories each participant received per question.

Figure 3.5

Question 1a Flexibility Categories in NVivo 12. A category is depicted by the arrows after "Category" (i.e., Friends-Negative, Home Issues, Trauma). A response is below the arrowed categories (i.e., Allergies, Forgotten Assignment, Bad Luck).

Originality was rated by counting how many idea codes were original. If less than 5%, which was three participants from the pilot study ($n = 68*0.05 = 3.4 \approx 3$ participants), created the

same solution, they received a point for originality. For example, in question one, if two participants chose Home Troubles and Allergies as problems, then they both received two points.

Reliability of Scoring Method

Since the divergent thinking tasks' scoring method is subjective, Dr. Norgaard and I had an outside evaluator separately rate 10% of the responses, which was seven participants from the pilot study ($n = 68*.1 = 6.8 \approx 7$ participants). The outside evaluator was a veteran teacher with over 20 years of experience in music education and research. The outside evaluator had no ties to the current program or school. We chose for the evaluator to only look at 10% of the data, because of their time commitment and they were unable to evaluate more than 10%. The purpose of using an outside evaluator was to check the inter-rater reliability of the scoring method. The outside rater and I separately rated the seven participants. The outside evaluator received the seven participant pretests with no codes in an MS Word file (same list as Figure 3.4). Also, the evaluator received the scoring guide provided by Runco, which provided descriptions of the three categories (fluency, flexibility, and originality). Originality was scored based on the seven participants and not the entire sample ($N = 68$). Once the evaluator completed the ratings of the seven participants, the scores were imported into SPSS, v. 26. After using Cohen's Kappa on the two raters' scores, there was moderate inter-rater reliability ($\kappa = 0.51$, $p < .05$). The inter-rater reliability for flexibility (categories) was poor ($\kappa = 0.37$, $p < .05$). Also, the inter-rater reliability for originality was poor ($\kappa = 0.36$, $p < .05$). However, fluency (total number of responses) had a strong inter-rater reliability ($\kappa = 0.87$, $p < .05$).

Data Analysis and Results

All participant scores for the surveys, as well as fluency, flexibility, and originality from the divergent thinking tasks, were placed into Microsoft Excel and then imported into SPSS, v. 26.

Surveys

For the RIBS survey, I categorized the mean and standard deviation of each grade level and group: Seventh Grade—RIBS Average, Eighth Grade—RIBS Average, Group 1—RIBS Average, Group 2—RIBS Average, Group 3—RIBS Average. For grade level, Seventh Grade—RIBS Average had the highest mean score ($M = 2.79$, $SD = 0.54$). In terms of group number, Group 2—RIBS Average had the highest mean ($M = 2.72$, $SD = 0.51$). However, Group 1—RIBS Average mean was close to the Group 2 average ($M = 2.71$, $SD = 0.\ 49$). A one-way ANOVA was used to determine if group affected middle school students' RIBS scores. The results of the one-way ANOVA were not significant [$F(2,66) = 1.85$ $p = 0.17$]. However, a one-way ANOVA determined grade level affected middle school students' RIBS scores [$F(2,66) = 4.32$ $p = 0.\ 04$].

Divergent Thinking Tasks

Descriptive statistics identified the range of scores for each group in relation to the divergent thinking tasks scoring categories. I categorized the mean and standard deviation of each form: Group 1—Total Fluency, Group 2—Total Fluency, Group 3—Total Fluency, Group 1—Total Flexibility, Group 2—Total Flexibility, Group 3—Total Flexibility, Group 1—Total Originality, Group 2—Total Originality, Group 3—Total Originality, Group 1—Overall Total, Group 2—Overall Total, Group 3—Overall Total. The lowest mean score was Group 2—Total

Originality (M = 1. 90, SD = 0.89), while the highest average was Group 1—Total Fluency (M = 5.35, SD = 2.35).

A one-way ANOVA was used to determine if group affected middle school students' divergent thinking scores. The results of the one-way ANOVA for all scoring categories were not significant—Total Fluency $F(2,66) = 2.09$ $p = 0.13$; Total Flexibility $F(2,66) = 1.09$ $p = 0.34$; Total Originality: $F(2,66) = 1.01$ $p = 0.37$; Overall Total: $F(2,66) = 3.39$ $p = 0.22$.

Since groups and scoring categories showed no significance, I ran a between-subjects analysis to explore each variable, scoring categories, group number, and grade level, separately. All scoring categories showed an interaction between group and grade levels. The analysis results identified a significant interaction of grade level and group for overall total: $F(2,66) = 7.59$ $p = 0.001$. For group and total fluency, the between-subjects analysis identified a significant interaction: $F(2,66) = 3.29$ $p = 0.04$. Also, the interaction of group and grade level for total fluency was significant: $F(2,66) = 6.47$ $p = 0.003$. There was a significant interaction between grade level and group for total flexibility: $F(2,66) = 6.11$ $p = 0.004$. Additionally, a significant interaction between grade level and group for total originality: $F(2,66) = 9.41$ $p = 0.000$.

Figures 3.6 and 3.7 are mean plots from total originality and overall total across grade levels and group numbers. The plots illustrate the significant difference between Group 1—Seventh Grade, the creativity program, and Group 1—Eighth Grade.

Figure 3.6

Total Originality Means by Group Number and Grade Level.

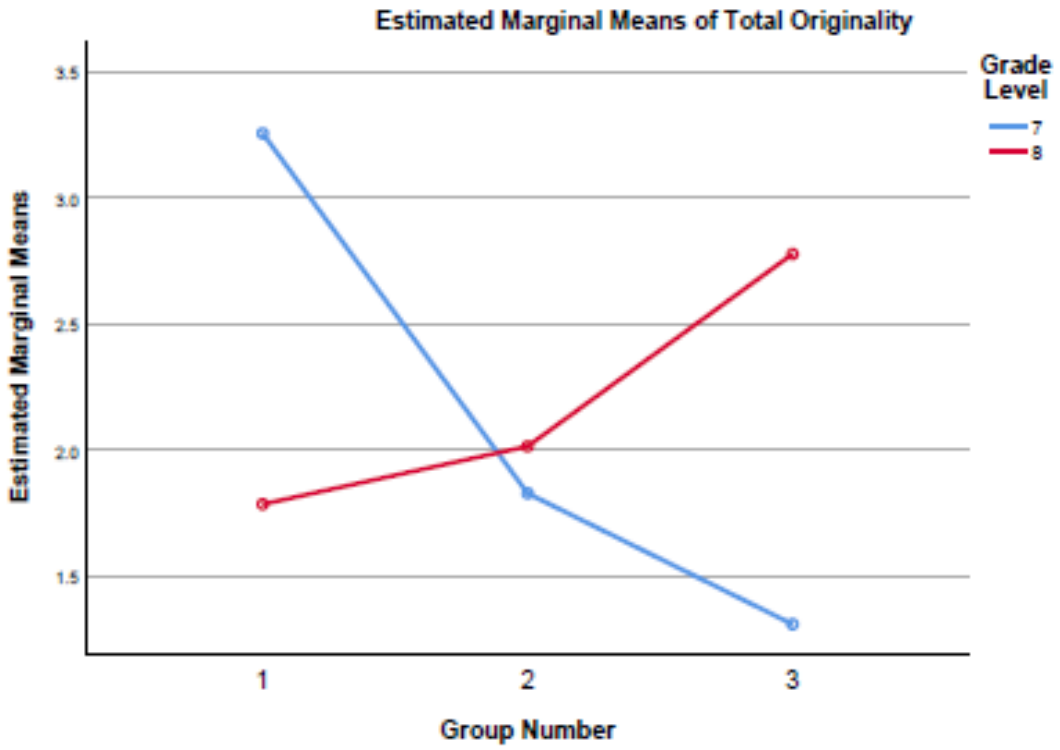
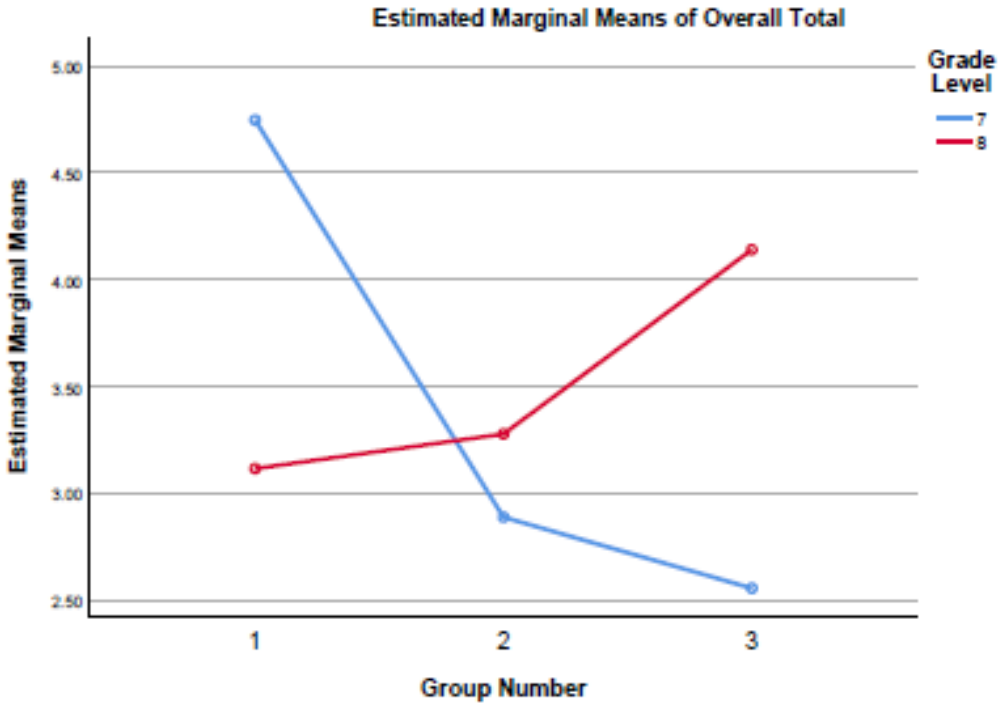


Figure 3.7

Overall Total Means by Group Number and Grade Level.



Discussion of Results

The main contribution of this pilot study was that Dr. Norgaard and I investigated the feasibility of the study design and the measurements. The students could complete the tests in a reasonable amount of time and read the text. Based on student responses on the test, all students understood the directions for each section.

There were four main limitations of the pilot study design. This research's first limitation is that I was unsure of the participants' divergent thinking scores and survey answers after the school-based creativity program. Unfortunately, there was not a post-assessment given to indicate the participants' ending point after the program. A posttest could help to determine if grade levels and group numbers help participants growth in divergent thinking. Also, the posttest

design could help control for initial group differences. The second limitation was that I did not have academic achievement data in the pilot. Since there were not any academic achievement scores, I was unable to answer our initial hypothesis. The third limitation was the moderate inter-rater reliability. A significant issue with the inter-rater reliability was having both evaluators create categories. The lack of categorical structure may have played a role in the evaluators scoring. The final limitation was the originality scoring because it only looked at the top 5%.

Moving Forward

For the current study I took over the project and used data from the current 2020–2021 school year, which consisted of sixth-, seventh-, and eighth-grade students. Participants from the three middle school levels completed the pre- and post-assessment. Based on the pilot study, I decided to recheck inter-rater reliability on the divergent thinking tasks by using multiple outside raters instead of one evaluator. For the current study, SY 2020–2021, I included a posttest at the end of the school-based creativity program in May. Additionally, I completed a repeated measure analysis that compared pre- and posttest scores across the three groups and grade levels.

Based on my doctoral committee's critique, I changed the scoring of Originality to Subjective Originality for the divergent thinking results. The subjective originality score was based on the number of original or unique responses the person could create for the object. It is important to determine if a response is original by cross-checking with other participant answers for the specific prompt. For the subjective originality scoring, I decided to use Cropley's (1967) approach. Reiter-Palmon et al. (2019) stated that "this approach yields zero weights for all responses with a relative frequency of occurrence greater than or equal to 0.15. In addition, responses occurring less often than 0.15 receive a weight of one, responses occurring less often than 0.05 receive a weight of 2, responses occurring less often than 0.03 receive a weight of 3,

and responses occurring less often than 0.01 receive a weight of 4" (p. 3; supplemental material). For example, based on the previous SY 2019–2020 data, Subjective Originality was rated by counting how many idea codes were original. Based on the subjective originality scoring, if 5–15% of the participants had the same answer, the participant received one point (n = 68*0.15 = 10. 2 ≈ 10 participants). If 4–5% of participants had the same answer, then the participant received two points (n = 68*0. 05 = 3. 4 ≈ 3 participants). If the 2–3% of the participants had the same answer, then those participants received three points (n = 68*0. 03 = 2. 04 ≈ 2 other participants). If 1% had the same response, then they received four points (n = 68*0. 01 = 0. 68 ≈ 1 other participant). Lastly, if no other participant had the same response, then the individual received five points for that answer. For example, in question one, if two other participants chose Home Troubles and Allergies as problems, then they both received six points (3 points for "Home Troubles" + 3 points for "Allergies" = 6 total points).

I chose this scoring method because I wanted to include more of the participants' results for each question. Initially, the pilot study only looked at 5% of the data, while this new subjective originality scoring method allows for 15% of the data to be included in the results. Predetermined thresholds were a better option for evaluating unique responses compared to looking at the top 5% of original responses (Reiter-Palmon et al., 2019).

Current Study: SY2020–2021

This section will include descriptions of the program, selection of participants, data collection methods, data analysis, and limitations of the current study.

About the Program

The entire grade level was enrolled in the creativity program for sixth grade. All grade level teachers participated in a project-based learning training with the PBL Institute. The Instructional Support Coach worked with academic teachers to implement PBL in academic

classrooms. Students spent one class period a week in their literacy class completing school-based creativity projects tied to content creation. Sample projects included gig projects, inventions, podcasting, and student passion projects.

For seventh and eighth grade, a small group of students voluntarily opted into the creativity program. Students spent two literacy class periods a week with a school-based creativity instructional coach, who facilitated school-based creativity projects tied to content creation. The school-based creativity Instructional Coach participated in related professional development. The students participating in the pilot program were pulled out of their normal literacy class and grouped with other school-based creativity students during the two literacy classes each week. The projects were similar to the project mentioned above in the sixth-grade section. In addition, eighth-grade students completed an in-depth capstone project with an industry mentor in a self-selected area of interest.

Selection of Participants

The study used students in sixth through eighth grade ($N = 75$). Students were divided into three groups: 1) complete school-based creativity program services, 2) partial school-based creativity program services, and 3) not receiving the school-based creativity program. See Table 3.3 for a breakdown of participants by program and grade level. Since the school-based creativity program group was exclusively sixth-grade students, I named the group Full Creativity-Sixth Grade.

Table 3.3

SY2020–2021 Participants

Creativity Group and Grade Level	Completed Pre-and Posttest
Full Creativity	
Full Creativity-Sixth Grade	32
Overall Total	32
Partial Creativity	
Seventh Grade	20
Eighth Grade	13
Overall Total	33
No Creativity	
Seventh Grade	4
Eighth Grade	6
Overall Total	10

All sixth-grade students were automatically enrolled in the school-based creativity program because the school administration decided to roll out the program to the entire grade level. Seventh- and eighth-grade students had to opt into the program, and then they were selected via lottery until all of the spots were filled. There were no requirements for entry into the program (no GPA or previous experience). In October, the onsite school administrator recruited sixth-, seventh-, and eighth-grade students for the study. Recruitment materials were distributed to all parents whose child was in the school-based creativity program and other school students not in the program. A recruitment email was sent to the parent's email with a link. The link went to a Qualtrics page that contained the parent consent form using the parent's private email. Once that was received, a link was sent to the student. The first page of the online test contained the student assent form. Simply "by clicking here," the students agreed to

complete the test battery. The person obtaining child assent was the onsite school administrator and not a teacher at the school.

Additional Analysis

In addition to the divergent thinking tests, Runco Ideational Behavior Scale, and academic achievement scores, the music capstone projects were used for content analysis. Rhodes's (1961) 4 P's model and the Consensual Musical Creativity Assessment were used as the conceptual framework for the content analysis. The framework was used to investigate the development of creativity through the school-based creativity program.

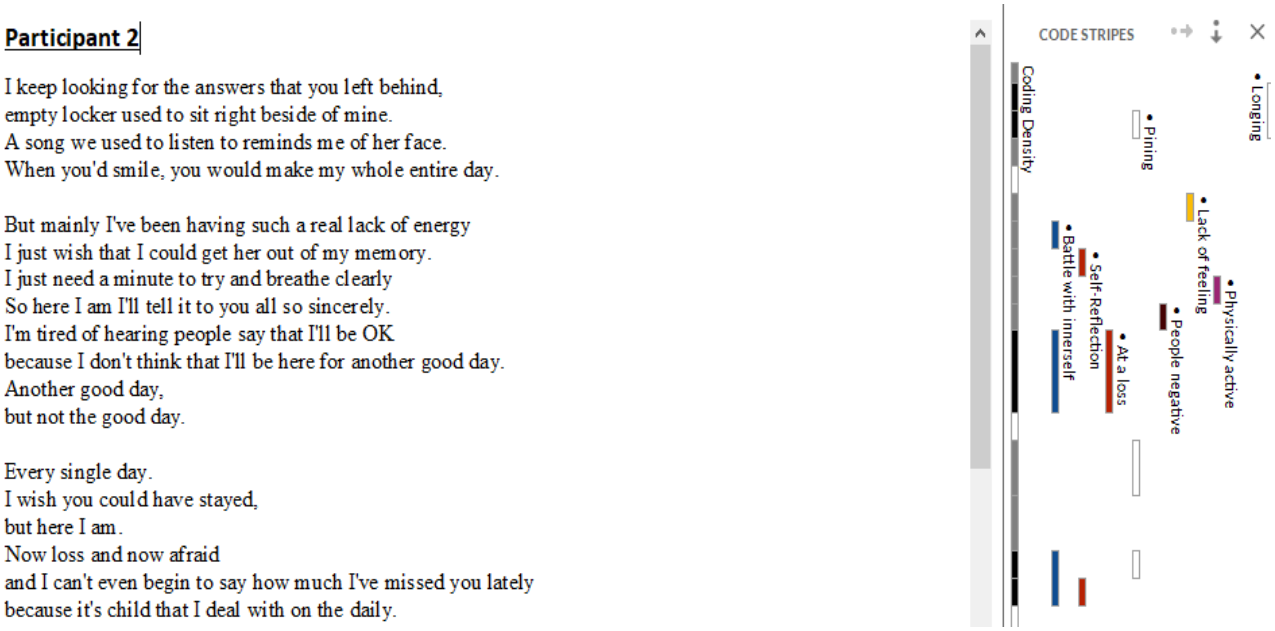
For the content analysis, all student projects had to be music-focused products, which meant they must be projects that were only music. For example, recorded songs and written compositions qualified as music-focused products, while videos or marketing that included music were not included in the content analysis. The mp3 files from the music-focused projects were imported into NVivo 12. Additionally, the lyrics were transcribed by me in Microsoft Word and then imported into NVivo 12.

Content Analysis Method

All song lyrics were labeled using coding. Miles and Huberman (1994) posited that coding should be conducted at the outset to look for patterns within the data. For this study, the purpose of the coding was to look for patterns within the participants' song lyrics. As I was reading the lyrics I came up with codes that described certain phrases. Figure 3.8 shows the conceptual coding process from a participant's song lyrics.

Figure 3.8

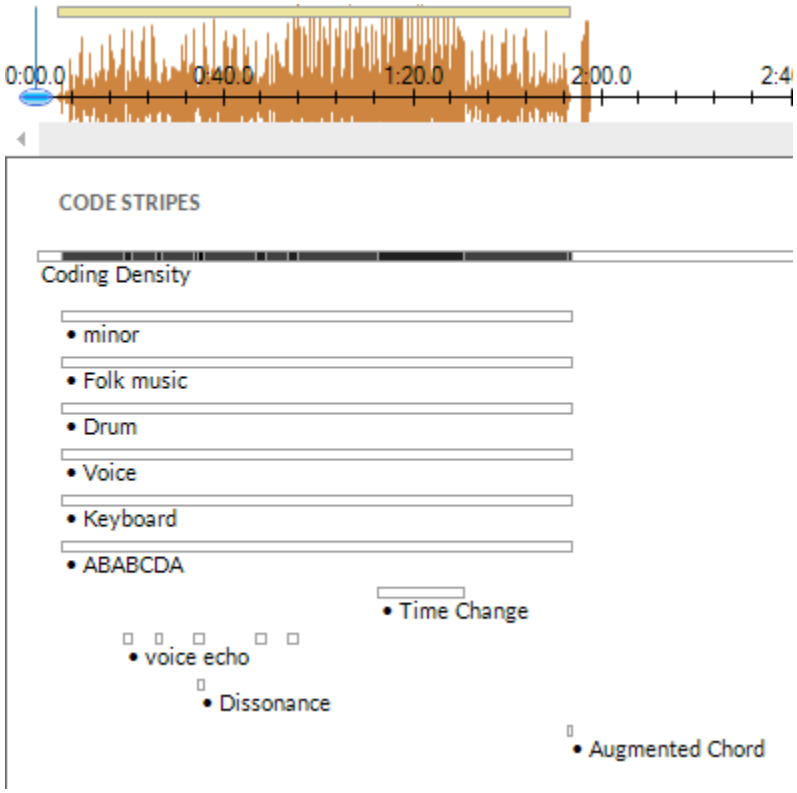
Conceptual Coding of Song Lyrics



Similar to the lyrics, all song files were labeled using coding. The coding labels consisted of specifics within the music, such as instrumentation, musical genre, style, song form, and miscellaneous (i.e., sound effects). Figure 3.9 shows the coding process from a participant's composition.

Figure 3.9

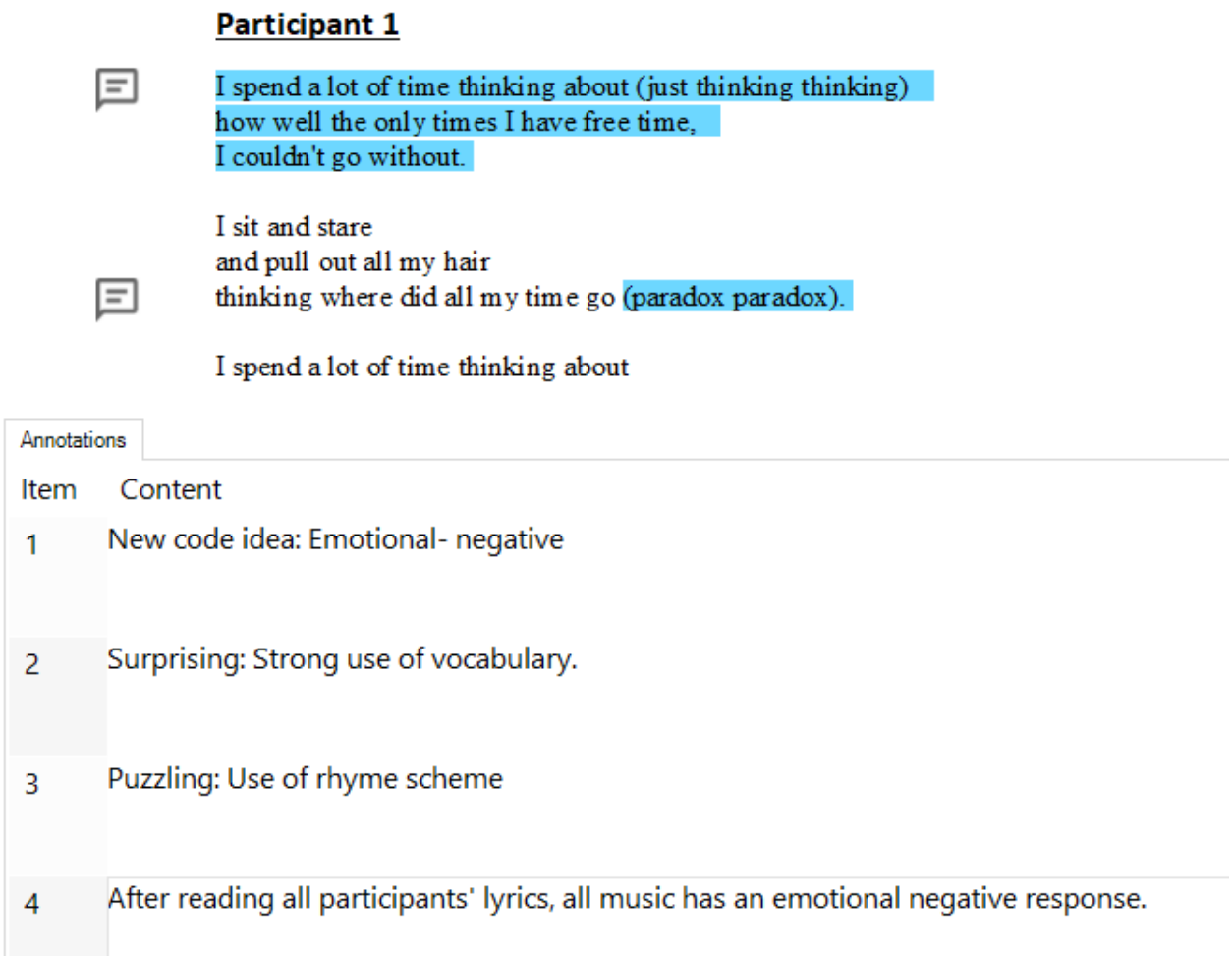
Coding of a Composition



Throughout the coding process, written memos were created from the codes. Memos consisted of reflective remarks, new ideas for codes, and what was puzzling or surprising about the lyrics or composition (see Figure 3.10).

Figure 3.10

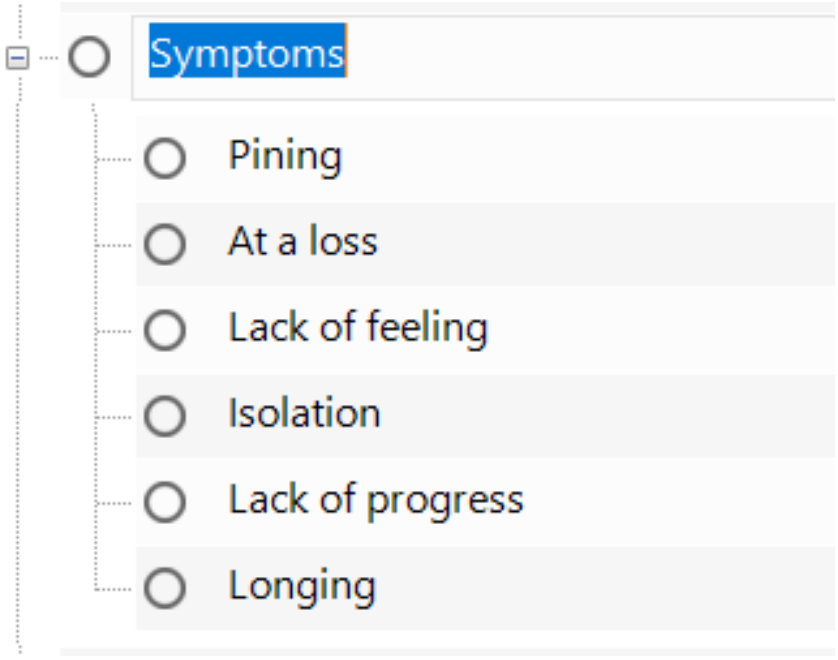
Memoing of a Participant's Song



After the initial coding phase, axial coding was chosen to draw connections between the codes. Axial coding was included to look for larger patterns across the music projects. For instance, connections among the initial codes and creative elements from the creativity framework were noted in the compositions. First, I read over all of the codes to determine how they could be grouped into categories. Then, I placed all codes from the initial coding phase into overall categories (see Figure 3.11).

Figure 3.11

Example of Initial Codes Placed in Overall Category (highlighted in blue)



For the song recording, I used an a priori coding scheme based on the Consensual Musical Creativity Assessment Scale. I chose the assessment from Mawang et al. (2019) as a framework to analyze the students' music capstone projects. The CMCAS was not used as a quantitative measure. Instead, the CMCAS was used as a qualitative tool to find potential similar or unique elements between the creative products (music compositions) and the four categories from the CMCAS. The four categories created for the content analysis of the music compositions came from the CMCAS: musical craftsmanship, musical syntax, musical originality, and aesthetic sensitivity (see Figure 3.12).

Figure 3.12

Example of Interesting Features That Align with the CMCAS

Lastly, theme statements were created that described larger patterns within the data. The themes will be presented in chapter 4.

Data Collection Methods

For the current study, all participants took a pretest and posttest. The testing and school-based creativity program occurred in three phases: (1) Phase One: Pre-Assessment; (2) Phase Two: School-Based Creativity Program; and (3) Phase Three: Post-Assessment. Phase One was collected in November and early December 2020. Due to COVID-19, the test changed to online, which was different from the pilot study's paper/pencil format. The pilot study sections, Runco Ideational Behavioral Scale, and Runco Comprehensive Assessment Battery did not change from the pilot. However, the pilot study questions were altered so that students who took the pretest from the previous year would be able to see new questions (see Appendix B). The pretest was imported into Qualtrics. In September, students and teachers not in the study practiced going through the online pretest to check for readability and ensure the software was efficient. The pretest was ready to implement after some minor changes to the online layout and flow. In the study, participants took the online tests in November 2020. The data was collected between five

to six months, spanning the school year 2020–2021. The posttest was administered to the participants in May 2021. Student achievement data was also collected for SY2020–2021. The students' music capstone projects were collected for SY2020–2021 (n = 5).

Phase One: Pre-Assessment

After piloting the new electronic pretest format in fall 2020, I collected responses (N=93) from mid-November to early December of 2020 from sixth-, seventh-, and eighth-grade students in three groups: Full Creativity group (n = 42; all sixth graders) consisted of students enrolled in the school-based creativity program. Students were selected randomly by lottery until program spaces were full in one of four areas: Music & Recording, Film & Animation, Art & Design, and Technology & Engineering. Partial Creativity group (n = 28; 22 seventh graders, 6 eighth graders) consisted of students not enrolled in the school-based creativity program. In order to balance class sizes, students from the Partial Creativity group were placed on the School-Based Creativity Program Academic Teams with the students in the program. Group 3 (n = 23; 17 seventh graders, 6 eighth graders) consisted of students not enrolled in the school-based program, and they were not placed on School-Based Creativity Program Academic Teams. The No Creativity Group students did not receive any School-Based Creativity Program services.

Each student completed a one-hour electronic pre-assessment, which consisted of the RIBS, Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game from the *rCAB Tests.*

Phase Two: School-Based Creativity Program

The students were enrolled in the school-based creativity program. Based on the breakdown of participants, only sixth grade (all of Full Creativity) received full school-based

creativity program services. The sixth-grade students received project-based learning in academic classrooms and the school-based creativity program in English/language arts once a week. Partial Creativity (seventh and eighth graders) did not get PBL in their academic classrooms because the teachers were not trained in it. The seventh- and eighth-grade students in the Partial Creativity group still received school-based creativity program services during their English/language arts classes. Both, Full Creativity and Partial Creativity groups created gig and capstone projects because it took place during their English/language arts class. The No Creativity group did not create any projects because they were not receiving creativity services.

Phase Three: Post-Assessment

The online posttest was administered in May 2021. The posttest was the same format as the pretest, but the divergent thinking questions were altered, so students were not giving the same responses as the pretest. In addition to the pre- and posttest, the students took the Georgia Milestones standardized assessment in April 2021. Once the students completed the GMAS, the students' academic achievement scores from the current school year were sent to the onsite school administrator. The administrator then matched the standardized assessment scores to the aligning participant number for anonymity. Once all standardized assessment data were matched, the administrator sent the scores to the researchers. Due to COVID-19, students were not required to take the Georgia Milestones, which negatively impacted the sample size (n = 66; Full Creativity- Sixth Grade: n = 29, Seventh Grade: n = 22, Eighth Grade: n = 15).

Lastly, the music-focused capstone projects were completed in May 2021 (n = 5; Eighth Grade: n = 5). The students' final projects were uploaded by the students and school administrator to a video platform called Flipgrid.

Data Analysis

I hypothesized that the Full Creativity-sixth grade students would score higher on the divergent thinking measures from time 1 to time 2 over the Partial and No Creativity groups. Based on the pilot study procedures, intra-class correlation was checked by looking at 10% of the pretests. I chose for the evaluators to only look at 10% of the data, because of their time commitments. They were unable to evaluate more than 10%. The evaluation process of divergent thinking tasks is a long and arduous process for a rater. Unfortunately, they were unable to complete more than 10% of the participant data. I used four outside raters to check for intra-class correlation. The four outside raters consisted of two undergraduate and two graduate students from a music cognition and creativity lab. The raters were chosen as evaluators for this study because they had 10+ years' experience in the music field and 1+ years' experience in creativity. The participants and I met virtually to review scoring procedures. The evaluators received the same information from the Runco Scoring Guide.

After intra-class correlation was checked, I began to analyze the pre- and posttest scores and Georgia Milestones scores. Nonparametric testing was chosen to analyze the Runco pre-assessment data by grade level, as well as pre- and post-assessment by creativity groups, because the sample size was not normally distributed across grade level or group. The Kruskal-Wallis test was used to investigate three main effects for this current research study: 1) The effect the school-based creativity program has on divergent thinking scores by comparing groups, 2) The effect time 1 (pretest) and time 2 (posttest) have on divergent thinking scores, and 3) the effect of grade level for pretest only. Since I was unable to compare across groups due to an uneven sample distribution, I compared pretests to posttests within groups through a paired samples t-test for each cumulative scoring category.

Additionally, I divided participants into two groups based on their GMAS standardized scores: low achieving (n = 33) and high achieving (n = 33). The division was similar to Anwar et al.'s (2012) research on creativity of high and low achievers at the secondary school level. I conducted two repeated measures analyses, 1) pre- and posttest divergent thinking scores with GMAS ELA as a covariate and 2) pre- and posttest divergent thinking scores with GMAS Math as a covariate to determine potential interactions between high and low group membership and divergent thinking improvement. However, when conducting multiple analyses on the same dependent variable (scores), the chance of committing a Type 1 error increases, which could increase the likelihood of coming across a significant result. A Bonferroni correction was conducted to help protect from a Type 1 error.

A content analysis was used to identify interesting features and elements that did or did not align with the conceptual framework. I looked for features of these products that show how creativity manifests through music. The themes found to form the analysis will be presented in chapter 4.

Limitations

There were four important limitations to this study design. The first was the intra-class correlation. The outside raters should have evaluated more than 10% of the divergent thinking data. Ideally, the outside raters should evaluate 35–50% of the data to depict how well their scores relate to one another accurately.

The second limitation was classroom restrictions because of COVID-19. All instruction during the pandemic was divided between in-school and remote learning. Students were given the option to learn at school or in their homes. Since the change of environment, students in Full Creativity-Sixth Grade or Partial Creativity groups received the school-based creativity program online. However, students enrolled in in-person learning met with the program coordinator and

teachers at school, while the virtual students met with the program coordinator online. Since the coaching was not given through the same platform for all students, the study may see a drastic difference in scores between the virtual and in-person group members. Ideally, all students should be receiving coaching from the same platform.

Third, due to COVID-19, the pre- and posttests moved to an electronic format. Participants took the pretest and posttest at their house, which could have led to unreliable answers. Since students were home, participants may have worked together and had issues with not answering some of the questions. Ideally, all students should have completed the test battery in the presence of a school administrator.

Fourth, the Runco testing battery chosen for this research study was already put in place before the start of this dissertation. Unfortunately, the chosen testing battery only looked at divergent thinking through writing prompts. Since the test limited the participants on how they could respond, it could potentially impact results. In hindsight, I should have changed the testing battery to evaluate divergent thinking through writing and drawing prompts, as well as virtual games to give students different outlets to showcase divergent thinking potentially.

4 RESULTS AND ANALYSIS

The first section of this chapter reports the findings by data source. Data sources included pre- and post-assessment from the Runco Ideational Behavioral Scale, Realistic Problem Generation, Realistic Presented Problems, Titles Game, Figures, and Georgia Milestones Achievement Scores. The second section of the chapter summarizes the findings based on the research questions.

Runco Ideational Behavioral Scale

All participants completed Likert items from the Runco Ideational Behavioral Scale. The data was transferred into SPSS Statistic Version 26 for statistical analysis. As mentioned in chapter 3, the RIBS consists of 28 Likert items that measure everyday creativity (see Table 4.1). A flip scale was used for questions 6, 15, 21, and 24 to avoid repetition and prevent bias (see highlighted questions in Table 4.1). Participants were instructed to answer each Likert-style item on a 0–4 scale indicating how often each of the phrases described their thinking and behavior, from 0 being “never” to 4 being “just about every day, and sometimes more than once each day.”

Table 4.1

RIBS Questions

RIBS Questions
Q1When faced with a problem I take my time exploring various options and alternative solutions.
Q2 I change what I want to do as a career.
Q3 When reading books or stories I have ideas of better endings
Q4 When faced with a problem I do not just accept the first solution. I make sure to think of several options.
Q5 People wonder if I am scatter-brained or absent-minded because I think about different things all at once.
Q6 I have thoughts, which can block out all other thoughts—it is like I am stuck in a rut.
Q7 I work out new ways to solve a problem.
Q8 I see better ways of doing boring things.
Q9 I have an idea about a new route between home and school.
Q10 I see a cloud and have several ideas about what the shape or figure could be.
Q11 I observe people and think about the reasons and meaning behind their actions.
Q12 I look at a problem from more than one point of view.
Q13 It is easy for me to understand other people's ideas.
Q14 I have different thoughts about careers that would be fun for me.
Q15 When cooking, I stick to the recipe or the directions that came with the food.
Q16 When I need a new username or password, it is easy for me to think of good options.
Q17 When I get a new pet, or when someone I know gets one, it is easy for me to think of good names for it.
Q18 I see a pattern (on the sidewalk, or anywhere outside) and see things in the shape.
Q19 I consider many options and alternatives when solving a problem.
Q20 I have different thoughts about careers that would be fun for me.
Q21 When making things, I stick to plans. I do not improvise if someone has prepared plans.
Q22 I have ideas for arranging or rearranging the furniture at home.
Q23 I read something (written by someone else) and realize there are different ways to look at life.
Q24 Sometimes I make plans (e.g., going to a particular restaurant or movie), but something ruins those plans and I can't think of what to do instead.
Q25 I see a shadow or some other pattern and have an idea for what it could represent.
Q26 When doing math I am tempted to follow my own ideas about how to solve a math problem.
Q27 If someone tells me how to do something, I tend to think of different ways to get it done.
Q28 When reading, I often think of different titles for the book or article.

RIBS Pre- and Post-Assessment

The four negative behavior questions were recoded before analyzing the pre- and post-assessment data. Specifically, a score of 0 (never) would equal 4 (just about every day), 1 (yearly) equals 3 (weekly), and a rating of 2 (monthly) stayed the same. For example, Participant A answered question 6, "I have thoughts, which can block out all other thoughts—it is like I am stuck in a rut" with an answer of 1 (yearly). Since the question was in the negative, it must be recoded to reflect the ideational behavior level of the participant. On a weekly basis (3), the participant has multiple thoughts and does not feel like they are stuck in a rut.

Table 4.2 presents descriptive statistics for each group's RIBS Overall Pre- and Post-Assessment scores by group.

Table 4.2

Descriptive Statistics of RIBS Pre- and Post-Assessment Scores by Group

Creativity Group	Overall Pretest RIBS Scores			Overall Posttest RIBS Scores		
	n	*M*	*SD*	*n*	*M*	*SD*
Full-Creativity	32	2.38	.58	32	2.42	.57
Partial Creativity	33	2.79	.51	33	2.66	.52
No Creativity	10	2.46	.39	10	2.81	.64

A Kruskal-Wallis test was performed on the mean RIBS Overall Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, Partial Creativity, and No Creativity groups. Results indicated nonsignificant difference between Full Creativity-Sixth Grade, Partial Creativity, and No Creativity ($\chi^2(2) = 4.22$, $p = 0.12$, $\varepsilon^2 = 0.16$). A Kruskal-Wallis test was performed on the mean RIBS Overall Post-Assessment score to determine significance between Full Creativity-Sixth Grade, Partial Creativity, and No Creativity

groups. Results indicated no significance between Full Creativity-Sixth Grade, Partial Creativity, and No Creativity, ($\chi^2(2) = 2.36$, $p = 0.30$, $\varepsilon^2 = 0.16$).

Table 4.3 presents descriptive statistics for each group's RIBS Overall Pre- and Post-Assessment scores by grade level.

Table 4.3

Descriptive Statistics of RIBS Pre- and Post-Assessment Scores by Grade Level

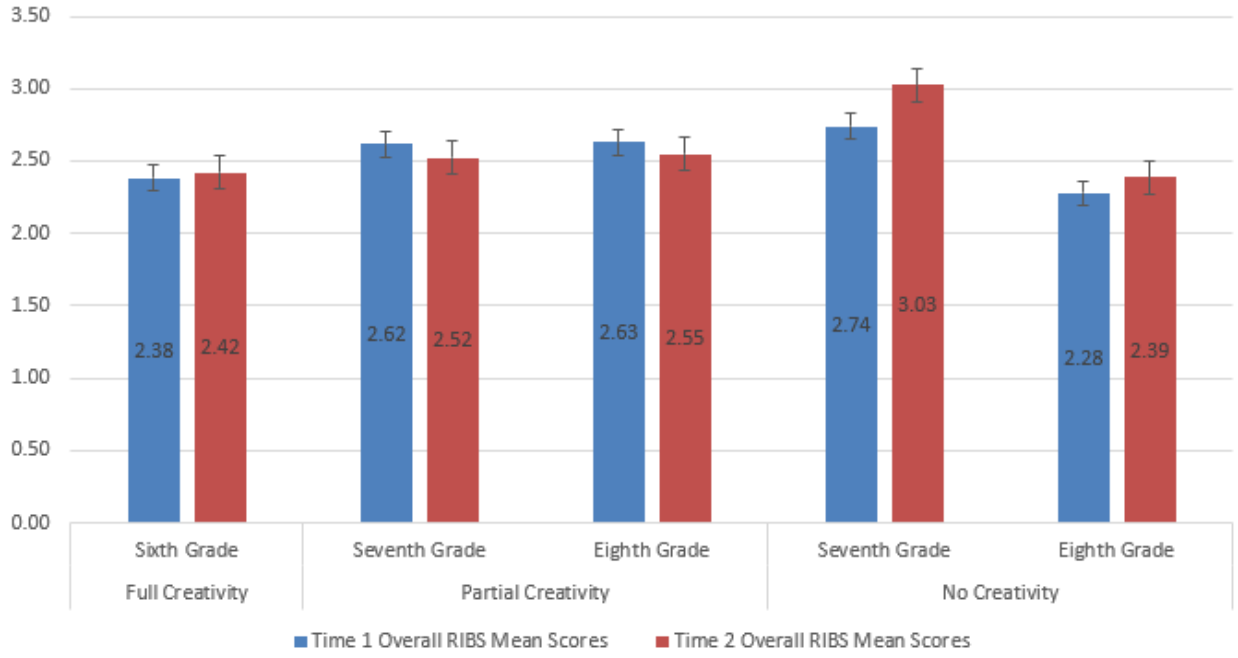
Grade Level	Overall Pretest RIBS Scores			Overall Posttest RIBS Scores		
	n	*M*	*SD*	*n*	*M*	*SD*
Sixth Grade	32	2.38	.58	32	2.42	.57
Seventh Grade	24	2.75	.48	24	2.72	.56
Eighth Grade	19	2.66	.53	19	2.66	.55

A Kruskal-Wallis test was performed on the mean RIBS Overall Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there were no significant differences between Full Creativity-Sixth Grade, seventh grade, and eighth grade ($\chi^2(2) = 3.44$, $p = 0.18$, $\varepsilon^2 = 0.10$). A Kruskal-Wallis test was performed on the mean RIBS Overall Post-Assessment score to determine significance between Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated no significance between Full Creativity-Sixth Grade, seventh grade, and eighth grade ($\chi^2(2) = 1.99$, $p = 0.37$, $\varepsilon^2 = 0.11$).

Figure 4.1 presents a mean comparison between RIBS pre- and post-assessment scores of all groups and grade levels.

Figure 4.1

Comparison of Overall Means of RIBS Pre- and Post-Assessment by Group and Grade Level



I believe these results may be influenced by students' perceptions of their creativity. Since the RIBS questionnaire is a self-reporting tool that gives students the opportunity to critique their creativity, students may not be aware how little or much creativity they use on a daily basis. The sample size is small, which means the results may not be meaningful. There was no significant change across grade level. Based on descriptive statistics, participants in the No Creativity group had a higher overall mean score for Time 2. Even though this group did not receive any specific school-based creativity training, it is possible students in 8th grade simply improve over time on this measure. This will be discussed further in the Discussion section below.

Divergent Thinking Questions

Data was gathered from divergent thinking questions for each group and grade level. As previously outlined in chapter 3, a rating scale was adapted from the Runco Scoring Guide and

Reiter-Palmon et al. (2019) to assess the participants' responses. There were four categories of divergent thinking questions: Realistic Problem Generation, Realistic Presented Problems, Title Games, and Figures. All categories required student responses, which were graded on fluency, flexibility, and subjective originality. The open-ended questions were designed to measure a student's creative potential.

As stated in chapter 3, the reliability of the evaluation process for divergent thinking questions was rechecked with more raters ($N = 5$). Each rater evaluated about 10% of the pre-assessments ($N = 93*.10 = 9.30 \approx 10$ participants) using the Runco Scoring Guide to measure fluency and flexibility. Fluency is the number of responses per question, image, or title. Flexibility is the number of categories of all responses per question, image, or title. The Reiter-Palmon et al. (2019) scoring was used to evaluate originality through subjective ratings. The outside raters and I separately rated the 10 participant pretests in an MS Word file. Raters scored each response on three categories (fluency, flexibility, and subjective originality). Subjective originality was scored based on the 10 participants and not the entire sample. Table 4.4 outlines the number of points a response may earn with 10 participants in the sample. The evaluator adds up all the points from a question, image, or title to come up with the participant's subjective originality score.

Table 4.4

*Subjective Originality Scoring for Reliability (*N = *10)*

Number of Participants Per Same Response	Number of Points per Response
0 participants	2 points
1 participant	1 point
2 or more participants	0 points

Questions 1–2, Realistic Problem Generation

The first task, Divergent Thinking: Realistic Problem Generation (RPG), consisted of two, three-part questions. For the first part of the question, the participants created a list of problems impacting a given topic. In the second part of the question, the participants chose one problem from their first section list. The third part of the question had the participants list possible solutions to that problem. The first and third tasks were scored on fluency, flexibility, subjective originality, and total (average taken from the three previous scoring categories). Table 4.5 presents descriptive statistics for each grade level's RPG Pre-Assessment scores.

Table 4.5

Descriptive Statistics of Realistic Problem Generation Pre-Assessment Scores by Grade Level

Grade	Pre-RPG Fluency		
	n	*M*	*SD*
Sixth Grade	30	2.49	.71
Seventh Grade	23	3.96	1.54
Eighth Grade	19	3.63	1.80

Grade	Pre-RPG Flexibility		
	n	*M*	*SD*
Sixth Grade	30	1.77	.41
Seventh Grade	23	2.42	.68
Eighth Grade	19	2.11	.67

Grade	Pre-RPG Subjective Originality		
	n	*M*	*SD*
Sixth Grade	30	7.60	2.92
Seventh Grade	23	13.52	5.67
Eighth Grade	19	12.17	7.45

Grade	Pre-RPG Total		
	n	*M*	*SD*
Sixth Grade	30	3.95	1.28
Seventh Grade	23	6.63	2.57
Eighth Grade	19	5.97	3.27

Table 4.6 presents descriptive statistics for each group's RPG Pre- and Post-Assessment scores.

Table 4.6

Descriptive Statistics of Realistic Problem Generation Pre- and Post-Assessment Scores by Group

Group	Pre-RPG Fluency			Post-RPG Fluency		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	2.49	.71	31	2.32	.96
Partial Creativity	32	3.85	1.64	33	3.42	1.82
No Creativity	10	3.68	1.78	10	3.05	.88

Group	Pre-RPG Flexibility			Post-RPG Flexibility		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	1.77	.41	31	1.73	.55
Partial Creativity	32	2.30	.71	33	2.08	.70
No Creativity	10	2.23	.65	10	1.73	.36

Group	Pre-RPG Subjective Originality			Post-RPG Subjective Originality		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	7.60	2.92	31	8.63	4.20
Partial Creativity	32	12.91	6.15	33	12.38	7.70
No Creativity	10	12.90	7.84	10	11.08	4.80

Group	Pre-RPG Total			Post-RPG Total		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	3.95	1.28	31	4.22	1.85
Partial Creativity	32	6.35	2.77	33	5.96	3.32
No Creativity	10	6.27	3.41	10	5.28	1.88

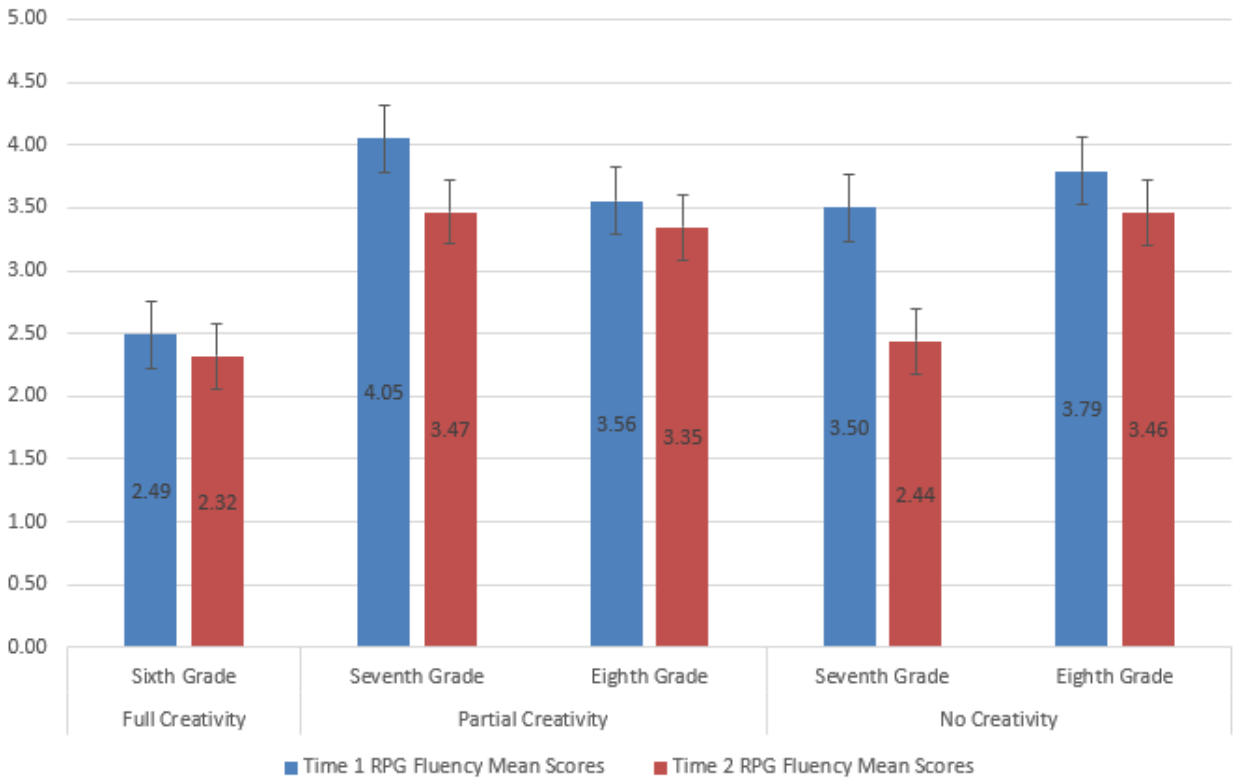
Fluency

A Kruskal-Wallis test was performed on the mean Realistic Problem Generation Fluency Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there was a statistically significant difference between grade levels with a moderate effect size ($\chi^2(2) = 13.38$, $p = 0.001$, $\varepsilon^2 = 0.09$) with the sixth grade scoring lower.

Figure 4.2 presents the mean comparison between group and grade levels for Realistic Problem Generation Fluency Pre- and Post-Assessments.

Figure 4.2

Realistic Problem Generation Fluency Pre- and Post-Assessment Means by Group and Grade Level



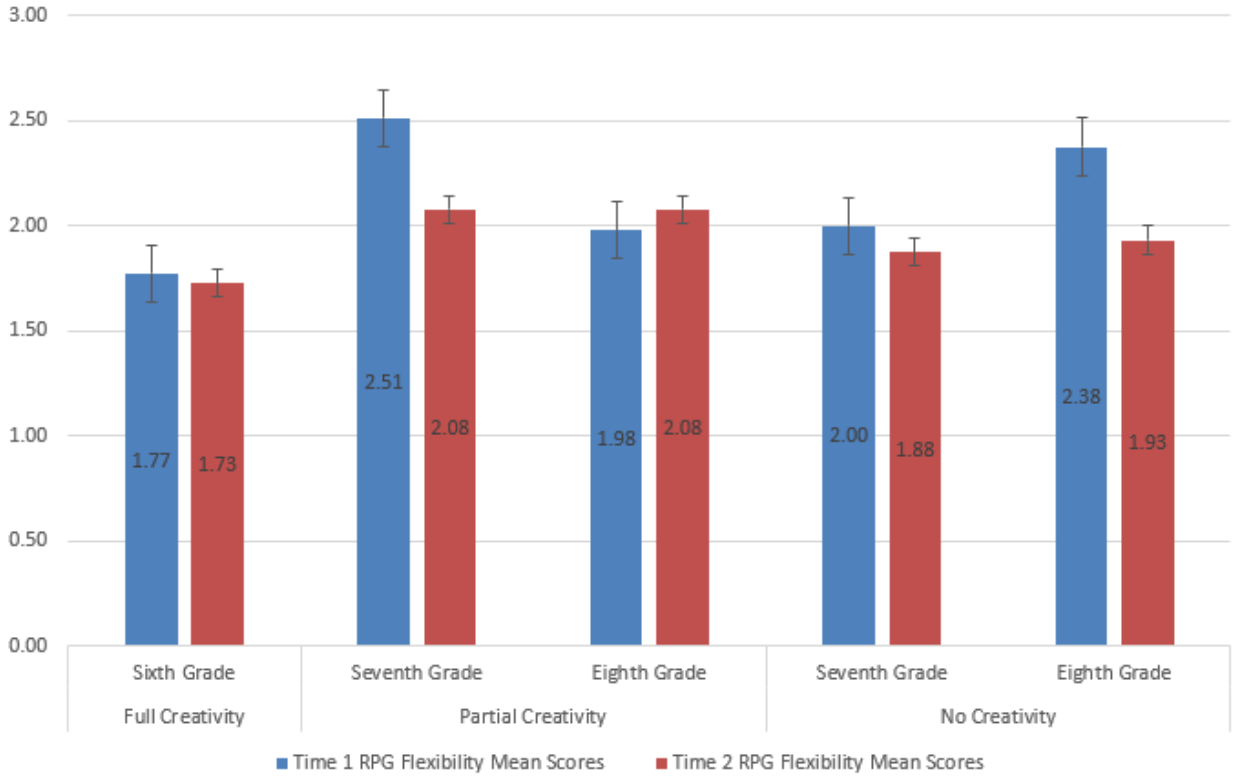
Flexibility

A Kruskal-Wallis test was performed on the mean Realistic Problem Generation Flexibility Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated a significant difference between grade levels with a moderate effect size ($\chi^2(2) = 12.95$, $p = 0.002$, $\varepsilon^2 = 0.09$).

Figure 4.3 presents the mean comparison between group and grade levels for Realistic Problem Generation Flexibility Pre- and Post-Assessment.

Figure 4.3

Realistic Problem Generation Flexibility Pre- and Post-Assessment Means by Group and Grade Level



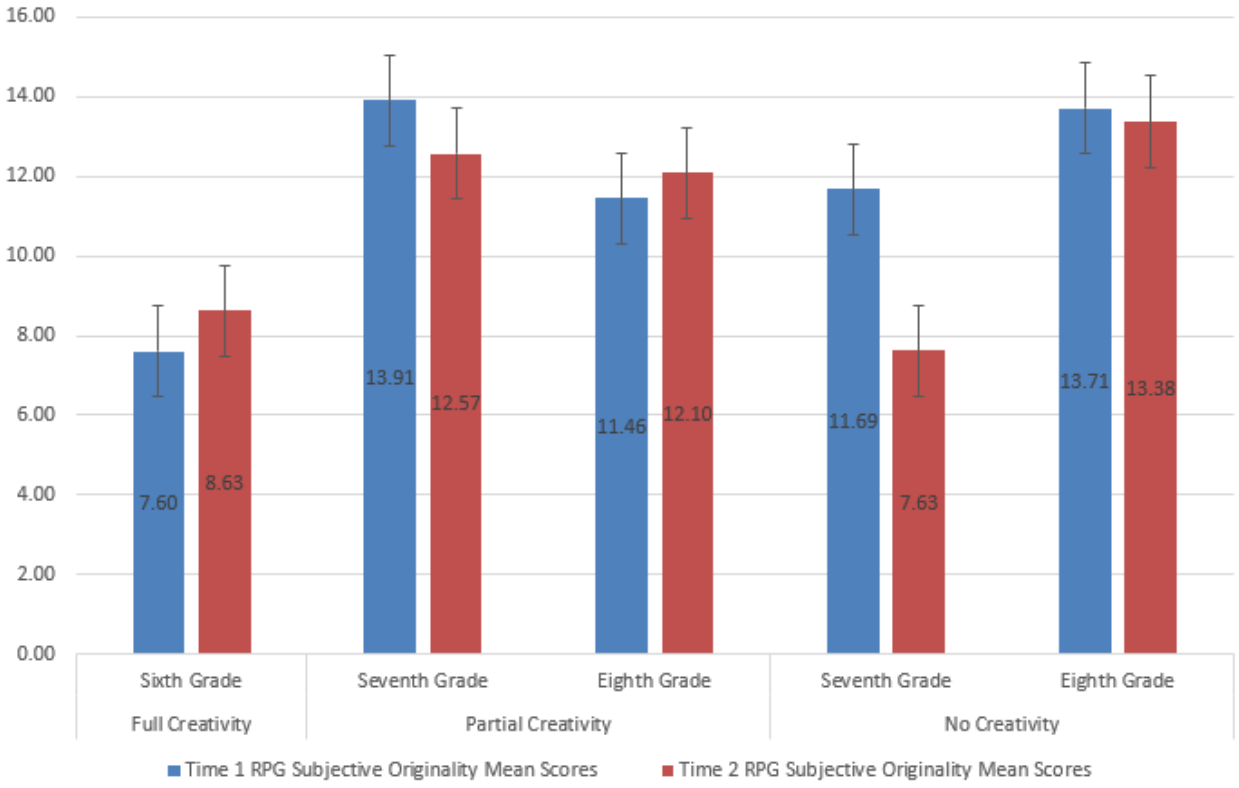
Subjective Originality

A Kruskal-Wallis test was performed on the mean Realistic Problem Generation Subjective Originality Pre-Assessment scores to determine if there were significant differences between Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated a significant difference between grade levels with a moderate effect size ($\chi^2(2) = 14.02$, $p < 0.001$, $\varepsilon^2 = 0.09$) with sixth grade scoring lower.

Figure 4.4 presents the mean comparison between group and grade levels for Realistic Problem Generation Subjective Originality Pre-Assessment.

Figure 4.4

Realistic Problem Generation Subjective Originality Pre- and Post-Assessment Means by Group and Grade Level



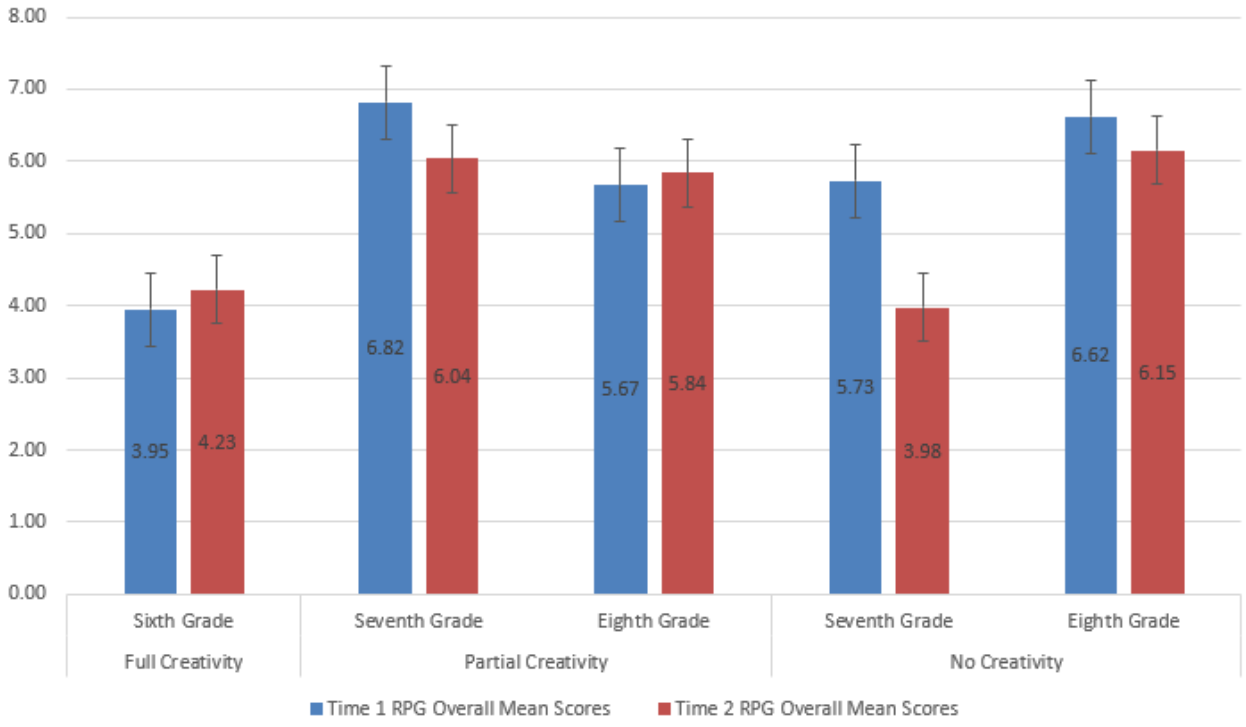
Overall Total

A Kruskal-Wallis test was performed on the mean Realistic Problem Generation Total Pre-Assessment scores to determine if there were significant differences between grade levels. Results indicated that there were significant differences between grade levels for the pretest scores with a moderate effect size ($\chi^2(2) = 14.57$, $p < 0.001$, $\varepsilon^2 = 0.09$) with sixth grade scoring lower.

Figure 4.5 presents a mean comparison between RPG Overall Total pre- and post-assessment scores of all groups and grade levels.

Figure 4.5

RPG Overall Total Pre- and Post-Assessment Means by Group and Grade Level



Questions 3–4, Realistic Presented Problems

Divergent Thinking: Realistic Presented Problems (RPP) consisted of two questions. The participants read about two problems that may occur at school and at home. After reading the problem, participants wrote down as many solutions as they could for each problem. The tasks were scored on fluency, flexibility, subjective originality, and total (average taken from the three previous scoring categories).

Table 4.7 presents descriptive statistics for each group's Realistic Presented Problem Pre-Assessment scores by grade level.

Table 4.7

Descriptive Statistics of Realistic Presented Problem Pre-Assessment Scores by Grade Level

Grade	Pre-RPP Fluency		
	n	*M*	*SD*
Sixth Grade	30	2.80	.95
Seventh Grade	24	4.04	2.41
Eighth Grade	18	3.47	1.51

Grade	Pre-RPP Flexibility		
	n	*M*	*SD*
Sixth Grade	30	2.07	.74
Seventh Grade	24	2.65	1.02
Eighth Grade	18	2.22	.57

Grade	Pre-RPP Subjective Originality		
	n	*M*	*SD*
Sixth Grade	30	5.77	3.24
Seventh Grade	24	9.02	6.60
Eighth Grade	18	7.94	5.38

Grade	Pre-RPP Total		
	n	*M*	*SD*
Sixth Grade	30	3.54	1.47
Seventh Grade	24	5.24	3.25
Eighth Grade	18	4.55	2.40

Table 4.8 presents descriptive statistics by creativity group for Realistic Present Problem pre- and post-assessment scores.

Table 4.8

Descriptive Statistics of Realistic Presented Problem Pre- and Post-Assessment Scores by Group

Group	Pre-RPP Fluency			Post-RPP Fluency		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	2.80	.95	32	2.75	1.25
Partial Creativity	32	3.91	2.27	33	3.39	1.90
No Creativity	10	3.45	1.28	10	2.80	1.48

Group	Pre-RPP Flexibility			Post-RPP Flexibility		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	2.07	.74	32	2.30	.91
Partial Creativity	32	2.50	.97	33	2.65	1.35
No Creativity	10	2.35	.47	10	2.30	1.14

Group	Pre-RPP Subjective Originality			Post-RPP Subjective Originality		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	5.77	3.24	32	4.92	3.38
Partial Creativity	32	8.86	6.67	33	7.53	6.64
No Creativity	10	7.60	3.58	10	6.80	5.08

Group	Pre-RPP Total			Post-RPP Total		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	30	3.54	1.47	32	3.32	1.77
Partial Creativity	32	5.09	3.20	33	4.53	3.23
No Creativity	10	4.47	1.66	10	3.97	2.49

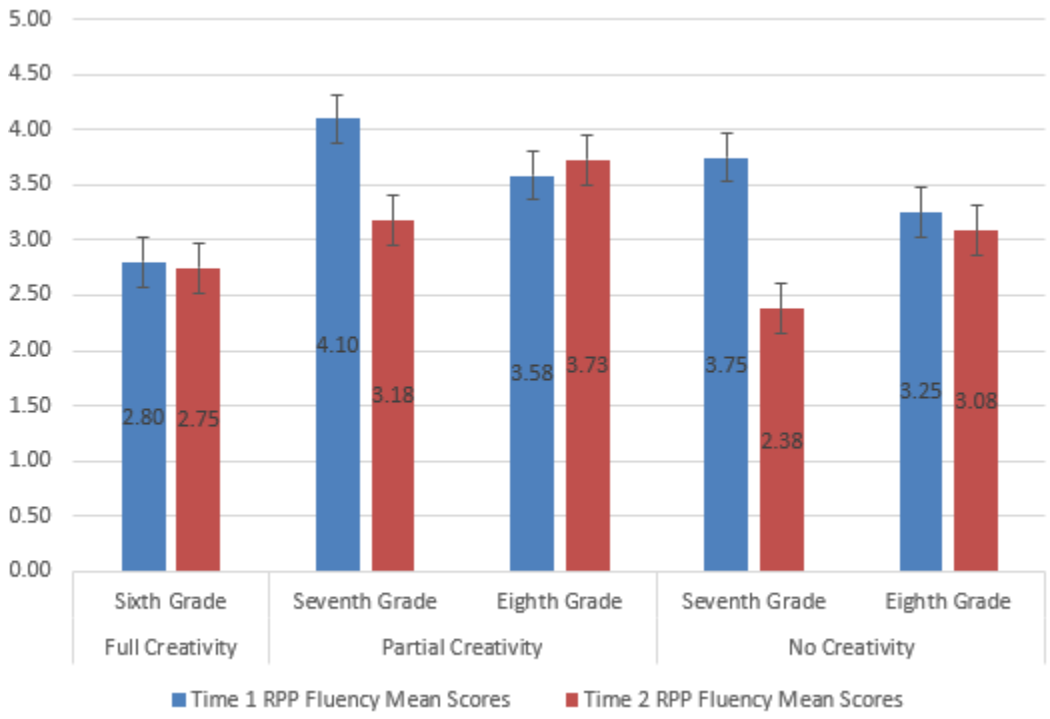
Fluency

A Kruskal-Wallis test was performed on the mean Realistic Presented Problem Fluency Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there was no significant difference between grade levels with a moderate effect size ($\chi^2(2) = 3.94$, $p = 0.02$, $\varepsilon^2 = 0.10$).

Figure 4.6 presents the mean comparison between group and grade levels for Realistic Presented Problem Fluency Pre- and Post-Assessments.

Figure 4.6

Realistic Presented Problem Fluency Pre- and Post-Assessment Means by Group and Grade Level



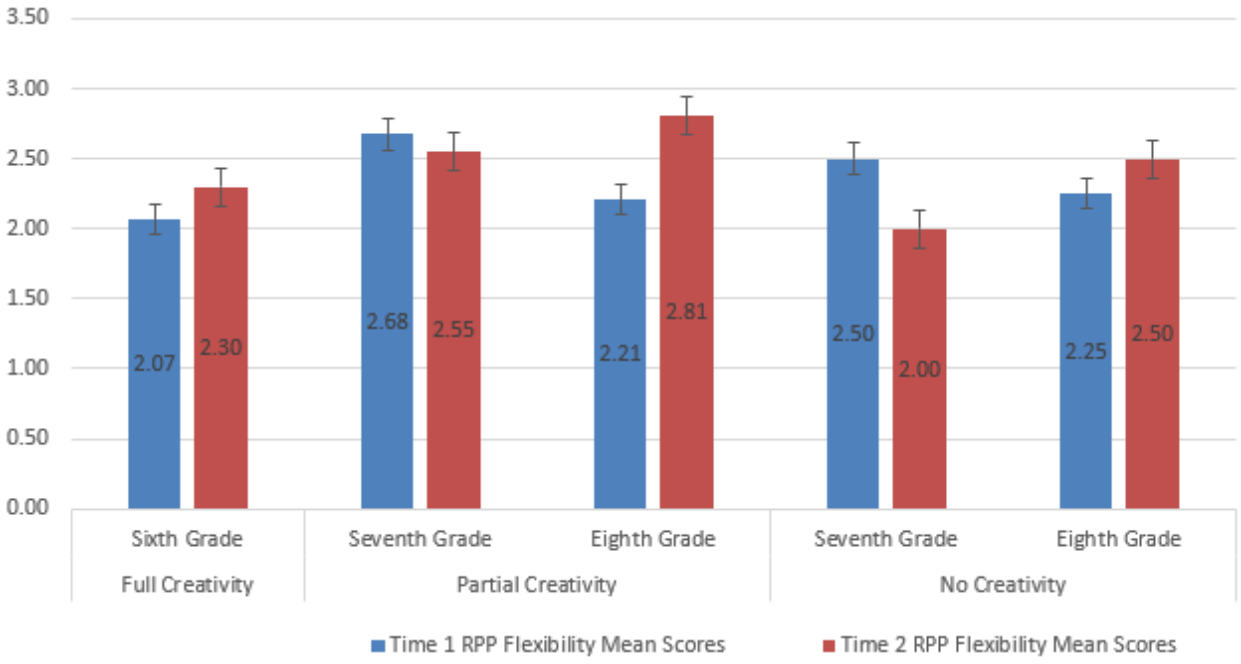
Flexibility

A Kruskal-Wallis test was performed on the mean Realistic Presented Problem Flexibility Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there was no significant difference between grade levels ($\chi^2(2) = 4.74$, $p = 0.09$, $\varepsilon^2 = 0.10$).

Figure 4.7 presents the mean comparison between group and grade levels for Realistic Presented Problem Flexibility Pre- and Post-Assessments.

Figure 4.7

Realistic Presented Problem Flexibility Pre- and Post-Assessment Means by Group and Grade Level



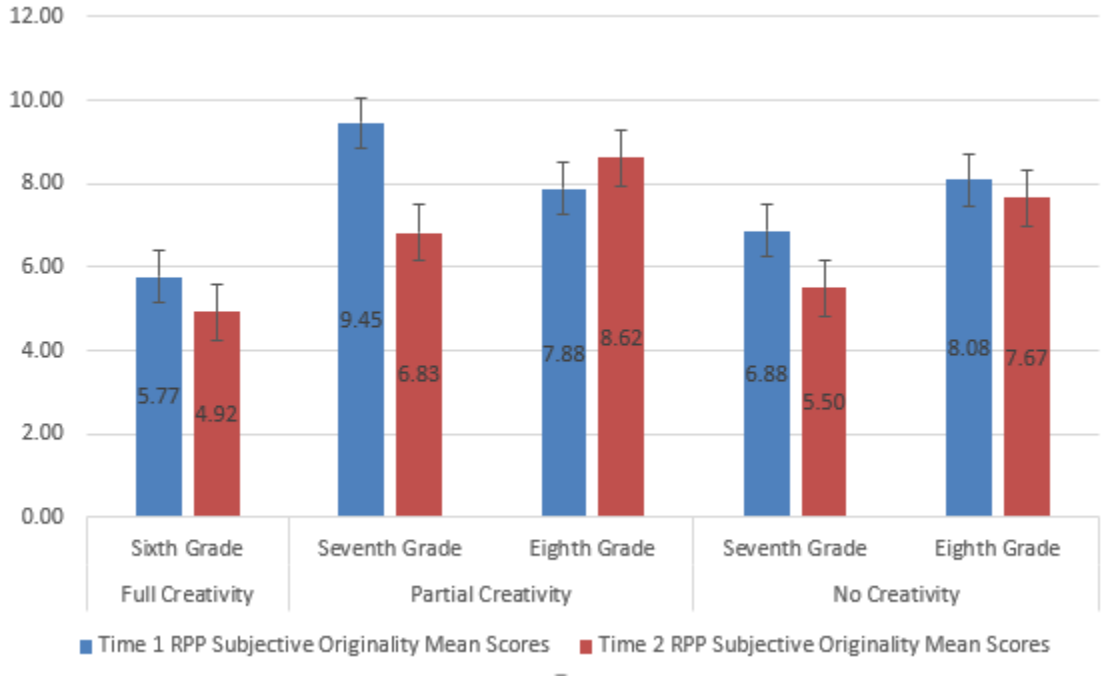
Subjective Originality

A Kruskal-Wallis test was performed on the mean Realistic Presented Problem Subjective Originality Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there were no significant differences between grade levels ($\chi^2(2) = 3.28$, $p = 0.19$, $\varepsilon^2 = 0.10$)

Figure 4.8 presents the mean comparison between group and grade levels for Realistic Presented Problem Subjective Originality Pre- and Post-Assessments.

Figure 4.8

Realistic Presented Problem Subjective Originality Pre- and Post-Assessment Means by Group and Grade Level



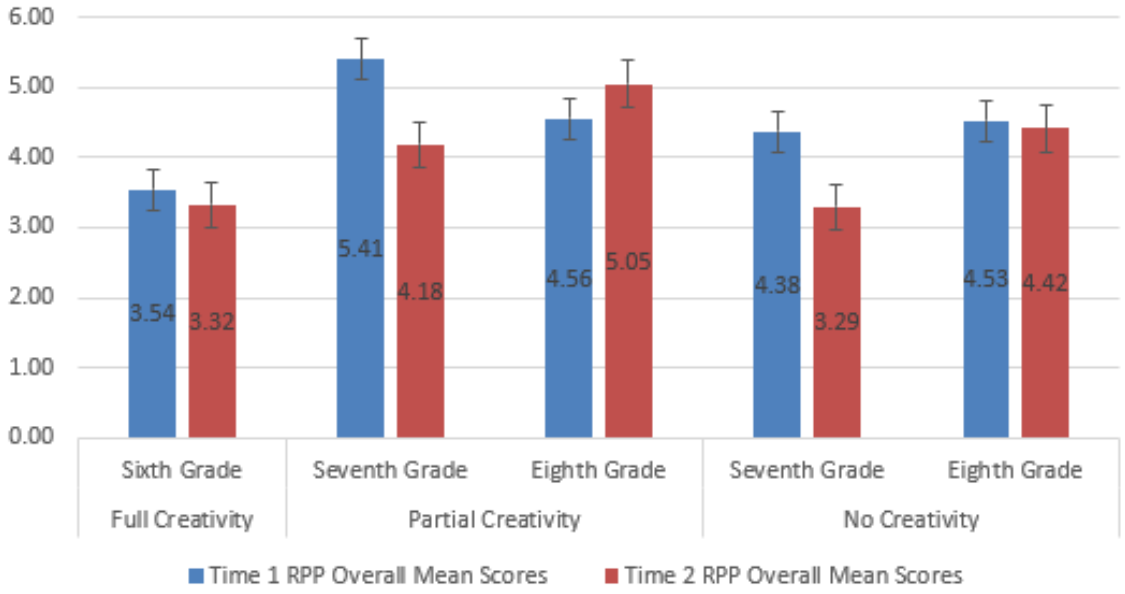
Overall Total

A Kruskal-Wallis test was performed on the mean Realistic Presented Problem Overall Total Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there was a statistically significant difference between grade levels with a moderate effect size ($\chi^2(2) = 3.51$, $p = 0.07$, $\varepsilon^2 = 0.10$).

Figure 4.9 presents the mean comparison between group and grade levels for Realistic Presented Problem Overall Total Pre- and Post-Assessments.

Figure 4.9

Realistic Presented Problem Overall Total Pre- and Post-Assessment Means by Group and Grade Level



Questions 5–7, Titles Game

Divergent Thinking: Titles Game (TG) consisted of three questions. The participants listed as many alternative titles as possible for specific movies, tv shows, and books. The tasks were scored on fluency, flexibility, subjective originality, and total (average taken from the three previous scoring categories).

Table 4.9 presents descriptive statistics for each group's Titles Game Pre-Assessment scores by grade level.

Table 4.9

Descriptive Statistics of Titles Game Pre-Assessment Scores by Grade Level

Grade	Pre-TG Fluency		
	n	*M*	*SD*
Sixth Grade	29	1.83	.90
Seventh Grade	23	2.73	1.67
Eighth Grade	17	2.82	1.97

Grade	Pre-TG Flexibility		
	n	*M*	*SD*
Sixth Grade	29	1.54	.59
Seventh Grade	23	1.67	.82
Eighth Grade	17	1.75	.85

Grade	Pre-TG Subjective Originality		
	n	*M*	*SD*
Sixth Grade	29	8.42	4.23
Seventh Grade	23	12.56	7.49
Eighth Grade	17	12.59	9.07

Grade	Pre-TG Total		
	n	*M*	*SD*
Sixth Grade	29	3.93	1.88
Seventh Grade	23	5.65	3.30
Eighth Grade	17	5.72	3.91

Table 4.10 presents descriptive statistics of Tiles Game Pre- and Post-Assessment scores by group.

Table 4.10

Descriptive Statistics of Titles Game Pre- and Post-Assessment Scores by Group

Group	Pre-TG Fluency			Post-TG Fluency		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	1.83	.90	31	1.84	.88
Partial Creativity	30	2.81	1.96	33	2.58	1.62
No Creativity	10	2.67	1.14	10	2.85	1.06

Group	Pre-TG Flexibility			Post-TG Flexibility		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	1.54	.59	31	1.27	.34
Partial Creativity	30	1.69	.90	33	1.45	.57
No Creativity	10	1.73	.56	10	1.55	.44

Group	Pre-TG Subjective Originality			Post-TG Subjective Originality		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	8.42	4.23	31	6.97	3.77
Partial Creativity	30	12.93	8.99	33	9.83	7.02
No Creativity	10	11.50	4.59	10	11.25	5.20

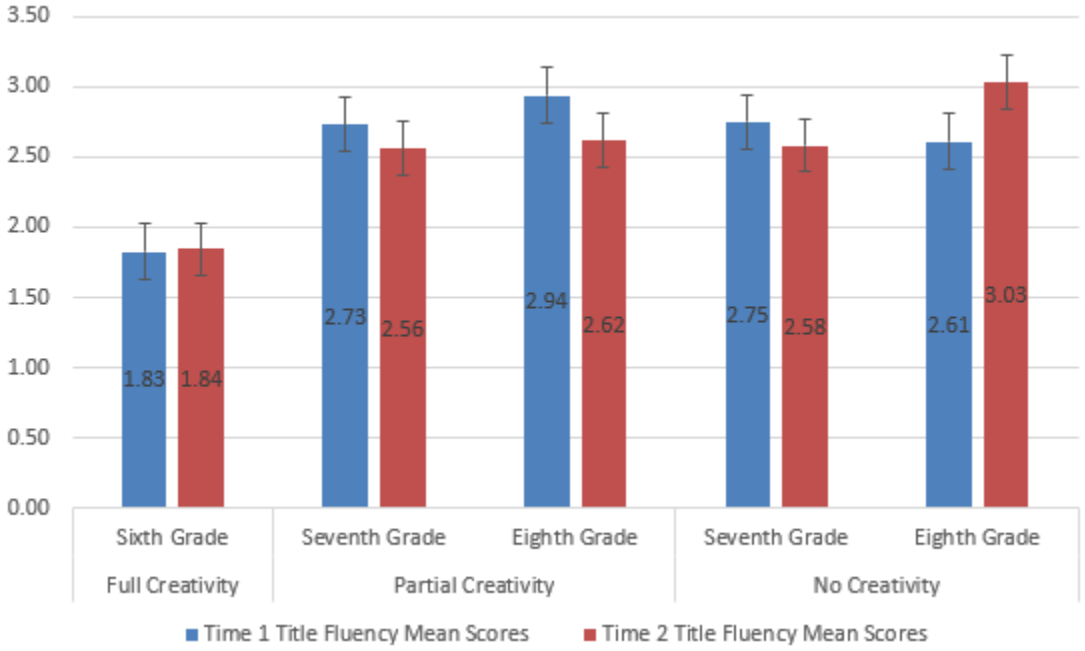
Group	Pre-TG Total			Post-TG Total		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	3.93	1.88	31	3.36	1.62
Partial Creativity	30	5.81	3.92	33	4.62	3.01
No Creativity	10	5.30	2.01	10	5.22	2.16

Fluency

A Kruskal-Wallis test was performed on the mean Titles Game Fluency Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there was a statistically significant difference between grade levels for pretest scores with sixth grade scoring lower with a moderate effect size ($\chi^2(2) = 5.71$, $p = 0.05$, $\varepsilon^2 = 0.11$). Figure 4.10 presents the mean comparison between group and grade levels for Titles Game Overall Fluency Pre- and Post-Assessments.

Figure 4.10

Titles Game Fluency Pre- and Post-Assessment Means by Group and Grade Level

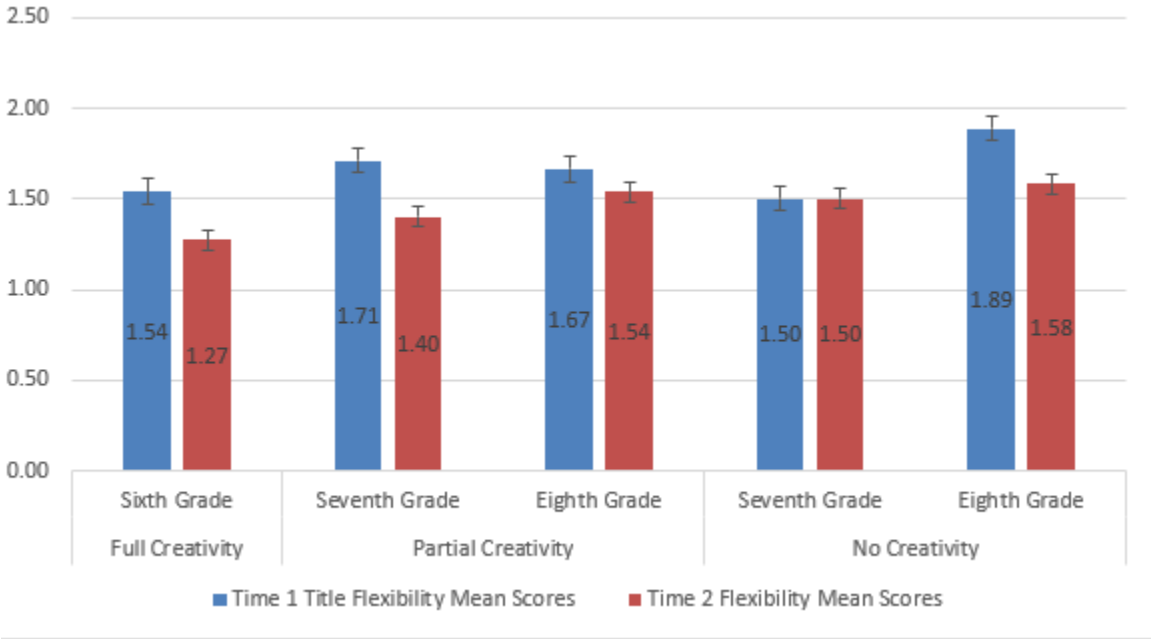


Flexibility

A Kruskal-Wallis test was performed on the mean Titles Game Flexibility Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there were no significant differences between grade levels ($\chi^2(2) = 0.54$, $p = 0.76$, $\varepsilon^2 = 0.11$). Figure 4.11 presents the mean comparison between group and grade levels for Titles Game Overall Flexibility Pre- and Post-Assessments.

Figure 4.11

Titles Game Flexibility Pre- and Post-Assessment Means by Group and Grade Level

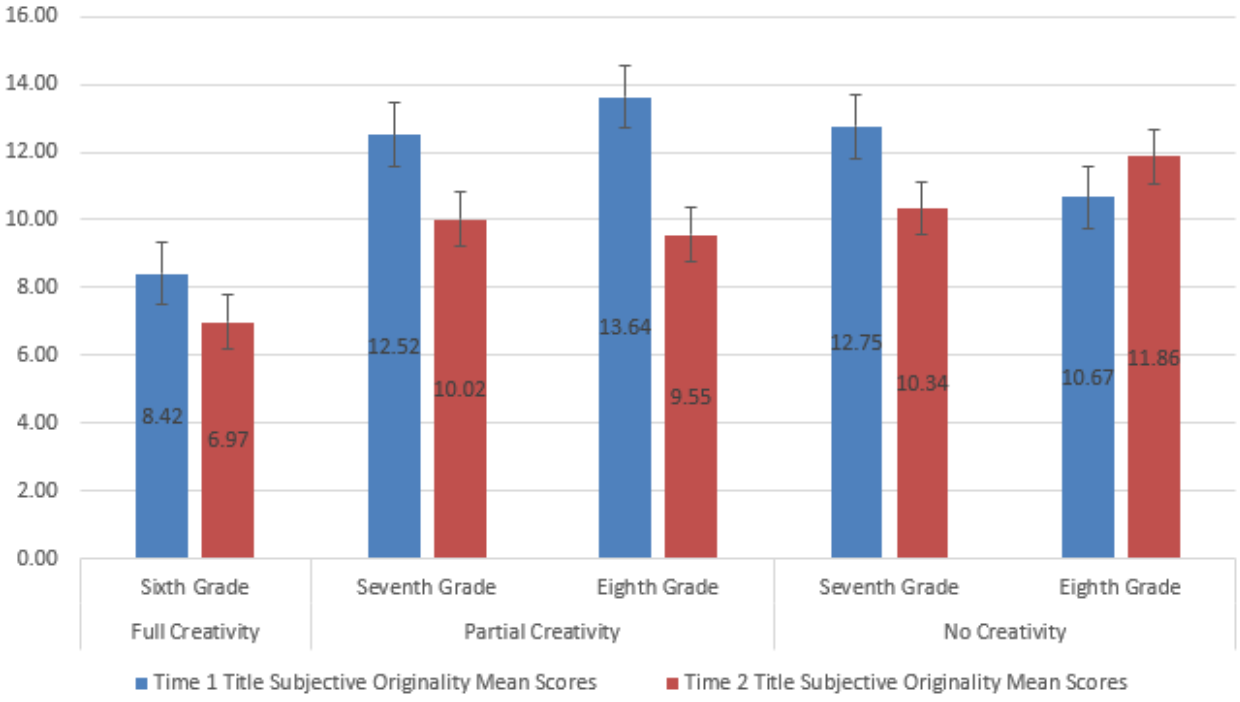


Subjective Originality

A Kruskal-Wallis test was performed on the mean Titles Game Subjective Originality Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Pretest results indicated that there was a statistically significant difference between grade levels with a moderate effect size ($\chi^2(2) = 7.14$, $p = 0.03$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.12 presents the mean comparison between group and grade levels for Titles Game Overall Subjective Originality Pre- and Post-Assessments.

Figure 4.12

Titles Game Subjective Originality Pre- and Post-Assessment Means by Group and Grade Level

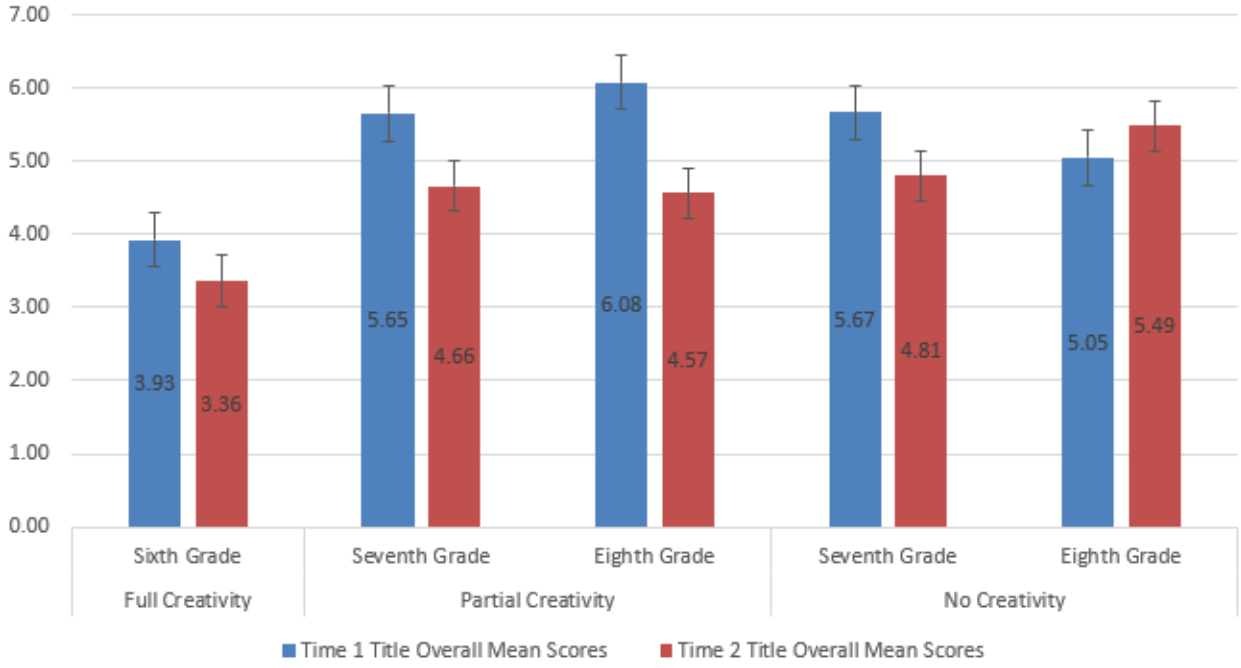


Overall Total

A Kruskal-Wallis test was performed on the mean Titles Game Overall Total Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Pretest results indicated that there was a significant difference between grade levels with a moderate effect size ($\chi^2(2) = 6.46$, $p = 0.04$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.13 presents the mean comparison between group and grade levels for Titles Game Overall Total Pre- and Post-Assessments.

Figure 4.13

Titles Game Overall Total Pre- and Post-Assessment Means by Group and Grade Level



Questions 8–10, Figures Game

The last divergent thinking activity was a Figures Game (FIG), which consisted of three questions. The participants looked at an image and listed as many things as possible that the drawing could have represented. The tasks were scored on fluency, flexibility, subjective originality, and total (average taken from the three previous scoring categories).

Table 4.11 presents descriptive statistics for each grade level's Figures Game Pre-Assessment scores.

Table 4.11

Descriptive Statistics of Figures Game Pre-Assessment Scores by Grade Level

Grade	Pre-FIG Fluency		
	n	*M*	*SD*
Sixth Grade	29	2.84	1.20
Seventh Grade	23	3.81	1.74
Eighth Grade	17	5.55	2.67

Grade	Pre-FIG Flexibility		
	n	*M*	*SD*
Sixth Grade	29	2.33	.92
Seventh Grade	23	3.03	1.32
Eighth Grade	17	4.37	1.97

Grade	Pre-FIG Subjective Originality		
	n	*M*	*SD*
Sixth Grade	29	7.2	4.05
Seventh Grade	23	10.48	6.38
Eighth Grade	17	15.86	11.27

Grade	Pre-FIG Total		
	n	*M*	*SD*
Sixth Grade	29	4.12	1.99
Seventh Grade	23	5.77	3.10
Eighth Grade	17	8.59	5.26

Table 4.12 presents descriptive statistics for each group's Figures Game Pre- and Post-Assessment scores by creativity group.

Table 4.12

Descriptive Statistics of Figures Game Pre- and Post-Assessment Scores by Group

Group	Pre-FIG Fluency			Post-FIG Fluency		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	2.84	1.20	32	3.5	1.38
Partial Creativity	30	4.22	2.17	33	5.07	2.72
No Creativity	10	5.53	2.60	10	5.17	2.87

Group	Pre-FIG Flexibility			Post-FIG Flexibility		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	2.33	.92	32	2.95	1.05
Partial Creativity	30	3.38	1.57	33	3.76	1.28
No Creativity	10	4.27	2.12	10	4.03	2.00

Group	Pre-FIG Subjective Originality			Post-FIG Subjective Originality		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	7.2	4.05	32	6.84	4.57
Partial Creativity	30	11.33	8.50	33	11.34	10.11
No Creativity	10	17.07	9.83	10	11.8	11.02

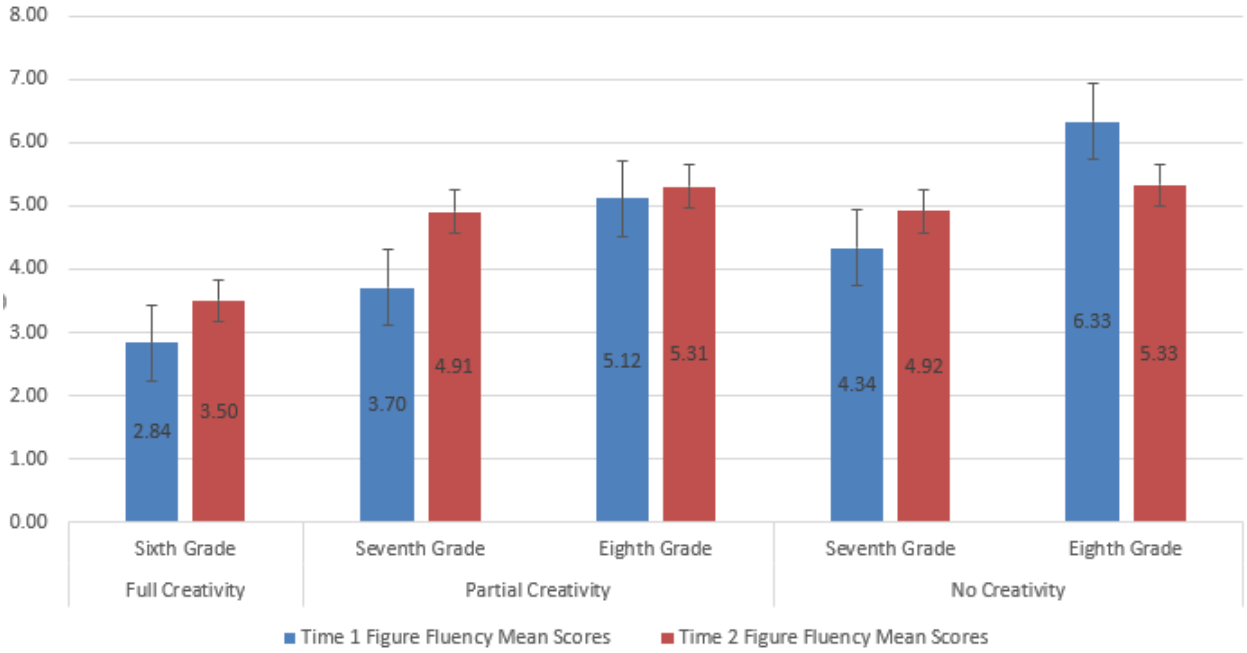
Group	Pre-FIG Total			Post-FIG Total		
	n	*M*	*SD*	*n*	*M*	*SD*
Full Creativity	29	4.12	1.99	32	4.43	2.22
Partial Creativity	30	6.31	4.03	33	6.72	4.64
No Creativity	10	8.96	4.81	10	7.00	5.25

Fluency

A Kruskal-Wallis test was performed on the mean Figures Game Fluency Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there was a significant difference between grade levels for pretest scores with a moderate effect size ($\chi^2(2) = 15.74$, $p < 0.001$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.14 presents the mean comparison between group and grade levels for Figures Game Fluency Pre- and Post-Assessments.

Figure 4.14

Figures Fluency Pre- and Post-Assessment Means by Group and Grade Level

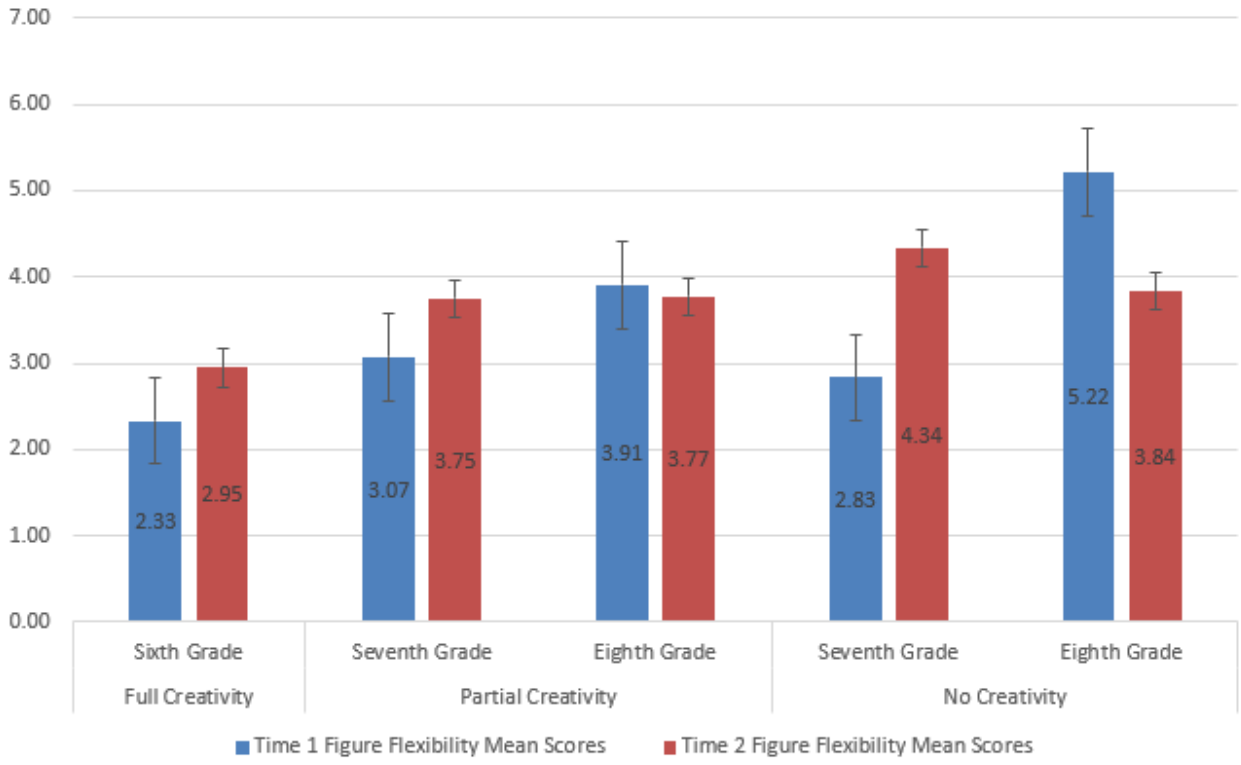


Flexibility

A Kruskal-Wallis test was performed on the mean Figures Game Flexibility Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there was a significant difference between grade levels for pretest scores with a moderate effect size ($\chi^2(2) = 15.74$, $p < 0.001$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.15 presents the mean comparison between group and grade levels for Figures Game Flexibility Pre- and Post-Assessments.

Figure 4.15

Figures Flexibility Pre- and Post-Assessment Means by Group and Grade Level

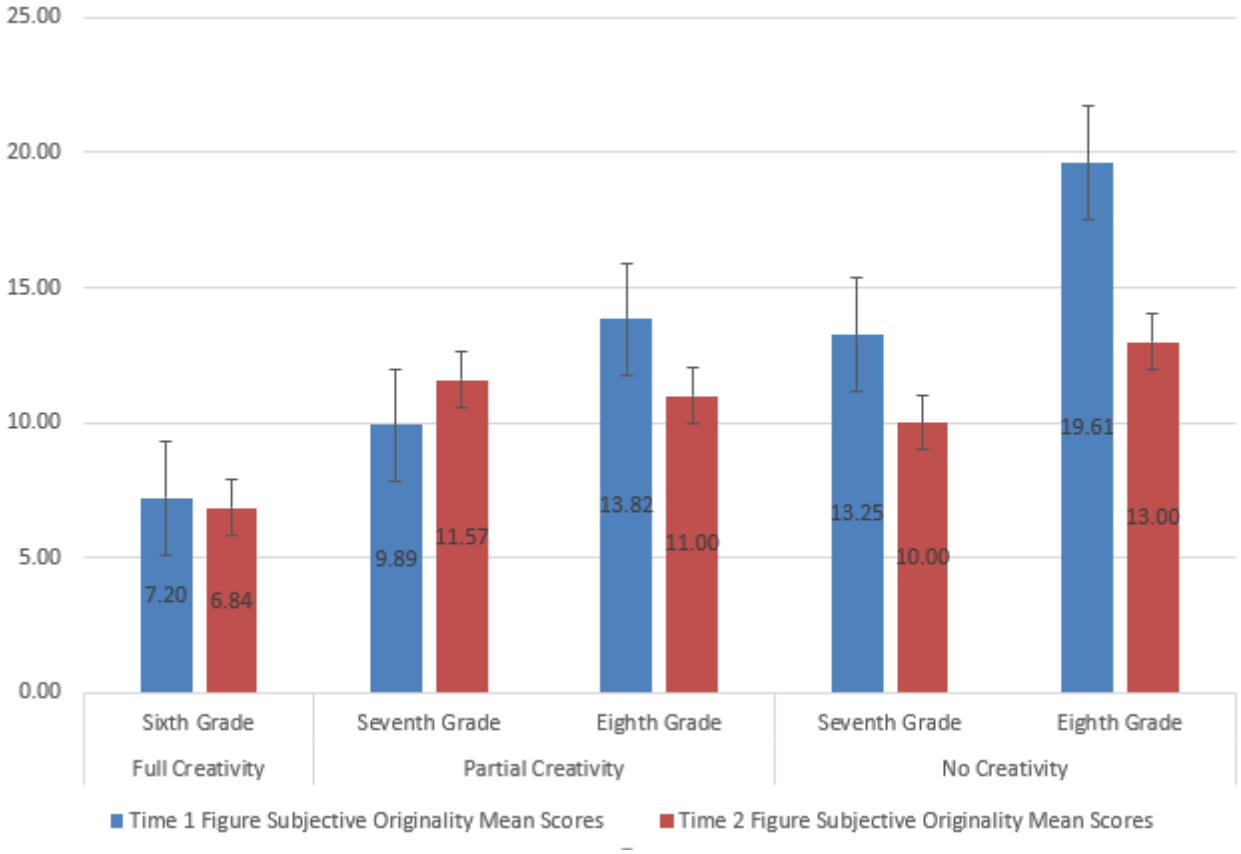


Subjective Originality

A Kruskal-Wallis test was performed on the mean Figures Game Subjective Originality Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there was a significant difference between grade levels with a moderate effect size ($\chi^2(2) = 9.89$, $p = 0.007$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.16 presents the mean comparison between group and grade levels for Figures Game Subjective Originality Pre- and Post-Assessments.

Figure 4.16

Figures Subjective Originality Pre- and Post-Assessment Means by Group and Grade Level

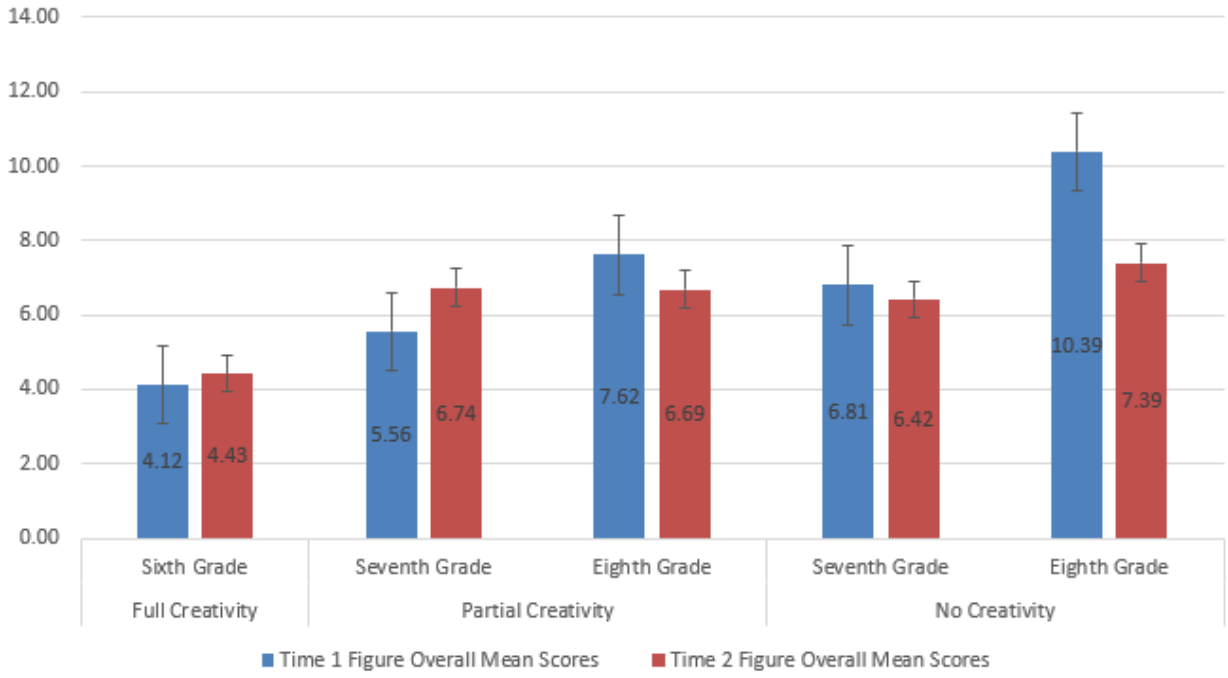


Overall Total

A Kruskal-Wallis test was performed on the mean Figures Game Overall Total Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there was a significant difference between grade levels for pretest scores with a moderate effect size ($\chi^2(2) = 12.24$, $p = 0.002$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.17 presents the mean comparison between group and grade levels for Figures Game Overall Total Pre- and Post-Assessments.

Figure 4.17

Figures Overall Total Pre- and Post-Assessment Means by Group and Grade Level



Cumulative Total

I created an overall mean score for each category, combining all divergent thinking activity scores. Below are the results within group and by grade level.

Within Group

I was unable to compare across groups due to an uneven sample distribution. Instead, I compared pretests to posttests within groups through a paired samples t-test for each cumulative scoring category. Table 4.13 presents descriptive statistics and paired samples t-test results within group for each overall scoring category.

Table 4.13

Descriptive Statistics and Paired Samples T-Test Results of Overall Pre- and Post-Assessment Scores within Group

Group	Pre-Overall Fluency			Post-Overall Fluency		Paired Samples Test		
	n	*M*	*SD*	*M*	*SD*	t	df	*p*
Full Creativity								
Sixth Grade	28	2.5	0.7	2.7	0.92	-1.11	27	0.21
Partial Creativity								
Seventh Grade	17	3.67	1.67	3.57	1.86	0.45	16	0.50
Eighth Grade	11	3.65	1.7	3.36	1.71	0.69	10	0.38
No Creativity								
Seventh Grade	5	3.59	1.43	3.08	0.97	1.66	4	0.13
Eighth Grade	5	4	1.68	3.73	1.62	0.35	4	0.55

Group	Pre-Overall Flexibility			Post-Overall Flexibility		Paired Samples Test		
	n	*M*	*SD*	*M*	*SD*	t	df	*p*
Full Creativity								
Sixth Grade	28	1.93	0.5	2.15	0.55	-1.79	27	0.20
Partial Creativity								
Seventh Grade	17	2.48	0.77	2.45	0.85	0.3	16	0.58
Eighth Grade	11	2.41	0.9	2.37	0.8	0.23	10	0.62
No Creativity								
Seventh Grade	5	2.21	0.6	2.43	0.71	-0.4	4	0.53
Eighth Grade	5	2.93	0.77	2.39	0.86	1.75	4	0.11

Group	Pre-Overall Sub. Originality			Post-Overall Sub. Originality		Paired Samples Test		
	n	*M*	*SD*	*M*	*SD*	t	df	*p*
Full Creativity								
Sixth Grade	28	7.25	2.45	7.11	3.34	0.22	27	0.62
Partial Creativity								
Seventh Grade	17	11.54	5.78	10.43	7.84	1.15	16	0.20
Eighth Grade	11	11.16	7.01	9.01	6.46	1.41	10	0.14
No Creativity								
Seventh Grade	5	11.14	4.79	8.37	3.14	2.31	4	0.06
Eighth Grade	5	13.02	6.48	11.48	6.51	0.55	4	0.46

Group	Pre-Overall Total			Post-Overall Total		Paired Samples Test		
	n	*M*	*SD*	*M*	*SD*	t	df	*p*
Full Creativity								
Sixth Grade	28	3.89	1.18	3.99	1.58	-0.27	27	0.60
Partial Creativity								
Seventh Grade	17	5.9	2.73	5.48	3.49	1	16	0.25
Eighth Grade	11	5.74	3.18	4.91	2.98	1.19	10	0.20
No Creativity								
Seventh Grade	5	5.65	2.26	4.62	1.58	2.06	4	0.08
Eighth Grade	5	6.65	2.96	5.86	2.98	0.61	4	0.43

Paired samples t-tests were performed on the Overall Fluency, Flexibility, Subjective Originality, and Total Pre-Assessment and Post-Assessment scores to determine if there were significant differences within each group. Results indicated that Overall Flexibility in the Full Creativity-Sixth Grade group approached significance ($p = 0.06$). There was no adjustment for multiple comparisons since there was no significance throughout each scoring category.

Grade Level

Table 4.14 presents descriptive statistics for each group's Overall Pre-Assessment scores by grade level.

Table 4.14

Descriptive Statistics of Overall Pre- and Post-Assessment Scores by Grade Level

Grade	Pre-Overall Fluency		
	n	*M*	*SD*
Sixth Grade	28	2.50	.70
Seventh Grade	21	3.65	1.61
Eighth Grade	17	3.77	1.65

Grade	Pre-Overall Flexibility		
	n	*M*	*SD*
Sixth Grade	28	1.93	.50
Seventh Grade	21	2.43	.75
Eighth Grade	17	2.60	.87

Grade	Pre-Overall Subjective Originality		
	n	*M*	*SD*
Sixth Grade	28	7.24	2.45
Seventh Grade	21	11.46	5.53
Eighth Grade	17	11.81	6.68

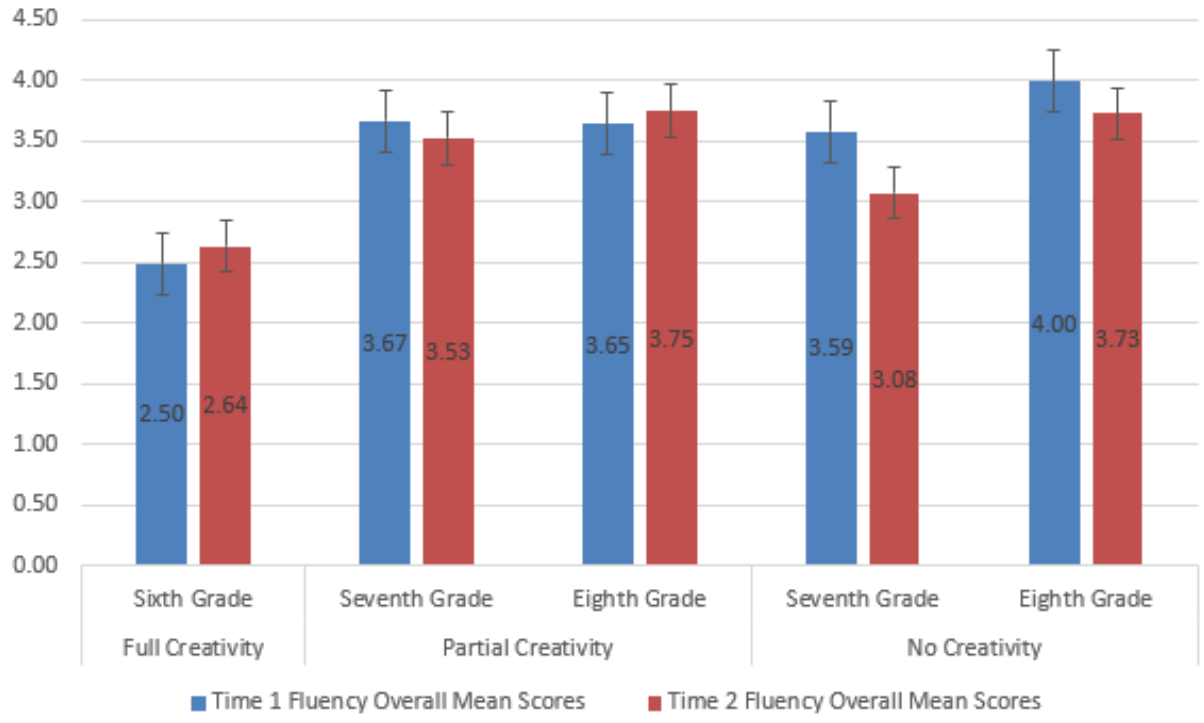
Grade	Pre-Overall Total		
	n	*M*	*SD*
Sixth Grade	28	3.89	1.18
Seventh Grade	21	5.85	2.61
Eighth Grade	17	6.06	3.04

Fluency

A Kruskal-Wallis test was performed on the mean Overall Fluency Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there was a significant difference between grade levels for pretest scores with a moderate effect size ($\chi^2(2) = 12.06$, $p = 0.002$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.18 presents the mean comparison between group and grade levels for Overall Fluency Pre- and Post-Assessments.

Figure 4.18

Overall Pre- and Post-Assessment—Overall Fluency Means for Group and Grade Level

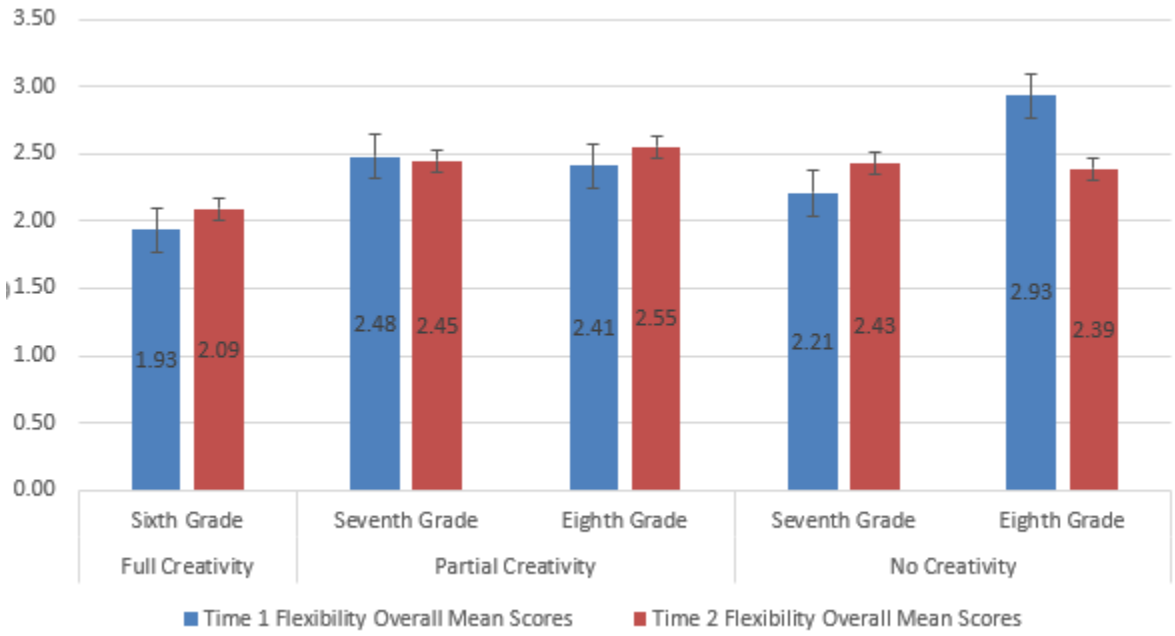


Flexibility

A Kruskal-Wallis test was performed on the mean Overall Flexibility Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The pretest results indicated that there was a significant difference between grade levels with a moderate effect size ($\chi^2(2) = 9.95$, $p = 0.007$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.19 presents the mean comparison between group and grade levels for Overall Flexibility Pre- and Post-Assessments.

Figure 4.19

Overall Flexibility Pre- and Post-Assessment Means by Group and Grade Level

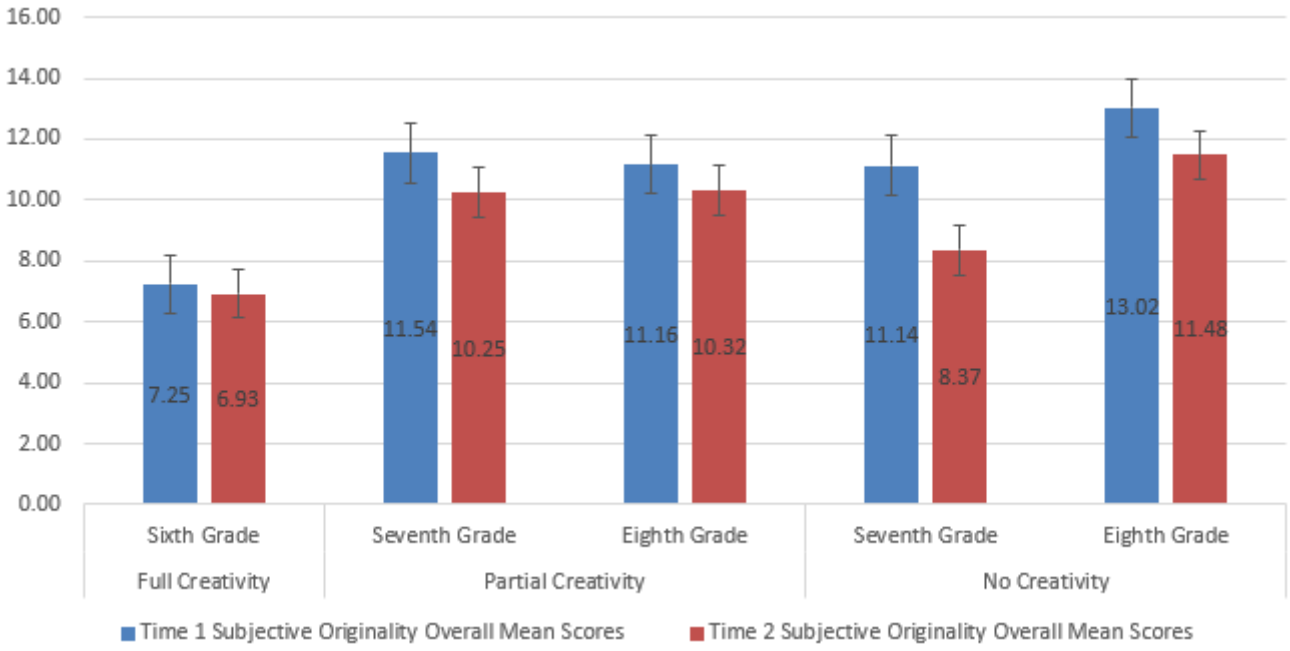


Subjective Originality

A Kruskal-Wallis test was performed on the mean Overall Subjective Originality Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. Results indicated that there was a significant difference between grade levels for pretest scores with a moderate effect size ($\chi^2(2) = 10.57$, $p = 0.005$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.20 presents the mean comparison between group and grade levels for Overall Subjective Originality Pre- and Post-Assessment.

Figure 4.20

Overall Subjective Originality Pre- and Post-Assessment Means by Group and Grade Level

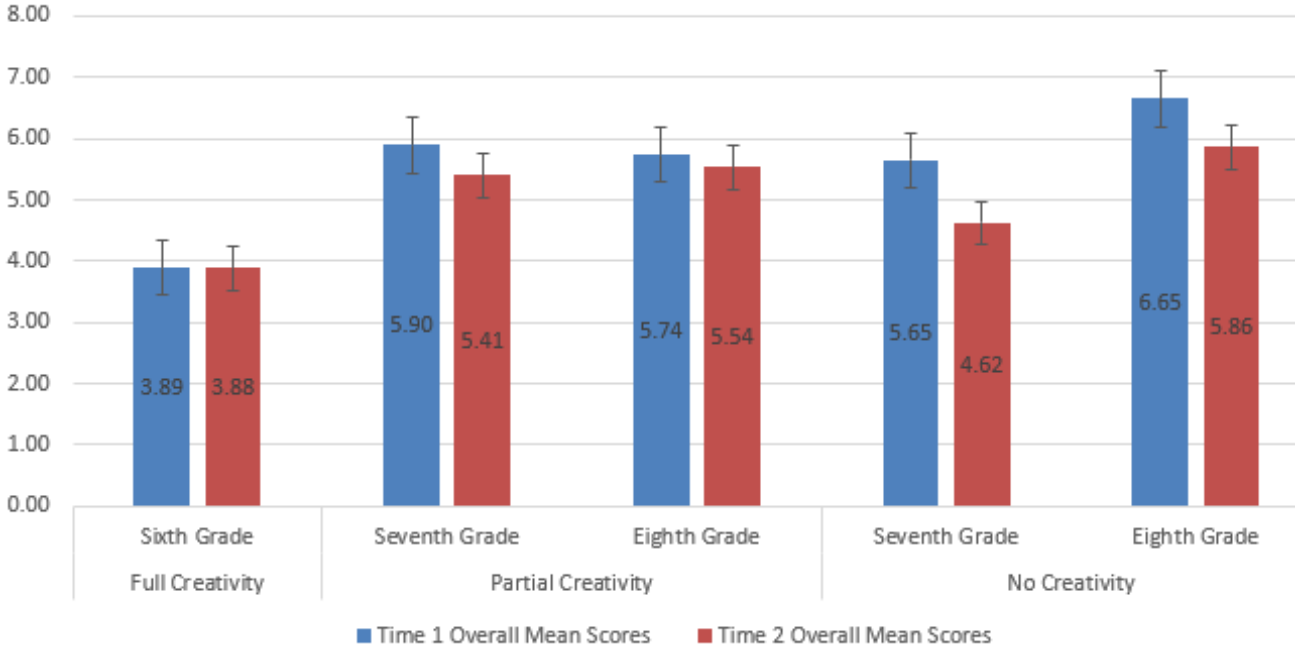


Overall Total

A Kruskal-Wallis test was performed on the mean Overall Total Pre-Assessment scores to determine if there were significant differences between the Full Creativity-Sixth Grade, seventh grade, and eighth grade. The Overall Total score was based on the participant's' average scores from Overall Fluency, Overall Flexibility, and Overall Subjective Originality categories. Results indicated that there was a significant difference between grade levels for both sets of scores with a moderate effect size ($\chi^2(2) = 10.87$, $p = 0.004$, $\varepsilon^2 = 0.10$) with sixth grade scoring lower. Figure 4.21 presents a mean comparison between Overall Total Pre- and Post-Assessment scores of all groups and grade levels.

Figure 4.21

Overall Pre- and Post-Assessment—Overall Total Means by Group and Grade Level



Standardized Assessment Scores

The Georgia Milestones Assessment System is a comprehensive summative assessment that gauges a student's proficiency level. The purpose of the GMAS is to measure a students' level of preparedness for the next grade level. The assessment is designed to identify information about how well a student is mastering state-level standards in the four core areas: English/language arts, math, science, and social studies. However, some grade levels only take two core sections: English/language arts and math. For this study, we will only look at math and English/language arts, because all middle school grade levels take those specific sections of the test. Table 4.15 identifies the scoring levels for the math and English/language arts sections. The highlighted portion identifies the threshold students need to meet to move on to the next grade level.

Table 4.15

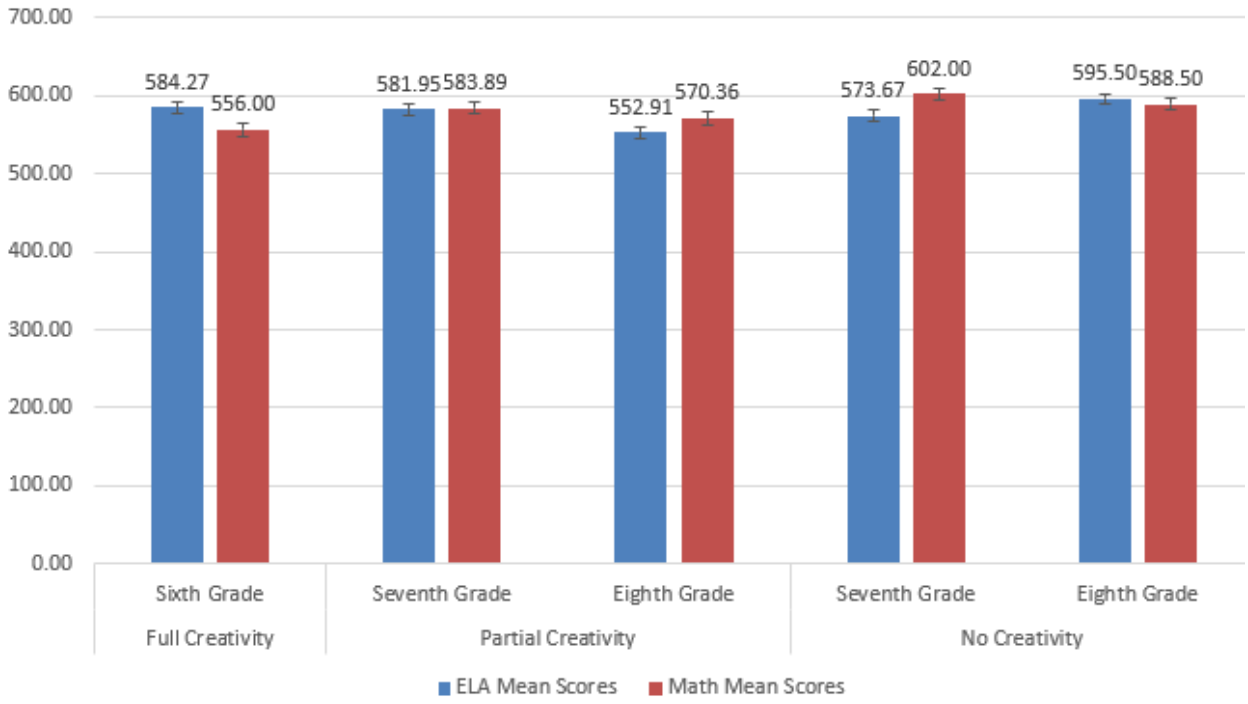
GMAS Scoring for Math and English/Language Arts

Content Area	Grade Level	Level 1: Beginning Learner	Level 2: Developing Learner	Level 3: Proficient Learner	Level 4: Distinguished Learner
English/Language Arts	Grade 6	140 to 474	475 to 524	525 to 598	599 to 820
	Grade 7	165 to 474	475 to 524	525 to 591	592 to 785
	Grade 8	225 to 474	475 to 524	525 to 580	581 to 730
Math	Grade 6	285 to 474	475 to 524	525 to 579	580 to 700
	Grade 7	265 to 474	475 to 524	525 to 579	580 to 740
	Grade 8	275 to 474	475 to 524	525 to 578	579 to 755

Participants completed the GMAS in April 2021. Figure 4.22 presents the scores of English/language arts and math by group and grade level.

Figure 4.22

English/Language Arts and Math Scores by Group and Grade Level

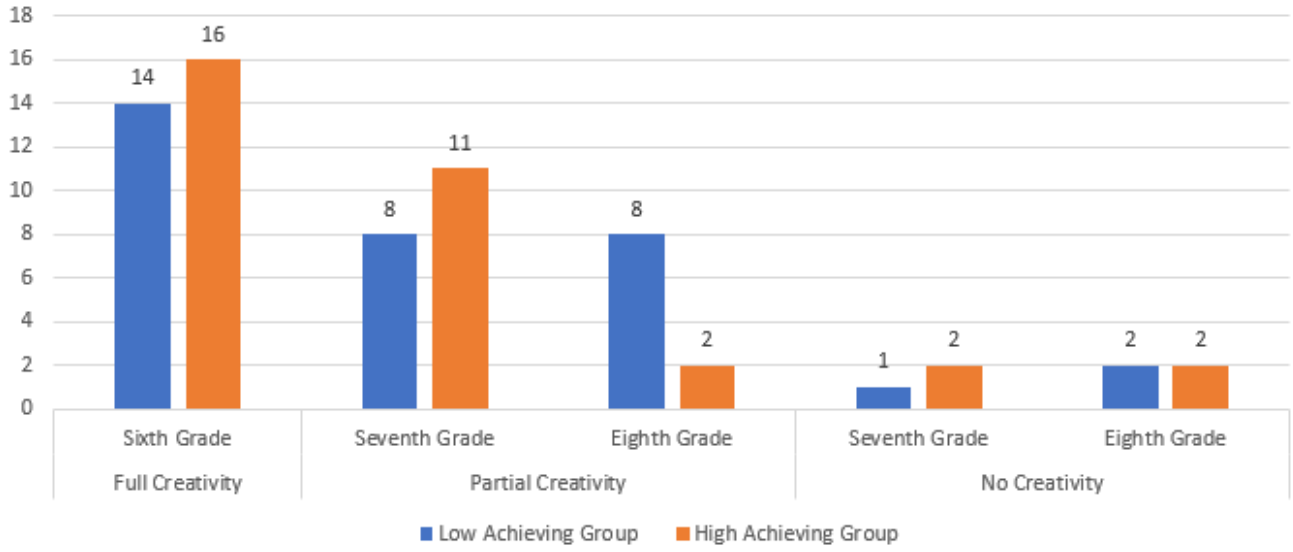


Based on group, scores were at a proficient level for all of English/language arts and Full Creativity-Sixth Grade and Partial Creativity for math. The No Creativity group reached a Level 4: Distinguished Learner status for math. Based on grade level, scores were at a Proficient Learner level for eighth grade English/language arts and math. Seventh grade scores for both content areas were at the Distinguished Learner level.

The GMAS data was divided into three categories: English/language arts (ELA), math, and an average of both, ELA and math. Participants were divided into two groups based on their GMAS standardized scores: low achieving (n = 33) and high achieving (n = 33). See Figure 4.23 for the breakdown of the low achieving and high achieving groups by grade level and creativity group.

Figure 4.23

Number of Participants in GMAS Low and High Achieving Groups Separated by Grade Level and Creativity Group



A Friedman test was performed on all pre- and post-assessment scoring categories with GMAS ELA scores as a covariate to determine if there were interactions between group, time, and GMAS ELA scores. Results indicated no significant interaction between divergent thinking scoring categories and GMAS ELA scores. Another Friedman test analysis was performed on all pre- and post-assessment scoring categories with GMAS math scores as a covariate. Results indicated no significant interaction between divergent thinking scoring categories and GMAS math scores.

I believe the results for all divergent thinking scoring categories and GMAS ELA scores, as well as all divergent thinking scoring categories and GMAS math scores, were partially due to a lack of student participation on the GMAS. Due to COVID-19 procedures, students could opt out of the GMAS, which caused the low sample size. Next year, we will be able to evaluate

academic achievement by comparing SY2020–2021 and SY2021–2022 academic achievement scores for all divergent thinking scoring categories.

Content Analysis

A content analysis was included to investigate the development of creativity through the school-based creativity program. Since a portion of this dissertation concerns music education, it was essential to look at the music capstone projects completed by the students in the program (*n* = 5). The epilogue section of this dissertation will contain an analysis that compares the creative music projects to existing literature about creative products.

As previously outlined in chapter 3, the mp3 recordings and song lyrics were labeled using coding to look for patterns within the data. Inductive coding was used on the song lyrics. As I was reading the lyrics, I came up with codes that described certain phrases. For example, *I've been having such a real lack of energy* was coded as self-reflection. The audio files and lyrics were coded based on instrumentation, musical genre, style, song form, content, and miscellaneous (i.e., sound effects). Next, axial coding was used to draw connections between the codes across the music projects. I read over all the codes for the lyrics to determine how they could be grouped into categories. Then, I placed all codes from the initial coding phase into overall categories. For the song recording, I used an a priori coding scheme based on the Consensual Musical Creativity Assessment Scale. I chose the assessment from Mawang et al. (2019) as a framework to analyze the students' music capstone projects. The CMCAS was not used as a quantitative measure. Instead, it was used as a qualitative tool to find potential similar or unique elements between the creative products (music compositions) and the four categories from the CMCAS. The four categories created for the content analysis of the music compositions came from the CMCAS: musical craftsmanship, musical syntax, musical originality, and

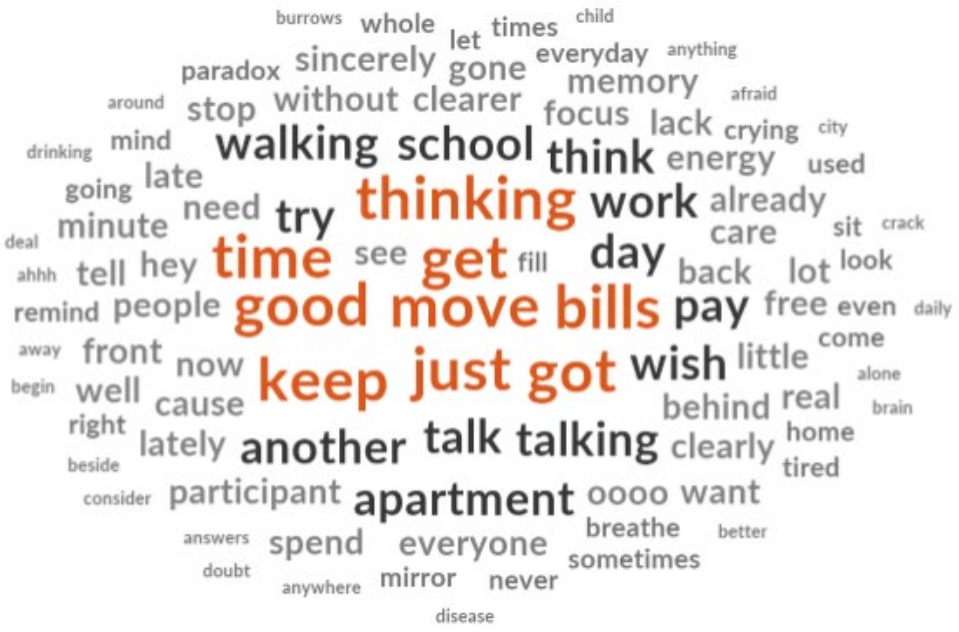
aesthetic sensitivity. Lastly, theme statements were created that described larger patterns within the data. Categories used for the content analysis of the music compositions came from the CMCAS: musical craftsmanship, musical syntax, musical originality, and aesthetic sensitivity. The remaining categories were based on the song lyrics (i.e., environment and emotion; see Appendix C). Using the main codes from the CMCAS and lyrics, I found two main themes that emerged from the music capstone projects analysis: emotional expression and musical creativity. These themes captured the participants' ideas across the data and represented my main conclusions for the content analysis.

Analysis of the Song Lyrics

All of the musical compositions were used as a form of emotional expression. The lyrics for each song incorporated social and personal reflections. The lyrics described lived or known experiences, such as emotional subjects, negative environments, and finances. Figure 4.24 is a word frequency chart that includes the most used words throughout the compositions. The words in orange text are the words used most frequently.

Figure 4.24

Word Frequency of Music Capstone Project Lyrics



Some song lyrics incorporated emotional responses, such as self-reflection, longing, devotion, and battle with their inner self. For example, Participant A's song lyrics were about their battle with time and how they spend all of their time thinking instead of completing work. Participant D wrote a folk song about how they wanted a specific someone to come back into their life.

Another topic used in some of the compositions was negative environments. For instance, Participant B's song lyrics were about spending excessive amounts of time in traffic while people are trying to get to work and school. Participant C wrote about how a school can harm someone when their peers talk negatively about them to other people.

Lastly, financial struggle was a topic incorporated into several song lyrics. For example, Participant E discussed their hardships because they did not have money. Participant B noted that money is an essential factor in everyday life, but it is challenging to earn it.

Analysis of the Mp3 Files

Musical creativity was prevalent throughout the music capstone projects. Each participant utilized different forms of musical creativity throughout their compositions. For instance, ornamentation, different sounds outside of the Western canon, and original meters were used throughout the songs.

Participant A created a song that incorporated drum, keyboard, and voice. The song could be classified as folk music due to the emphasis on acoustic instruments. Participant A included creative elements throughout the song, including voice echo, a dissonance section, an augmented chord, and a time change from simple to compound meter. Participant B created an electronic composition that included voice, keyboard, and Garageband EDM DJ equipment. The composition was written in a conventional ABA format, but reverb and voice effects were used to showcase their creativity. For instance, Participant B's voice effects included voice trills and auto-tune in various spots to enhance the composition. Participant C created a Soundtrap hip hop/rap composition with a drum mix and keyboard. Participant C incorporated keyboard effects throughout the composition, such as trills, appoggiaturas, and reverb. Additionally, the composition included instrument effects, such as echo and vibrato. Participant D created a folk music composition that included guitar and voice. Although the composition was written in ABA format, the major composition incorporated instrument ornamentation, such as appoggiaturas and slides. Participant E created a rap song that included drum beat and vocals. Although the composition was in simple meter, the participant played with the strong beat by moving it to the off-beats. Additionally, Participant E included reverb as a creative element in their composition.

Summary of Content Analysis

Musical creativity and emotional expression were found throughout the five music capstone projects. The participants' incorporated everyday life and social experiences into their compositions. Each composition utilized musical creativity, craftsmanship, syntax, originality, and aesthetic sensitivity through ornamentation, sounds outside the Western canon, and meter change. In the epilogue chapter, I will discuss how the results of the content analysis could impact music education.

Exploratory Analysis

A Pearson product-moment correlation coefficient was computed to assess the relationship between divergent thinking scores and GMAS standardized assessment ELA, math, and average scores.

GMAS ELA Scores

Table 4.16 presents correlations between overall divergent thinking scores and GMAS ELA scores by achievement group.

Table 4.16

Correlation Results between Overall Divergent Thinking Scores and GMAS ELA Scores

Group	Overall Fluency Pretest		Overall Fluency Posttest	
	r	*p*	*r*	*p*
Low Achieving	.33	.06	.38	.03
High Achieving	.21	.27	.15	.41

Group	Overall Flexibility Pretest		Overall Flexibility Posttest	
	r	*p*	*r*	*p*
Low Achieving	.46	.02	.39	.03
High Achieving	.32	.08	.15	.40

Group	Overall Subjective Originality Pretest		Overall Subjective Originality Posttest	
	r	*p*	*r*	*p*
Low Achieving	.38	.05	.37	.04
High Achieving	.24	.20	.18	.33

Group	Overall Total Pretest		Overall Total Posttest	
	r	*p*	*r*	*p*
Low Achieving	.38	.05	.38	.03
High Achieving	.25	.19	.17	.34

The Low-Achieving group had a significant weak, positive correlation between most overall pretest and posttest divergent thinking scoring categories and GMAS ELA scores. These results are not surprising as higher ELA scores would mean the participant is a better writer, which is how we measured divergent thinking. The High-Achieving group had a weak, positive correlation between all overall pretest and posttest divergent thinking scoring categories, but they were not significant. Based on the results, the divergent thinking pre- and posttest scores did not appear to be associated with GMAS ELA standardized achievement scores in the High-Achieving group, possibly due to a ceiling effect of ELA scores.

GMAS Math Scores

Table 4.17 presents correlations between overall divergent thinking scores and GMAS math scores by achievement group.

Table 4.17

Correlation Results between Overall Divergent Thinking Scores and GMAS Math Scores

Group	Overall Fluency Pretest		Overall Fluency Posttest	
	r	*p*	*r*	*p*
Low Achieving	.22	.27	.32	.07
High Achieving	-.05	.79	-.01	.95

Group	Overall Flexibility Pretest		Overall Flexibility Posttest	
	r	*p*	*r*	*p*
Low Achieving	.16	.42	.33	.06
High Achieving	.05	.81	-.01	.95

Group	Overall Subjective Originality Pretest		Overall Subjective Originality Posttest	
	r	*p*	*r*	*p*
Low Achieving	.14	.47	.33	.06
High Achieving	.02	.91	.01	.98

Group	Overall Total Pretest		Overall Total Posttest	
	r	*p*	*r*	*p*
Low Achieving	.16	.42	.33	.06
High Achieving	.01	.96	.00	.99

The Low-Achieving group had a significant weak, positive correlation between all overall pre- and posttest divergent thinking scoring categories and GMAS math scores, but the relationships were not significant. All pre- and posttest divergent thinking scoring categories for the High-Achieving group did not appear to be associated with the math GMAS scores.

GMAS Average Scores

Table 4.18 presents correlations between overall divergent thinking scores and GMAS math scores by achievement group.

Table 4.18

Correlation Results between Overall Divergent Thinking Scores and GMAS Average Scores

Group	Overall Fluency Pre-Test		Overall Fluency Post-Test	
	r	*p*	*r*	*p*
Low Achieving	0.34	0.88	0.4	0.02
High Achieving	0.08	0.67	0.11	0.55
Group	Overall Flexibility Pre-Test		Overall Flexibility Post-Test	
	r	*p*	*r*	*p*
Low Achieving	0.3	0.13	0.44	0.01
High Achieving	0.21	0.26	0.12	0.53
Group	Overall Subjective Originality Pre-Test		Overall Subjective Originality Post-Test	
	r	*p*	*r*	*p*
Low Achieving	0.31	0.12	0.38	0.03
High Achieving	0.18	0.35	0.15	0.43
Group	Overall Total Pre-Test		Overall Total Post-Test	
	r	*p*	*r*	*p*
Low Achieving	0.32	0.11	0.39	0.02
High Achieving	0.16	0.39	0.14	0.45

Based on the results, all posttest divergent thinking scoring categories appeared to be associated with the Average GMAS scores for the Low-Achieving group. Though a similar association was present with pretest divergent thinking scores this association was not significant. For the High-Achieving GMAS Average scores and pre- and posttest divergent thinking scores were not correlated.

Summary

The overall results from each data source are outlined above. The data source findings span several research questions posed in this study. Three research questions were outlined at the beginning of this study: (1) How does divergent thinking vary across grade levels of middle school students as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game? It is important to note that grade level was used as a proxy for age. (2) How does a middle school student's engagement in a school-based creativity program affect divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game? (3) Is there a relationship between students' divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game and academic achievement scores as measured by the Georgia Milestones Achievement Test?

The overall results from the quantitative analysis of the Divergent Thinking responses brought little clarity on the effect of school-based creativity programs on divergent thinking. In addition, there were no significant interactions between academic achievement and divergent thinking scores.

On the other hand, the results from the exploratory analysis showed a relationship between GMAS ELA and Overall Fluency posttests, Overall Flexibility pre- and posttests, Overall Subjective Originality pre- and posttests, and Overall Total pre- and posttests for the Low-Achieving group. The exploratory analysis results may be unsurprising because divergent

thinking tests all included written responses. Therefore, writing ability may greatly influence test performance.

The lack of changes from pre- to post-scores may be partly attributed to the testing window from time 1 to time 2 being shorter than anticipated due to COVID-19. The school-based creativity program began in January and ran until May, so any changes would occur within five months instead of an entire school year. Second, the Full and Partial Creativity lesson modules and activities were moved to an online format which could have affected the impact of instruction. Third, COVID-19 likely affected the sample distribution across all groups. Lastly, older students tended to have a higher mean score on the divergent thinking tasks for time 1 and 2. All of these limitations are discussed below.

5 DISCUSSION

This research study investigated the potential transfer effects of domain-specific creativity training on domain-general divergent thinking indices. This study contributes to the existing research on divergent thinking in relation to age, testing fatigue, lack of transfer effect, and creativity training implementation. Additionally, I looked at how music activities were incorporated into the program and what music teachers could learn from that information (see epilogue chapter). This chapter will summarize the research methods, a discussion of the results as compared to previous research, the limitations of this study, and implications for divergent thinking and academic achievement, followed by recommendations for future research. The chapter will conclude with professional reflections on the study concerning education in general and music instruction.

Summary of the Methods

A quantitative approach was selected to investigate the effect of a school-based creativity program on divergent thinking and standardized academic achievement measures. Specifically, a pretest and posttest design were chosen for this study. A content analysis was conducted to investigate the development of creativity through the school-based creativity program. Stratton (2019) suggests that a pretest and posttest design is most appropriate when testing a dependent variable (divergent thinking) before and after an intervention (school-based creativity program). The benefit of combining the quantitative and qualitative analysis was that I could look at the data through two different viewpoints. The content analysis helped shed light on the school-based creativity program by looking at student creativity through a domain-specific lens. The inclusion of the content analysis was to investigate the students' music projects, as opposed to only focusing on their test scores from the pre- and posttest (Ozkan & Topsakal, 2021; Rafner et al., 2022). Additionally, I was able to look at the data through a different lens by investigating

the program through interviews and student reflections from their video responses. Including both methods in the study allowed for a more well-rounded approach to understanding the results.

The participants from this study came from a middle school in the southeastern part of the USA. The participants were chosen through convenience sampling based on their attendance at the school that adopted the school-based creativity program. Four types of data were collected and analyzed for this study. The first set of data collected included a testing battery that consisted of two types of instruments: the Runco Ideational Behavioral Scale, a Likert-type self-report instrument, and divergent thinking tests: Realistic Problem Generation, Realistic Presented Problems, Titles Game, and Figures. These were administered in December (pretest) and May (posttest). The second type of data collected was the math and English/language arts scores from the Georgia Milestones Achievement Scores in April. The third set of data was selected students' music capstone projects. The final type of data collected was interviews with the program coordinator and administrator of the creativity program.

A total of 75 students participated in the pretest and posttest RIBS and divergent thinking tasks. Out of the 75 students, 66 participants completed the GMAS. Three quantitative analyses were used to evaluate the pretest, posttest, and GMAS scores. A Kruskal-Wallis was used to evaluate statistical differences among the pre-test means by grade level (sixth grade, seventh grade, and eighth grade), as well as pretest and posttest differences by group (Full Creativity-Sixth Grade, Partial Creativity, and No Creativity). A paired samples t-test analysis was conducted to determine if there was a potential interaction between high- and low-achieving group membership and divergent thinking improvement. A Friedman test was used as an exploratory analysis to identify potential relationships between students' divergent thinking and

academic achievement scores by grade level. One qualitative analysis was used to evaluate the music capstone projects. A content analysis was conducted to investigate the development of creativity through the school-based creativity program (see "Conclusions from the Music Research Methods" section).

Conclusions

This study was based on Rhodes's (1961) 4 P's model by focusing on the effect of place on the creative person, process, and product, as was introduced in chapters 1 and 2. Quantitative and qualitative approaches were used in the research study. The results from the quantitative data identified that there were no transfer effects between participation in the creativity program and divergent thinking scores. The content analysis of the music capstone projects showcased domain-specific student creativity.

This section will present conclusions and thoughts organized around my three research questions. First, I will draw conclusions about how grade level influenced divergent thinking scores. Second, I will discuss how group influenced divergent thinking scores. Third, I will draw conclusions about the relationship between students' divergent thinking and academic achievement scores. Next, I will discuss the implications and limitations of the study and future research recommendations. Lastly, I note personal reflections about this research study.

Question 1: How does divergent thinking vary across grade levels of middle school students as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game? It is important to note that grade level was used as a proxy for age.

Before answering the research question, it is important to note the sample for each grade level (Sixth Grade: n = 32, Seventh Grade: 24, and Eighth Grade: 19). Since the sample across each grade level was uneven, it is important to read results with caution. The participants

completed the same pre- and post- divergent thinking tests. Based on Klausmeirer and Wiersma's (1964), Smith and Carlsson's (1985), and Beniwal and Singh's (2019) findings, I hypothesized that older participants would achieve higher divergent thinking scores than younger participants. Based on the group pretest and posttest scores, grade level did affect divergent thinking, with lower grades scoring less, which confirmed my hypothesis. The overall scoring in all categories went as follows: sixth grade scored the lowest, seventh grade was in the middle range, and eighth grade scored the highest in the pretest and posttest. These results aligned with existing research that supports the idea that students in a higher grade level, especially elementary and middle school, will achieve higher scores on identical divergent thinking tests (Klausmeirer & Wiersma, 1964; Beniwal & Singh, 2019; Smith & Carlsson, 1985). For example, Beniwal and Singh investigated differences of creativity among 240 preteens and teenagers based on age, location, and gender. Each participant completed six divergent thinking tasks from Sharma's (2011) *Divergent Production Abilities Scale*, which included written responses. The individuals were evaluated based on eight abilities: word fluency, ideational fluency, spontaneous flexibility, associated fluency, expressional fluency, adaptive flexibility, originality, and elaboration. The findings showed that the older children (15–16) group had a higher mean score in all scoring categories compared to the younger (14–15) group. The findings from my study yielded similar results to Smith and Carlsson's investigation of creativity on 142 adolescents ranging from 12 to 16 years of age. Participants completed a percept-genetic creativity test and percept-genetic personality test. The analysis showed that there was a steady increase in divergent thinking scores from 13-year-old participants, the nominal age of a seventh or eighth grader.

Studies have shown that elementary and middle schoolers' vocabulary and writing abilities improve as they age (Currie et al., 2019). In our study, more robust and original answers were common in the older students' responses, which led to a higher overall mean score for both the pre- and posttests in the upper grades. Students wrote as many answers as possible for each divergent thinking question before moving on to the next question. The majority of upper-grade students were writing more extended responses to the Realistic Problem Generation and Realistic Presented Problem. The realistic questions allowed participants to write more than one or three words while creating an alternative movie title or figure name would require fewer words in their responses. Table 5.1 includes an example that compares three responses to one of the Realistic Problem Generation questions at varying grade levels.

Table 5.1

Examples of Participants Responses to Realistic Problem Generation Question 1a by Grade Level

QUESTION 1a. List problems that are impacting your school due to the COVID-19 pandemic. Do not limit yourself; the more problems you can list, the better.	
Sixth Grade Response	1. No field trips 2. Sanitation
Seventh Grade Response	1. Sick kids (with COVID) 2. Transitioning from different types of learning due to COVID numbers (at first we did Brick and Mortar and now we are all in-school) 3. Less school activities 4. Restrictions on extracurriculars 5. We must social distance and wear masks
Eighth Grade Response	1. Having to attend a Zoom class every two hours instead of going directly to school 2. Not being able to talk to your friends unless they too are virtual or if both of us are brick and mortar 3. Having to submit all the work directly into Schoology 4. Not being able to do your schoolwork if Schoology crashes or if your internet crashes 5. Not being able to see your teachers every day because you are virtual and only get to see your teacher twice a week and in some cases once every two weeks for some connections like band 6. Not being able to ask your teacher questions by unmuting because your mic does not work on your Chromebook.

Most sixth-grade responses to the realistic questions consisted of one to three words. Several seventh-grade responses included some descriptors and expressive language (i.e., communicating their thoughts and feelings into their responses), while most eighth-grade students only wrote using descriptors and expressive language to the realistic questions. These results align with Beniwal and Singh's (2019) study on age differences of creativity among 14–16-year-old students. The researchers observed a significant difference in word fluency, expressional fluency, elaboration, and overall creativity, with the 15–16 year olds scoring higher than the 14–15 year

old students. The findings raise concerns about the testing method chosen in Beniwal and Singh's and my study. The results from the exploratory analysis of the present study are in line with findings from Beniwal and Singh's investigation. The exploratory analysis showed weak, positive correlations between GMAS ELA and Overall Fluency posttests, Overall Flexibility pre- and posttests, Overall Subjective Originality pre- and posttests, and Overall Total pre- and posttests for the low-achieving group. The current findings from the exploratory analysis influenced the way data was collected since students answered each divergent thinking question by typing one-word answers, phrases, or sentences into the computer—a relatively limiting method of data collection.

In summary, grade level influenced divergent thinking scores across all scoring categories: fluency, flexibility, originality, and total. Younger participants scored less in all scoring categories than the seventh- and eighth-grade students. As the grade level increased, the participants had higher overall fluency, flexibility, originality, and total scores. Older students used more descriptors and expressive language when recording their responses to the divergent thinking questions, which was more prevalent in the Realistic Problem Generation and Realistic Presented Problems. It is plausible that older participants have a more comprehensive vocabulary range than younger participants, which affected the divergent thinking scores. However, the findings do not reflect lower creativity in lower grades. Recently, researchers explored the idea of game play as a means to evaluate creativity instead of traditional testing (Rafner et al., 2022).

Question 2: How does a middle school student's engagement in a school-based creativity program affect divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game?

The data to answer this research question came from each group's divergent thinking test scores comparing pre- to post-. Since the sample was uneven, with only full participation in the program in the sixth-grade group, I could not compare between groups. Instead, I compared within groups (Full Creativity-Sixth Grade, Partial Creativity-Seventh Grade, Partial Creativity-Eighth Grade, No Creativity-Seventh Grade, and No Creativity-Eighth Grade). Based on Ozkan and Topsakals's (2021) results (as summarized in chapter 2), I hypothesized that the school-based creativity program participants would achieve higher divergent thinking scores on the posttest. The results from the paired samples t-test did not confirm the hypothesis. There was a difference in descriptive statistics, but they were not significant. The cause of the results could have occurred due to the low sample size within each group or testing method.

Based on descriptive statistics, the Full Creativity-Sixth Grade group for the overall cumulative total category did not decline, while the other groups did lower their scores from pre- to posttest. Additionally, Full Creativity-Sixth Grade and Partial Creativity-Eighth Grade increased their overall cumulative fluency scores from time 1 to time 2. The overall fluency scores align with Van de Kamp et al.'s (2015) investigation on the enhancement of divergent thinking on 147 secondary students in visual arts education. The researchers divided the participants into two groups: experimental and control. The experimental group attended regular and intervention lessons, while the control group only completed regular lessons. Each individual completed a pretest and posttest that measured fluency, flexibility, and originality. The

investigators found that students fully immersed in the experimental group generated more fluency responses compared to the individuals in the control group.

There are many factors that could have affected this minimal outcome: no organized pedagogy, lack of evaluation on the creativity program before the implementation of the research study, and the choice of divergent thinking assessments. Based on the results, the participants in the Full Creativity program had virtually no transfer effects, which was expected based on the extensive training literature described earlier in the literature review (Kaniel, 2013; Scott et al., 2004). Previous research showed that training transfer could be problematic (Kaniel, 2013).

Based on interviews with the program coordinator and administrator, the school-based creativity program was not implemented to its fullest potential because of COVID-19 protocols. Teachers completed a one-day professional development training online and were not evaluated on their teaching of the creativity modules throughout the program. As stated in chapter 2, Kaniel (2013) posited that four factors would help the development of transfer and creativity: (1) a well-organized curriculum, (2) teaching models that incorporated process learning, differentiated instruction, integrated approach, and feedback, (3) a learning environment that strengthens transfer and creativity by incorporating feedback, lack of time restrictions, collaboration, and actively engaging individuals through discussions and problem-solving activities, and (4) training the instructors how to teach and model transfer and creativity (Maciejovsky & Budescu, 2007, p. 23).

The school-based creativity program modules included collaboration, feedback, and active learning, but the program was not evaluated before this study to ensure a consistent approach among the teachers incorporating the creativity training. According to Scott et al. (2004), creativity training must be well-organized to cause a potential increase in creative skills.

A lack of organization and unison among the teachers that incorporated the school-based creativity program impacted the transfer to the domain-general divergent thinking tests. Unfortunately, there is no guarantee that all the teachers who incorporated the creativity training into their classrooms created the same environments for the participants. For instance, Teacher A's feedback on a module may be more specific than Teacher B's comments.

A significant concern about the research study was that there may have been an increase in creativity in the students that attended the creativity training program, but I did not see it in the data due to the testing battery that was chosen to evaluate the participants (discussed in the "Limitations"). As presented in chapter five's "Research Question One," the testing battery chosen for this study could have negatively impacted the students' responses. The Runco Comprehensive Assessment Battery is a paper/pencil test that requires an individual to write down their responses, which can limit the number of responses and not necessarily gauge an individual's divergent thinking. According to Runco et al. (2004), it is important to include more than one divergent thinking test because each test measures a different process. Additionally, Rafner et al. (2022) discussed significant issues with standardized tests assessing creative processes, such as not being motivational due to strict testing conditions and not fully measuring real-world creativity because the test only assesses the final product, as opposed to the steps of the process. Many types of divergent thinking tests are not paper and pencil, which could be implemented for this study, such as visual tasks, which require participants to draw (Wallach & Kogan, 1965), and virtual games (Rafner et al., 2022). The games discussed earlier in chapter 2 could have helped with testing fatigue in my study because they provide a casual testing environment and motivate participants compared to regular standardized tests.

In summary, although the results were not significant, there was a difference in descriptive statistics within the groups. The Full Creativity-Sixth Grade group for the cumulative total category did not decline while the other groups did lower their scores from pre- to posttest. Additionally, Full Creativity-Sixth Grade and Partial Creativity-Eighth Grade increased their overall cumulative fluency scores from time 1 to time 2. However, there were no transfer effects between creativity training and divergent thinking scores for the majority of the results. The lack of transfer effects due to uneven implementation of the creativity training program and choice in divergent thinking tests. Creativity training that is well-organized and detailed can increase creativity scores (Scott et al., 2004). The current school-based creativity program affected the overall divergent thinking scores because the training was not consistent throughout the classrooms. Moving forward with this research study, it is important to revisit the testing battery and alter the tests by including more visual and virtual game tasks.

Question 3: Is there a relationship between students' divergent thinking scores as measured by the test results from Divergent Thinking: Realistic Problem Generation, Divergent Thinking: Realistic Presented Problems, Divergent Thinking: Titles Game, and Divergent Thinking: Figures Game and academic achievement scores as measured by the Georgia Milestones Achievement Test?

The data to answer this research question came from the divergent thinking test scores and Georgia Milestone Achievement Scores, GMAS, ELA, math, and Combined ELA and math (average) scores. Due to obstacles presented by the COVID-19 outbreak, I was unable to fully answer this question because students were unable to participate in the GMAS testing during the pilot study in 2020. Therefore, only one set of GMAS scores was available. Instead, I conducted two separate analyses: repeated-measures and Pearson-product correlation of pre- and posttest divergent thinking scores with GMAS ELA and math (collected in May 2021). Repeated measures analyses were performed on all pre- and post-assessment scoring categories with

GMAS ELA, math, and average as a covariate to determine if there were interactions between group, time, and GMAS scores. A Pearson product-moment correlation coefficient was computed to assess the relationship between divergent thinking scores and GMAS standardized assessment ELA, math, and average scores without time as a variable. Based on Ai (1999), Arora (2022), and Freund and Holling (2008), I hypothesized that participants with higher standardized achievement scores would have higher divergent thinking scores.

The results were mixed regarding the relationship between academic achievement and divergent thinking. The repeated measures results indicated no significant interactions between high and low group membership and divergent thinking improvement in GMAS ELA and GMAS math scores when comparing time. These results aligned with existing research that supports the idea that there is no significant difference between high and low achievement groups and creative potential (Anwar et al., 2012; Getzels & Jackson, 1962). However, after completing the Pearson product-moment correlations, there was a weak but significant positive relationship between GMAS ELA, GMAS average, and divergent thinking test scores in the Low Achievement group. This notion is based on Krause's (1972, 1977) and Dhatrak and Wanjari's (2011) studies on the low correlation between school achievement and divergent thinking test scores. It is important to note that the divergent thinking testing battery choice could have been a potential cause of the weak but significant positive relationship.

Based on the Pearson product-moment correlation, a major factor that could have caused the weak, positive relationship between divergent thinking scores and academic achievement in the low-achieving group was that the students who scored higher on the ELA section of the GMAS were better writers compared to the participants that did not do well on that portion of the test. The ELA section is comprised of writing and multiple-choice questions on reading

comprehension and writing skills. Unsurprisingly, the Low Achieving group students with a higher GMAS ELA score also did better on the divergent thinking tests because the divergent thinking testing battery was all writing. The results affected the testing battery since it required only one skill, writing. Dhatrak and Wanjari (2011) yielded a similar testing method and result. The researchers investigated correlations between creativity and academic achievement of 500 high school students. The measures chosen were GPA and Baqer Mehdi's *Verbal Test of Creativity*. The creativity test required the participants only to give verbal responses. They found a weak but significant positive relationship between creativity and academic achievement. On the contrary, Anwar et al. (2012) investigated creative thinking abilities of 208 high and low achievers in high school. The participants were divided into two groups based on their scholastic grades. The High Achieving group was 80% or higher, and the Low Achieving group was 40% or lower. The creativity measure used was a condensed version of the Torrance Tests of Creative Thinking, which consisted of figural and written tasks. The researchers found no significant difference between high and low achievement groups and creative potential. Although there was no significant difference, it is essential to note that the researchers used multiple evaluation forms, which could create a more accurate representation of the relationship between academic achievement and creativity.

There was no significance in the High Achieving group for the repeated measures and Pearson product-moment correlation. The "Limitations" section of this chapter will address the lack of significance in the High Achieving group.

In summary, the results from this study are an addition to the contradictory findings on the relationship between academic achievement and creativity (Gajda et al., 2017). There was no significant difference between high and low achievement, time, and creativity. However, there

was a weak but significant positive relationship between GMAS ELA, GMAS average, and divergent thinking test scores in the Low Achievement group. It is plausible that participants who achieved a higher GMAS ELA score also did better on the divergent thinking tests because the divergent thinking testing battery was all writing and a portion of the GMAS ELA evaluates writing. As previously stated in Question 2, instead of focusing on one style of testing battery, it is essential to incorporate multiple forms of creativity testing to get a more well-rounded assessment of the creative potential of an individual (Runco et al., 2004; see Implications).

Summary of the Music Research Methods

As noted in chapter 3, the qualitative data was based on students' final products taken from their music capstone projects, which were used to put the quantitative data into context. A total of five songs created by eighth-grade students were used in the music portion of this research study because all student projects had to be music-focused, meaning they had to be only music projects. Additionally, because of the program layout, only eighth-grade students completed capstone projects. A content analysis was conducted to investigate the development of creativity through the school-based creativity program. The analysis aimed to identify any relationships between the creative projects and existing literature about creative products.

Conclusions from the Music Research Methods

As previously stated in chapter 4, the content analysis identified two main themes present in the music capstone projects: musical creativity and emotional expression. Based on previous research located in the prologue of this document, a person's environment can play a role in their creative process (Kladder & Lee, 2019), and an individual's musical expertise can have a positive impact on their creative performance (Abrahan et al. 2021; Palmiero et al., 2020).

Environment

The environment of the school-based creativity program impacted the participants' creative performances. As students were immersed in the school-based creativity program, they completed activities promoting creativity, worked with mentors, and focused on creativity through literacy. The content analysis of the students' music capstone projects identified that each individual showcased one or more forms of musical creativity from Mawang et al.'s (2019) Consensual Musical Creativity Assessment framework. According to Kladder and Lee (2019), an individual's environment can impact their creative process. As previously stated in chapter 3, the foundation of the school-based creativity program is built on three essential elements: collaboration, problem-finding, and reflection. According to Kaniel (2013), collaboration, problem-finding, and reflection are part of the development of transfer and creativity.

Collaboration is the act of people working together. Previous researchers state that creativity can stem from collaboration because people can hear multiple views on a subject, which can help them create better ideas (Gilbert, 2016; Gruenhagen, 2017; Tan & Sin, 2020). The music capstone projects required the individuals to collaborate with a mentor within the project area. The mentors for the music capstone projects consisted of music teachers, musicians, and composers. According to Canfield (1961), the creative process is crucial to collaborative composition. During the creative process, the students can bounce ideas off of the mentor, which could help the student to decide what to include in their compositions (Gilbert, 2016). Problem-finding allows for the students to identify and fix problems within a newly created composition (Priest, 2002). Throughout the creation of the music capstone projects, students were required to complete checkpoints, which allowed them to add or remove some aspects of their compositions. Reflection is the ability to look at and determine one's strengths and areas that need improvement. After completing a step in their capstone project, students discussed or wrote

down their thoughts on their composition and either tweaked a portion of their project or moved on to the next step.

Musical Expertise

The students who completed the music capstone projects varied in musical experience, which could have impacted their overall creative performance. Students' video reflections on their compositions were used as evidence to identify their musical expertise level (i.e., how many years they attended a music class). According to Palmiero et al. (2020) and Abrahan et al. (2021), an individual's musical expertise can positively impact their creative performance. As a person becomes more experienced in music, there will be more creativity in their performance. Although I did not evaluate each student's musical expertise, it was apparent that the music capstone projects varied in musical ability. For instance, the use of ornamentation and key changes throughout the piece showed off a person's musicality.

Although all students showcased some form of musical creativity, students with more music experience incorporated more creative elements into their compositions. A person with less music experience may be limited in the amount of creativity they are showcasing because they are not as technically savvy as a person who has multiple years of musical experience. For instance, a student with one year of musical experience included trills as their musical element, while another student with three years of musical experience incorporated varying chords, trills, appoggiaturas, and varying meters.

Implications

Based on the current study, I recommend three main changes to future related research: altering the creativity program, changing of the testing battery, and accounting for student burnout due to over-testing.

Recommendations for School Implementation

Based on the results from this study, I encourage the following changes to the creativity program that could help schools to implement the creativity program: adapt the program for a wide variety of schools and a unified approach across all classrooms implementing the training and evaluating the creativity program.

I suggest allowing different types of middle schools to adapt this program to meet their needs. The chosen school was a high socioeconomic Status (SES) school near a major city. How does SES or the availability of creativity resources impact results? Xu and Pang (2020) investigated the relationship between children's creativity and their family's SES. The analysis showed a positive relationship between SES and different types of creativity. There is potential to add to the existing body of research on SES and creativity (Xu & Pang, 2020; Dai et al., 2012) by having researchers implement the creativity program at a low SES school. More school representation in the creativity program can help look at how geography and socioeconomic status affect divergent thinking.

Based on Kaniel (2013), a unified approach across all classrooms implementing the program is crucial in establishing an effective program design. Due to unforeseen circumstances out of the program director's control, the creativity training was not implemented to its fullest potential. There was no evaluation of the training throughout the program duration to guarantee that it was taught the same way throughout each classroom. Teachers need to have training that includes modeling of the program's expectations (Maciejovsky & Budescu, 2007). Evaluating the program and altering the content throughout each creativity module is essential to help create well-designed and consistent training (Scott et al., 2004).

Recommendations for Research

The testing battery and student burnout were two limitations in this study. Altering the testing battery and curbing student burnout are recommendations that could help future research in divergent thinking.

Altering the Testing Battery

The current research study incorporated the Runco Comprehensive Assessment Battery, which required participants to write down responses. As previously stated in response to Research Question 1 and 2 in this chapter, focusing solely on written responses can limit the responses an individual gives for each question (Beniwal & Singh, 2019). In our study, more robust and original answers were common in the older students' responses to the divergent thinking questions than in the younger participants, which led to a higher overall mean score for both the pre- and posttests in the upper grades. As previously stated in chapter 2, there are different types of divergent thinking tests. Would a game, drawing, or verbal divergent thinking test produce similar results to writing tests?

The Runco Comprehensive Assessment Battery did not correctly measure the participants' divergent thinking skills. The participants' creative abilities could be limited because the divergent thinking tests were only assessed through writing. Since the study was conducted on middle school students, these individuals are still learning how to write. A student's sentence structure and vocabulary are still in the development stages (Currie et al., 2019). It is important to incorporate different tests to measure divergent thinking, such as drawing and verbal. As previously explained in chapter 2, many types of divergent thinking tests are not paper and pencil, which could be implemented for this study, such as visual tasks (Torrance, 1990; Wallach & Kogan, 1965) and virtual games (Rafner et al., 2022). Changing the

testing battery to verbal, drawing, and games would offer a more balanced measurement than focusing solely on writing.

Student Burn Out

One potential confound in the current study was the effect of the testing schedule. The divergent thinking posttest was administered to most participants on the last three days of school. During that time, the students completed final exams in all subject areas: math, English/language arts, science, social studies, foreign language, and two connection classes (i.e., music, physical education, health, etc.). Additionally, some students completed district end of course tests (EOCT) for specific courses. According to the Georgia Department of Education (2022a), EOCTs are cumulative assessments in a specific subject area that count for 20% of the student's final grade. On top of the exams, the students enrolled in the school-based creativity program had to complete their final gig or capstone project. The above exam and project load did not include the week-long Georgia Milestones Achievement test each student completed in April. As stated in chapter 2, previous research on testing fatigue in students showed that time of day (Sievertsen et al., 2016) and testing anxiety (Richardson et al., 2012) could cause cognitive fatigue or burnout in students, which can impact their performance on standardized tests.

Students completed many assessments that final week before school let out in mid-May. The students were overly tested, which could have impacted the results of the divergent thinking scores. The exams and projects they were taking in their academic courses impacted their overall course grades. The divergent thinking test scores did not impact the students' grades in their classes, which could have caused the participants to consider the tests unimportant. According to Scheidler (2012), increased student engagement can affect the standardized test scores of middle school students.

Limitations

The limitations section of this chapter was broken down into three areas: the study, the school-based creativity program, and the music portion of the research study. The limitations of this study are as follows: geography, confound between grade and group type, a possible ceiling effect among the high-achieving group when measuring academic achievement, testing battery, testing fatigue, classroom restrictions due to COVID-19, teacher training, materials used to evaluate the creativity in the music projects, formal assessment of the final music product, and evaluation of the creative process.

Limitations of the Study

The scope of this study was limited to the middle school setting because the school district chose to pilot the school-based creativity program at a specific large middle school in the United States' southeast region. All students in the study attended the same school. Unfortunately, I could not gather data from other schools outside the district because the program was only implemented in one school. It is important to include multiple schools from a variety of backgrounds to get a more representative view of the United States. Previous research delved into the importance of place and its effect on student learning through socioeconomic status and its influence on achievement (Saifi & Mehmood, 2011), as well as the impact of poverty on cognitive development (Lipina & Colombo, 2009). Moving forward in this research study, a broader sample that matches the country could yield different results. Additionally, there was a significant confound between grade and group due to sample distribution. The sample distribution suffered because the creativity program was in its initial stages at the middle school. The current study took advantage of the fact that some students in the upper grades did not participate in the creativity program. However, as previously stated in the "Conclusions" section, the entire sixth grade group was fully immersed in the program, which skewed the results.

Ideally, the sample needed to be even across all grades and groups. The school's long-term plan is to include the creativity program in all grades, which would help increase and add additional grade levels to the samples in the Full Creativity and Partial Creativity groups. For this study, the Full Creativity group only had students from the sixth grade. At the time, the program was only offered full-time to sixth-grade students. The lack of sixth-grade representation in the Partial Creativity and No Creativity groups meant I could not run analyses comparing the groups' performances to each other. Also, the Full Creativity group had 32 participants, while the No Creativity group had 10 participants. Underrepresentation in the No Creativity group allowed only comparisons between pre- and post-data within grade levels.

As previously stated in the "Results" chapter and "Conclusion" section within this chapter, a possible ceiling effect was found among the high-achieving group in the GMAS scores. Additionally, there was no significance in the high-achieving groups for the repeated measures and Pearson product-moment correlation. The results are not surprising because the participants in the high-achieving group reached the highest or close to the highest possible score on the GMAS. Since students were already in the highest percentile, the participants could not achieve a higher score. It is likely that higher achieving students are receiving a more advanced curriculum in the classroom compared to lower achieving students through advanced or honors level classes. The GMAS evaluates the student on their mastery of grade-level work instead of their coursework requirements. For example, an eighth-grade student may take ninth-grade English/language arts and math but must take the eighth-grade GMAS, assessing them on learning objectives from a lower grade. Moving forward, class rank within a specific course could be used as an evaluation tool for academic achievement. Instead of separating the students

into high and low-achieving groups across all classes, I could focus on comparing the students within a specific class (i.e., comparison between students in an on-level ELA class).

Another significant concern about the research study was the testing battery. Since the testing battery was completely paper/pencil, some students could have limited their answers because of their writing ability. The lack of or shortened responses leads to the argument that the testing battery did not accurately evaluate some of the participant's creativity. Rafner et al. (2022) argued that game-based testing could be used as an alternative assessment to the paper/pencil format. Participants would not be required to rely on their writing levels. For instance, Minecraft, a virtual game, allows the participant to develop new ideas by building different objects, such as homes and weapons, for their world.

Lastly, student burnout, especially testing fatigue, was a significant limitation of the study. As stated in the "Implications" section, the testing schedule was a major issue because students were completing final exams and state end of course tests. The divergent thinking posttest was administered to most participants on the last three days of school. During that time, the students completed final exams in all subject areas. Also, some students completed district end of course tests for specific courses. Final exams and end of course tests were being completed throughout the time the posttest for this study was underway. Based on the interviews with the program coordinator and administrator, students were feeling stressed and overwhelmed by the amount of work that needed to be completed at the end of the year. Testing fatigue can impact a student's performance on a test (Richardson et al., 2012). Moving forward, the posttest should be administered a couple of weeks before final exams so that students do not have to feel stressed by taking all their tests at once. Additionally, moving to a game-based test could help

the students feel more relaxed and motivated than taking another paper/pencil test (Rafner et al., 2022).

Limitations of the Program

SY2020–2021 was the first year I collected pre- and post-assessment data. The school was under COVID-19 restrictions during this time frame, which impacted data collection. Students could not take the pretest until November/December because of school restrictions. In May, the same students completed the posttest, resulting in a five-month span between time 1 and 2. Ideally, the pretesting should have occurred in August. Additionally, some students were on campus while others attended school at home. The lack of on-campus teaching could have hindered full participation in the creativity program because some students did not attend face-to-face. Due to COVID-19 regulations, students were required to complete the online pre- and posttests at home. The at-home format led to various issues with students' tests. Four students had technical difficulties during the test, so the tests were unanswered. Another student wrote on their online test that they were confused about one of the questions. After submitting a portion of the test, they could not go back to change their responses. I suggest that students complete the tests in the classroom with a moderator in case the students have questions. Also, having a moderator can help students with technical issues. Another problem with COVID-19 was that I was unable to collect academic achievement during the previous year. Since I only had one set of academic achievement scores, I was unable to compare potential changes in academic achievement scores before and after aligned with the pre- and post-divergent thinking tests.

As previously stated in the "Conclusions," teacher training was a significant issue throughout this research study. Due to COVID-19 protocols, teachers were required to complete a one-day professional development training online and were not evaluated on teaching the creativity modules throughout the program. Unfortunately, there is no guarantee that the sixth-

grade students fully enrolled in the program received the same instruction throughout the entire school year since the teachers were not evaluated on their teaching of the modules. Moving forward, it is critical to evaluate teachers on their implementation of the program and the professional development given to them.

Limitations of the Music Portion

Four significant changes need to be made for the music portion of this research study: sample size and distribution, materials used to evaluate the creativity in the music projects, formal assessment of the final music product, and evaluation of the creative process. Moving forward in this research study, it is essential to note that the sample for the music capstone projects was five eighth-grade students enrolled in the Partial Creativity group. Since the sample is uneven and not diverse, it is vital to read the results with caution. It is essential to look at students' music projects who are fully and partially immersed and not enrolled in the creativity program.

The qualitative portion of the music research study consisted of the music capstone projects. A different conclusion from the content analysis could have occurred if I had included the student's portfolios to see their creative process throughout the entire program. The music capstone projects reflect a final snapshot of the students' learning throughout the program. Moving forward, it is essential to include the entire portfolio to showcase the creative process throughout the creativity training period.

Additionally, this study did not formally evaluate the final music projects. Instead, content analysis was based on students' final products, which were used to contextualize the quantitative data. However, I found that students who were enrolled in music for a longer period of time had a more complex music creation than students with little music training. If I were to continue this research study, I would incorporate the methods used by Abrahan et al. (2021) and

Palmiero et al. (2020) to see if musical expertise can enhance divergent thinking and academic achievement (see prologue for further information about these research studies).

Lastly, the music portion of this research study only looked at the students' final music product instead of the process. Since I did not look at the creative process, I cannot definitively show what students have learned throughout the school-based creativity program. Not looking at the creative process was a missed opportunity. Moving forward, I would like to evaluate the final product and investigate the creative process. It would be interesting to see how the product changes over time instead of seeing only the final creation. Like Beegle (2010), I would like to investigate if participants use the same planning method when creating music.

Contributions from the Study

Despite the limitations, there were some contributions from the research study, such as the strengths of combining quantitative and qualitative data, the benefits of the creativity program, and the future direction of the research study. In the initial data collection, I collected data solely from the rCAB. After meeting with my doctoral committee, I added the students' music projects to the analysis. The addition of the domain-specific content analysis specifically showed the limitations of the quantitative approach. Since there were limitations of the divergent thinking testing battery and testing environment, the addition of the qualitative data helped to understand what the students learned in the school based creativity program, without focusing solely on their test scores. I concluded from the results that the school-based creativity program did have an effect on the students' music projects.

The school-based creativity program gave students an outlet to create projects that aligned with their passions. An example of a student-led project was the creation of Hall Pass Entertainment. Hall Pass Entertainment, created by an eighth-grade student, is a self-funded, student-run entertainment label that connects teens with tools, training, and experiences to jump-

start their careers. The eighth-grade student decided that the student projects from the creativity program needed to be showcased under one entertainment label. The student collaborated with other classmates in the program to create content for the label. For instance, a seventh-grade student created the musical album *Breathtaking*, which consisted of 14 instrumental tracks and album cover art.

In addition to the label, students created projects to help the surrounding community. For instance, an eighth-grade student created concept art for a mural placed on a wall at a local theater. Another project by a group of eighth-grade students was an "up-cycle" clothing experience for the community. The students added flair to gently used clothing by cutting, destressing, and adding embellishments, which was then sold at a consignment shop in the area. The proceeds from the sale went to a local nonprofit. Students reflected on their progress throughout the creation process by answering questions, such as how their project could impact the school and community. Moving forward, future creativity research studies should not only gather divergent thinking data but also document specific benefits and examples of creative products.

Based on the results of the content analysis, it is important to include domain-specific testing into the research study. For instance, a specific test would be used to assess students completing music projects. A domain-specific test helps to determine a student's ability before and after the school-based creativity program in their chosen content, as opposed to focusing solely on domain-general indices. Moving forward, the team taking on this research study will use a pre and post-test informatic approach to quantitatively evaluate student performance in the creativity program.

Future Research Recommendations

There is some previous research related to creativity in general education courses, such as mathematics and science (Mann, 2009; Gong, 2020). However, the relationship between academic achievement and creativity show contradictory findings (Olatoye et al., 2010; Anwar et al., 2012; Getzels & Jackson, 1962; Ai, 1999; Freund & Holling, 2008). There has not been a recent study that combines middle school creativity training, divergent thinking, and academic achievement. The current study investigated creativity training and its effect on divergent thinking and academic achievement. However, the current study was inconclusive due to the testing battery, testing fatigue, teacher training, and uneven sample distribution. Additional research studies are necessary to fully understand the relationship between divergent thinking, creativity training, and academic achievement and how these topics could help general and music education.

The current study design could be adapted for general education, music education, and arts integration programs. However, the creativity training curriculum design and teacher training need to be thoroughly evaluated to strengthen the program design. Although the program was used at the middle school level, the school-based creativity program could be adapted for elementary schools, high schools, and higher education. Future studies could build from this research study by incorporating more types of divergent thinking tests and academic achievement. For example, adding participants across all groups, a more comprehensive assessment incorporating drawing and writing, games, and adding more of a focus on academic achievement. These objectives could result in a better view of creativity training, divergent thinking, and academic achievement.

Furthermore, future research could expand the analysis by including GPA and class rank as measurements of academic achievement. Solely looking at standardized tests limited the

meaning of academic achievement. Students may not be good test-takers, which could impact their standardized achievement scores. Multiple academic achievement variables could alter the relationship between academic achievement and divergent thinking.

Moving Forward

This dissertation incorporates data collected in the SY2020–2021 school year. Dr. Norgaard and I have already begun to move forward in the research process. The SY2021–2022 data collection began in August with a sample of $N = 90$ evenly distributed throughout the three groups and grade levels. Sixth- and seventh-grade students can enroll in the school-based creativity program full-time in the current year. Students completed the posttest in May 2022. For SY2022–2023, the research team taking over this study is changing the testing battery to game-based and altering the testing window so that the participants are not completing the divergent thinking posttest during the last week of school. Additionally, the team will include domain-specific pre- and post-tests to evaluate student performance in the school-based creativity program.

Professional Reflections

At the beginning of this project, I would have never dreamed how it would grow into the current study. The pilot study began right before COVID-19 hit the United States. The pretest was administered and collected, and students were immersed in the creativity training program. Once COVID-19 hit the schools, students stayed home for the rest of the semester, the program stopped, and I could not administer the posttests. The struggles of COVID-19 and new school protocols forced me to rethink my methodology from in-person to online. The change in my research study design resulted in a deeper understanding of how important creativity is on student learning. During the current study, teachers were required to revamp their lesson plans to meet the needs of both virtual and in-person learners. Each teacher had to devise creative

solutions and teaching methods to help students understand the content. The school-based creativity program initially designed for in-person learning had to be adapted to an online environment. The program coordinator had to create engaging online modules to help the students understand the content.

Throughout SY2019–2020, teachers revamped their lessons from in-person learning to an online platform. Students were learning through lesson modules, in-home activities, and video conferencing. Once SY2020–2021 started, the school systems and I were unsure how long it would be until the classrooms returned to some type of normalcy. Some students were in the classroom throughout the school year, while others were learning digitally. Although students were learning in different environments, the school-based creativity program helped give students an outlet to showcase their creativity and emotional expression.

The pandemic led to the current version of this dissertation. Although I cannot speak with certainty, the study procedures, participation, and results could have differed if the pandemic had not occurred. Initially, all students were to complete the divergent thinking tests in-person. Teachers were supposed to complete professional development on the creativity training in-person. Also, all students enrolled in the school-based creativity program were to complete the school training. Since data collection was not done in-person, I could not evaluate the creativity training program and assess the participants personally. It is important to note that data collection remained the same for the pre- and posttests. Since the tests were online, the students' ability on the computer could have impacted their results.

This research study impacted my thinking on creativity training and divergent thinking. Despite the inconclusive results, I still firmly believe in the value of the creativity program. This is due to anecdotal evidence communicated by the administrators and my assessment of the

music-related projects. I hope to spread awareness of the importance of implementing an effective creativity training program, using an appropriate research design, and collecting data using valid and reliable measurements.

EPILOGUE

The epilogue chapter outlines my reflection through the lens of music education and what this study means for music education. As previously stated in Chapter 5, I did not include a content analysis that studied the music projects in the initial stages of this research study. After speaking with my doctoral committee, listening to the interviews of the program coordinator, and looking at the students' projects, it was necessary to delve further into the music portion of the school-based creativity program to understand what the students learned throughout the school-based creativity program without placing all of the focus on students' divergent thinking scores.

Personal Music Reflections

My motivation for researching divergent thinking, creativity training, and academic achievement came from my experiences as a music educator. When I first began teaching as an ensemble teacher, I created a "typical" ensemble atmosphere in my classroom. Like Langley (2018), I was incorporating more performance-driven lessons to help prepare the ensemble groups for concerts instead of creating activities based on creativity. A typical ensemble curriculum focuses on technique and style for concert or competition preparation. My students learned repertoire and the techniques associated with music performance, such as scales, bowing exercises, and left-hand skills. At the time, there was no deviation from the standard ensemble curriculum because that was how I was taught in my middle and high school orchestras, and I did not know how to relinquish control to my students so they could become creators. Additionally, there was a lack of professional development on the subject in my district. Instead, ensemble professional development focused on concert performance preparation, such as choosing appropriate concert repertoire.

It was not until graduate school that I learned how to incorporate creative activities into my classroom. Once I started incorporating activities, such as improvisation and song creation,

my students were more motivated to learn certain techniques and practiced more at home. For instance, a student in my classroom wanted to create different 8-measure phrases that included a technique we were working on in class. After seeing the positive responses from my students, I realized the importance of incorporating creativity into the classroom.

This research study reinforced my ideas on giving students opportunities to create music. Based on the program coordinator and administrator interviews, the students enjoyed creating the gig and capstone projects. Many students that created music projects spoke to the coordinator about their appreciation of having the opportunity to create something for the community. One of the participants was happy they had a final product they created without the teacher's help because their creativity was encouraged. For instance, the student chose a chord that did not follow traditional music rules. Instead of the teacher or mentor telling them to remove it, they praised the student for thinking outside the box. The idea of praise allows the student to respond to creativity positively. The researcher found that the individual's broad sense of creativity gave them a positive self-concept, which aligns with Nazario et al.'s (2021) investigation of an individual's self-concept of the broad and strict sense of creativity.

Recommendations for School Music Implementation

Similar to Wall's (2018) research, in my professional teaching career, teacher accountability and music performance evaluations are essential in my district, which goes against the creativity model. The model includes student-led, collaborative, and exploration-centered activities that allow students to lead the activity instead of the teacher driving the instruction. A significant issue in education is academic achievement, which gives teachers little to no leeway in altering the curriculum. For music ensemble teachers, the focus is on preparing the students for concerts and competitions, which calls for a more rigid curriculum. Based on this research study, how can teachers implement creativity in the music classroom?

The content analysis and interviews identified four main themes from the school-based creativity program: student-driven, exploration-centered, flexible, and collaborative. In this section, I will discuss how each of these themes could inform creativity in the classroom. The school-based creativity program's passion projects helped students learn key concepts from their academic learning objectives and problem-solve throughout the process. The projects were student-driven and exploration-centered, which meant they created and completed their project from the start of an idea to the final product without assistance from the teacher or program coordinator. According to the interviews, the students enjoyed coming up with their ideas and seeing them come to fruition through their final products without the teacher or program coordinator giving them directives. Student-driven instruction allows them to connect their interests to their learning and facilitates critical and independent thinking (School-Based Creativity Program, 2020). Similar to Beegle (2010), student-driven learning provides an outlet for students to express themselves. For instance, in the music classroom, students can create compositions and improvisations based on techniques or concepts they are learning throughout the school year.

Based on the School-Based Creativity Program (2020), a flexible learning environment helps to promote immersive learning opportunities. In the music classroom, a flexible learning environment could include but is not limited to, taking away the chairs to encourage movement and activity and a time restriction so that students can focus on learning and not be limited by a deadline. Moving forward, the teacher should incorporate creative activities into their music classroom. As the teacher includes creativity activities, they should be flexible by evaluating and altering the content to help create a well-designed creativity module (Scott et al., 2004).

Kladder and Lee (2019) and Latifah and Virgan (2021) found that teachers should incorporate collaboration into their music classroom environment. For instance, a music teacher can have students work together to create a piece of music. Alternatively, like this research study, students could collaborate with mentors instead of students for their music projects. According to the interviews, a significant part of the collaboration process was that the participants could bounce ideas off the mentors. Moving forward, collaboration in a music program could help students share ideas effectively with others and encourages questioning and continuous reflection through multiple perspectives (School-Based Creativity Program, 2020).

Creativity in music education has been historically prevalent throughout the 20th and 21st centuries. Nevertheless, teacher accountability and academic achievement have taken over most classroom learning objectives. The research study taught me that music educators should not be afraid to incorporate creative activities into their classrooms. Instead, the music teacher should embrace the idea that creativity could help students in the music classroom.

The music projects allowed students to incorporate techniques and skills from their music classes into their songs. Based on the student reflections, multiple music students talked about how they were able to take what they were learning in their music classrooms and transfer it into their compositions. For example, one of the students from the study learned about major versus minor keys and decided to incorporate that into their song.

Future Music Research Recommendations

This portion of the research study could be adapted for elementary school, high school, or higher education. Future studies could build from this research study by incorporating more types of music products and an analysis of the creative process before the final product. For instance, an analysis of the student's portfolio or rough draft work could help shed light on how

the student created the product. These objectives will give us a better view of the effect of the process on the product.

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APPENDICES

Appendix A: SY2019-2020 Pilot Study Test Battery

RUNCO IDEATIONAL BEHAVIOR SCALE

Part of the *Runco Creativity Assessment Battery* (rCAB)© 2011

Directions: Use the 1-5 scale (given below) to indicate how often each of the phrases describes your thinking and behavior. You may need to approximate. Please indicate how you really think and behave, not how you would like to. Remember--no names are used. Your responses are confidential.

Again, you may need to approximate. For each item, circle the response option that is THE CLOSEST to beingaccurate. Here are the options:

0 = Never
1 = **approximately** once a year
2 = once or twice each month **(approximately)**
3 = once or twice each week **(approximately)**
4 = Just about every day, and sometimes more than once each day.

1. When faced with a problem I take my time exploring various options and alternativesolutions.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

2. I change what I want to do as a career.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

3. When reading books or stories I have ideas of better endings.

0	1	2	3	4
never	Yearly	Monthly	weekly	Daily

4. When faced with a problem I do not just accept the first solution. I make sure to think ofseveral options.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

5. People wonder if I am scatter-brained or absent-minded because I think about differentthings all at once.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

6. I have thoughts, which can block out all other thoughts--it is like I am stuck in a rut.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

7. I work out new ways to solve a problem.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

8. I see better ways of doing boring things.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

9. I have an idea about a new route between home and school.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

10. I see a cloud and have several ideas about what the shape or figure could be.

0	1	2	3	4
never	Yearly	Monthly	Weekly	Daily

11. I observe people and think about different reasons for what they do.

0	1	2	3	4
Never	Yearly	Monthly	Weekly	Daily

12. I look at a problem from more than one point of view.

0	1	2	3	4
Never	Yearly	Monthly	weekly	Daily

13. I realize that it is easy for me to understand other people's ideas.

0	1	2	3	4
Never	Yearly	Monthly	weekly	Daily

14. I have different thoughts about careers that would be fun for me.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

15. When cooking, I stick to the recipe or the directions that came with the food.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

16. When I need a new username or password, it is easy for me to think of good options.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

17. When I get a new pet, or when someone I know gets one, it is easy for me to think of good names for it.

0	1	2	3	4
never	Yearly	Monthly	weekly	daily

18. I see a pattern (on the sidewalk, or anywhere outside) and see things in the shape.

0	1	2	3	4
never	Yearly	Monthly	weekly	Daily

19. I consider many options and alternatives when solving a problem.

0	1	2	3	4
never	Yearly	Monthly	weekly	Daily

20. I have different thoughts about careers that would be fun for me.

0	1	2	3	4

never Yearly Monthly weekly Daily

21. When making things, I stick to plans. I do not improvise if someone has prepared plans.

0	1	2	3	4
never	Yearly	Monthly	weekly	Daily

22. I have ideas for arranging or rearranging the furniture at home.

0	1	2	3	4
never	Yearly	Monthly	weekly	Daily

23. I read something (written by someone else) and realize there are different ways to look at life.

0	1	2	3	4
never	Yearly	Monthly	weekly	Daily

24. I make plans (e. g. , going to a particular restaurant or movie), but something ruins thoseplans and I can't think of what to do instead.

0	1	2	3	4
never	Yearly	monthly	weekly	Daily

25. I see a shadow or some other pattern and have an idea for what it represents.

0	1	2	3	4
never	Yearly	monthly	Weekly	Daily

26. When doing math I am tempted to follow my own ideas about how to solve a math problem.

0	1	2	3	4
never	Yearly	monthly	Weekly	Daily

27. If someone tells me how to do something, I tend to think of different ways to get it done.

0	1	2	3	4
never	Yearly	monthly	Weekly	Daily

28. When reading, I think of different titles for the book or article.

0	1	2	3	4
never	Yearly	monthly	Weekly	Daily

DIVERGENT THINKING: REALISTIC PROBLEM GENERATION

Part of the *Runco Creativity Assessment Battery* (rCAB)© 2011

QUESTION 1a. List problems with your friends, peers, or schoolmates. These problems might be real, or they might be made up and imaginary. Do not limit yourself; the more problems you can list, the better. (Do not worry about spelling, and take your time.)

QUESTION 1b. Go back and select one of the problems you listed in #1a, above. Write it here:

Now we would like you to list possible solutions to that problem. Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.)

QUESTION 2a. List problems with the place you live (home, neighborhood, whatever). The more you list, the better. They do not have to be real problems--they can be things you have not actually experienced. Use your imagination!

QUESTION 2b. Go back and select one of the problems you listed in #2a, above. Write it here:

Now we would like you to list possible solutions to that problem. Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.)

QUESTION 3a. List problems with the health of someone you know or imagine (illness, exercise,diet). Again, these can be real or hypothetical and imaginary. The more you list, the better.

QUESTION 3b. Go back and select one of the problems you listed in #3a, above. Write it here:

Now we would like you to list possible solutions to that problem. Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.)

DIVERGENT THINKING: REALISTIC PRESENTED PROBLEMS

Part of the *Runco Creativity Assessment Battery* (rCAB)© 2011

Directions: On the next few pages, we will describe a few problems, which may occur at school andhome. Your task is to first read about the problem and then try to write down ***as many solutions asyou*** can for each problem.

Here is an example:

Your favorite television show, ***American Idol***, was on last night. You had so much fun watching it that you forgot to do your homework. You are about to go to school this morning when you realizethat your homework is due in your first class. Uh-oh. . . what are you going to do?

For this problem, you could answer, "Tell your teacher that you forgot to do your homework; try to do your homework in the car or bus on the way to school; ask your roommate, boyfriend, girlfriend,or classmate to help you finish your homework; do your homework tonight and turn it in the next time the class meets; or finish your homework first than show up late for class. " There are many more answer to this problem, and all of them are legitimate. There are no grades on this—it is not atest. It is more of a game. Spelling doesn't even matter!

Now turn the page, take your time, have fun, and remember to ***give as many ideas as possible***.

1. Your friend Pat sits next to you in one of your classes. Pat really likes to talk to you and often bothers you while you are doing your work. Sometimes Pat distracts you and you miss an important part of the class, and many times you don't finish your work because he is bothering you. What should you do? How would you solve this problem? Remember to list as many ideas and solutions as you can.

2. It is a great day for throwing frisbees in the park, and your buddy, Kelly, comes to your house and asks you if you want to go to the park. The park is not far away, the weather beautiful, throwing frisbees tons of fun! Unfortunately, you have a big project due tomorrow, and it requires a full day to complete. You would rather be playing. What are you going to do? Think of as many ideas as you can!

3. You are about half way through your daily walk when the clouds that were in the sky all morning suddenly disappear. You really need to avoid sunburn, but you did not bring a hat. What might you do?

DIVERGENT THINKING: TITLES GAME ©.
Part of the *Runco Creativity Assessment Battery* (rCAB)

List alternative titles for the movies, plays, and books below. Spelling does not matter and thereare no grades for this. Have fun and list as many alternatives as you can.

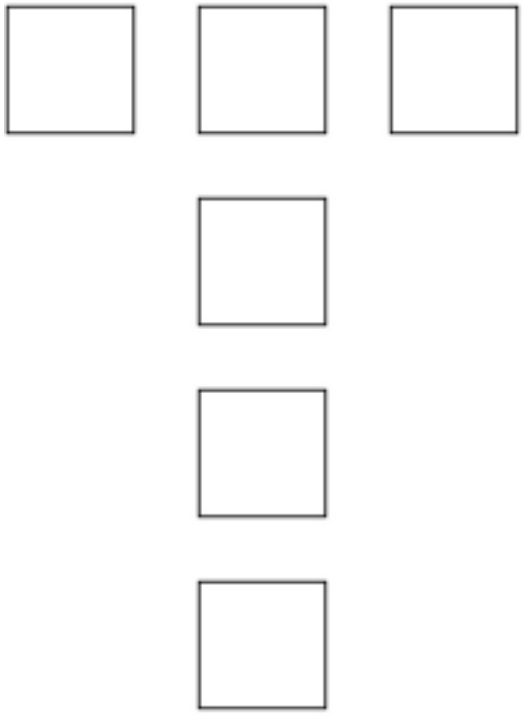
List alternative titles for the movie, "Frozen. "

List alternative titles for the TV show, "Spongebob Squarepants. "

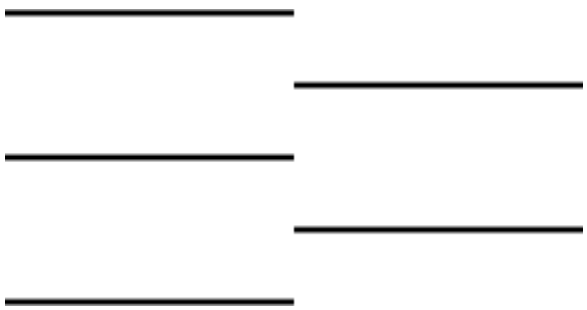
List alternative titles for a “Harry Potter” book.

Look at the figure below. What do you see? List as many things as you can that this figure might be. Thisis NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better.

Look at the figure below. What do you see? List as many things as you can that this figure might be. Thisis NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better.



Look at the figure below. What do you see? List as many things as you can that this figure might be. Thisis NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better.



Appendix B: SY2020-2021 Current Study Test Battery: Online Version

Pre- Test:

ID
Participant Number (i. e. 102)

_____

Ideational Behavioral Scale

Directions: Use the 1-5 scale (given below) to indicate how often each of the phrases describes your thinking and behavior. You may need to approximate. Please indicate how you really think and behave, not how you would like to. Remember--no names are used. Your responses are confidential.

Again, you may need to approximate. For each item, circle the response option that is **THE CLOSEST** to being accurate.

Here are the options:

0 = Never
1 = approximately once a year
2 = once or twice each month (approximately)
3 = once or twice each week (approximately)
4 = Just about every day, and sometimes more than once each day.

	Never (0) (1)	Yearly (1) (2)	Monthly (2) (3)	Weekly (3) (4)	Daily (4) (5)
Q1. When faced with a problem I take my time exploring various options and alternative solutions. (1)	○	○	○	○	○
Q2. I change what I want to do as a career. (2)	○	○	○	○	○
Q3. When reading books or stories I have ideas of better endings. (3)	○	○	○	○	○
Q4. When faced with a problem I do not just accept the first solution. I make sure to think of several options. (4)	○	○	○	○	○
Q5. People wonder if I am scatter-brained or absent-minded because I think about different things all at once. (5)	○	○	○	○	○

Q6. I have thoughts, which can block out all other thoughts--it is like I am stuck in a rut. (6)	○	○	○	○	○
Q7. I work out new ways to solve a problem. (7)	○	○	○	○	○
Q8. I see better ways of doing boring things. (8)	○	○	○	○	○
Q9. I have an idea about a new route between home and school. (9)	○	○	○	○	○
Q10. I see a cloud and have several ideas about what the shape or figure could be. (10)	○	○	○	○	○
Q11. I observe people and think about the reasons and meaning behind their actions. (11)	○	○	○	○	○

Q12. I look at a problem from more than one point of view. (12)	○	○	○	○	○
Q13. It is easy for me to understand other people's ideas (13)	○	○	○	○	○
Q14. I have different thoughts about careers that would be fun for me. (14)	○	○	○	○	○
Q15. When cooking, I stick to the recipe or the directions that came with the food. (15)	○	○	○	○	○
Q16. When I need a new username or password, it is easy for me to think of good options. (16)	○	○	○	○	○

Q17. When I get a new pet, or when someone I know gets one, it is easy for me to think of good names for it. (17)	○	○	○	○	○
Q18. I see a pattern (on the sidewalk, or anywhere outside) and see things in the shape. (18)	○	○	○	○	○
Q19. I consider many options and alternatives when solving a problem. (19)	○	○	○	○	○
Q20. I have different thoughts about careers that would be fun for me. (20)	○	○	○	○	○
Q21. When making things, I stick to plans. I do not improvise if someone has prepared plans. (21)	○	○	○	○	○

Q22. I have ideas for arranging or rearranging the furniture at home. (22)	○	○	○	○	○
Q23. I read something (written by someone else) and realize there are different ways to look at life. (23)	○	○	○	○	○
Q24. Sometimes I make plans (e. g. , going to a particular restaurant or movie), but something ruins those plans and I can’t think of what to do instead. (24)	○	○	○	○	○
Q25. I see a shadow or some other pattern and have an idea for what it could represent. (25)	○	○	○	○	○

Q26. When doing math I am tempted to follow my own ideas about how to solve a math problem. (26)	○	○	○	○	○
Q27. If someone tells me how to do something, I tend to think of different ways to get it done. (27)	○	○	○	○	○
Q28. When reading, I often think of different titles for the book or article. (28)	○	○	○	○	○

End of Block: Default Question Block

Start of Block: Block 1

Q1a. **Divergent Thinking: Realistic Presented Problems**

QUESTION 1a. List problems that are impacting your school due to the Covid-19 pandemic. Do not limit yourself; the more problems you can list, the better. Place a comma after each response. For example: ball, blue, running home. (Do not worry about spelling, and take your time.)

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Q1b. **QUESTION 1b.** Go back and select one of the problems you listed in #1a, above. Write it here:

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Q1c. Now we would like you to list possible solutions to that problem from **QUESTION 1b**. Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.) Place a comma after each response. For example: ball, blue, running home.

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Q2a. **QUESTION 2a.** List problems that could impact a community (including homes and neighborhoods) due to the Covid-19 pandemic. Place a comma after each response. For example: ball, blue, running home. The more you list, the better. They do not have to be real problems--they can be things you have not actually experienced. Use your imagination!

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Q2b. **QUESTION 2b.** Go back and select one of the problems you listed in #2a, above. Write it here:

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Q2c. Now we would like you to list possible solutions to that problem from **QUESTION 2b.** Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.) Place a comma after each response. For example: ball, blue, running home.

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End of Block: Block 1

Start of Block: Block 2

Q1. Divergent Thinking: Realistic Presented Problems

Directions: On the next few pages, we will describe a few problems, which may occur at school and home. Your task is to first read about the problem and then try to write down as many solutions as you can for each problem. **Here is an example:** Your favorite YouTube star had a new episode premier last night. You had so much fun watching it that you forgot to do your homework. You are about to go to school this morning when you realize that your homework is due in your first class. Uh-oh. . . what are you going to do? For this problem, you could answer, "Tell your teacher that you forgot to do your homework; try to do your homework in the car or bus on the way to school; ask your roommate, boyfriend, girlfriend, or classmate to help you finish your homework; do your homework tonight and turn it in the next time the class meets; or finish your homework first than show up late for class. " There are many more answers to this

problem, and all of them are legitimate. There are no grades on this—it is not a test. It is more of a game. Spelling doesn't even matter! Now turn the page, take your time, have fun, and remember to give as many ideas as possible.

1. You are attending a class online through a zoom with your teacher. You keep getting distracted by various things on your computer; surfing other websites, messaging other students, and watching YouTube. You were distracted and missed a really important part of the class, and know you don't know the content that was covered for the upcoming quiz. What should you do? How would you solve this problem? Remember to list as many ideas and solutions as you can. Place a comma after each response. For example: ball, blue, running home.

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Q2. 2. You want to tryout for the school basketball team, and know that you will be asked to run a mile as part of the skills being tested. You have several weeks until the tryouts occur, and do not currently run daily for exercise. You have a full day of commitments between school and family time. What are you going to do to prepare for tryouts that are quickly approaching? Think of as many ideas as you can! Place a comma after each response. For example: ball, blue, running home.

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End of Block: Block 2

Start of Block: Block 3

Q1. **Divergent Thinking: Titles Game**

Directions: List alternative titles for the movies, plays, and books below. Spelling does not matter and there are no grades for this. Have fun and list as many alternatives as you can. Place a comma after each response. For example: ball, blue, running home.

List alternative titles for the movie, ***"The Lion King. "***

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Q2. List alternative titles for the TV show, ***"Little Einsteins. "***

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Q3. List alternative titles for a ***"Diary of a Wimpy Kid. "***

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End of Block: Block 3

Start of Block: Block 4

Q1. **Figures:** Look at the figure below. What do you see? List as many things as you can that this figure might be. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better. Place a comma after each response. For example: ball, blue, running home.

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Q2. Look at the figure below. What do you see? List as many things as you can that this figure might be. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better. Place a comma after each response. For example: ball, blue, running home.

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Q3. Look at the figure below. What do you see? List as many things as you can that this figure might be. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better. Place a comma after each response. For example: ball, blue, running home.

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End of Block: Block 4

Start of Block: Block 5

Post-Test:

ID
Participant Number (i. e. 102)

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Ideational Behavioral Scale

Directions: Use the 1-5 scale (given below) to indicate how often each of the phrases describes your thinking and behavior. You may need to approximate. Please indicate how you really think and behave, not how you would like to. Remember--no names are used. Your responses are confidential.

Again, you may need to approximate. For each item, circle the response option that is **THE CLOSEST** to being accurate.

Here are the options:

0 = Never
1 = approximately once a year
2 = once or twice each month (approximately)

3 = once or twice each week (approximately)
4 = Just about every day, and sometimes more than once each day.

	Never (0) (1)	Yearly (1) (2)	Monthly (2) (3)	Weekly (3) (4)	Daily (4) (5)
Q1. When faced with a problem I take my time exploring various options and alternative solutions. (1)	○	○	○	○	○
Q2. I change what I want to do as a career. (2)	○	○	○	○	○
Q3. When reading books or stories I have ideas of better endings. (3)	○	○	○	○	○

Q4. When faced with a problem I do not just accept the first solution. I make sure to think of several options. (4)	○	○	○	○	○
Q5. People wonder if I am scatter-brained or absent-minded because I think about different things all at once. (5)	○	○	○	○	○

Q6. I have thoughts, which can block out all other thoughts--it is like I am stuck in a rut. (6)	○	○	○	○	○
Q7. I work out new ways to solve a problem. (7)	○	○	○	○	○
Q8. I see better ways of doing boring things. (8)	○	○	○	○	○
Q9. I have an idea about a new route between home and school. (9)	○	○	○	○	○

Q10. I see a cloud and have several ideas about what the shape or figure could be. (10)	○	○	○	○	○
Q11. I observe people and think about the reasons and meaning behind their actions. (11)	○	○	○	○	○
Q12. I look at a problem from more than one point of view. (12)	○	○	○	○	○

Q13. It is easy for me to understand other people's ideas (13)	○	○	○	○	○
Q14. I have different thoughts about careers that would be fun for me. (14)	○	○	○	○	○
Q15. When cooking, I stick to the recipe or the directions that came with the food. (15)	○	○	○	○	○

Q16. When I need a new username or password, it is easy for me to think of good options. (16)	○	○	○	○	○
Q17. When I get a new pet, or when someone I know gets one, it is easy for me to think of good names for it. (17)	○	○	○	○	○

Q18. I see a pattern (on the sidewalk, or anywhere outside) and see things in the shape. (18)	○	○	○	○	○
Q19. I consider many options and alternatives when solving a problem. (19)	○	○	○	○	○
Q20. I have different thoughts about careers that would be fun for me. (20)	○	○	○	○	○

Q21. When making things, I stick to plans. I do not improvise if someone has prepared plans. (21)	○	○	○	○	○
Q22. I have ideas for arranging or rearranging the furniture at home. (22)	○	○	○	○	○
Q23. I read something (written by someone else) and realize there are different ways to look at life. (23)	○	○	○	○	○

Q24. Sometimes I make plans (e.g. , going to a particular restaurant or movie), but something ruins those plans and I can't think of what to do instead. (24)	○	○	○	○	○
Q25. I see a shadow or some other pattern and have an idea for what it could represent. (25)	○	○	○	○	○

Q26. When doing math I am tempted to follow my own ideas about how to solve a math problem. (26)	○	○	○	○	○
Q27. If someone tells me how to do somethin g, I tend to think of different ways to get it done. (27)	○	○	○	○	○
Q28. When reading, I often think of different titles for the book or article. (28)	○	○	○	○	○

End of Block: Default Question Block

Start of Block: Block 1

Q1a. **Divergent Thinking: Realistic Presented Problems**

QUESTION 1a. List problems that are impacting your school life. Do not limit yourself; the more problems you can list, the better. Place a comma after each response. For example: ball, blue, running home. (Do not worry about spelling, and take your time.)

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Q1b. **QUESTION 1b.** Go back and select one of the problems you listed in #1a, above. Write it here:

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Q1c. Now we would like you to list possible solutions to that problem from **QUESTION 1b**. Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.) Place a comma after each response. For example: ball, blue, running home.

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Q2a. **QUESTION 2a.** List problems that could impact your community (home, neighborhood). Place a comma after each response. For example: ball, blue, running home. The more you list, the better. They do not have to be real problems--they can be things you have not actually experienced. Use your imagination!

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Q2b. **QUESTION 2b.** Go back and select one of the problems you listed in #2a, above. Write it here:

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Q2c. Now we would like you to list possible solutions to that problem from **QUESTION 2b.** Again, use your imagination! Be original. The more solutions you list the better. (Do not list new problems--be certain you are listing solutions or actions that help resolve the problem.) Place a comma after each response. For example: ball, blue, running home.

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End of Block: Block 1

Start of Block: Block 2

Q1. Divergent Thinking: Realistic Presented Problems

Directions: On the next few pages, we will describe a few problems, which may occur at school and home. Your task is to first read about the problem and then try to write down as many solutions as you can for each problem. **Here is an example:** Your favorite YouTube star had a new episode premier last night. You had so much fun watching it that you forgot to do your homework. You are about to go to school this morning when you realize that your homework is due in your first class. Uh-oh. . . what are you going to do? For this problem, you could answer, "Tell your teacher that you forgot to do your homework; try to do your homework in the car or bus on the way to school; ask your roommate, boyfriend, girlfriend, or classmate to help you finish your homework; do your homework tonight and turn it in the next time the class meets; or finish your homework first than show up late for class. " There are many more answers to this problem, and all of them are legitimate. There are no grades on this—it is not a test. It is more of a game. Spelling doesn't even matter! Now turn the page, take your time, have fun, and remember to give as many ideas as possible.

1. You are at school and found out that someone stole all of the money for your class field trip. You do not know who took the money. What should you do? How would you solve this problem? Remember to list as many ideas and solutions as you can. Place a comma after each response. For example: ball, blue, running home.

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Q2. 2. Your friend Kim wants to go to the mall with you today. The mall is not far away and it could be a lot of fun. Unfortunately, you have a writing assignment, and it requires a full day to complete. What are you going to do? Think of as many ideas as you can! Place a comma after each response. For example: ball, blue, running home.

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End of Block: Block 2

Start of Block: Block 3

Q1. **Divergent Thinking: Titles Game**

Directions: List alternative titles for the movies, plays, and books below. Spelling does not matter and there are no grades for this. Have fun and list as many alternatives as you can. Place a comma after each response. For example: ball, blue, running home.

List alternative titles for the movie, ***"Star Wars. "***

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Q2. List alternative titles for the TV show, ***"Sesame Street. "***

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Q3. List alternative titles for ***"The Cat in the Hat. "***

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End of Block: Block 3

Start of Block: Block 4

Q1. **Figures:** Look at the figure below. What do you see? List as many things as you can that this figure might be. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better. Place a comma after each response. For example: ball, blue, running home.

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Q2. Look at the figure below. What do you see? List as many things as you can that this figure might be. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better. Place a comma after each response. For example: ball, blue, running home.

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Q3. Look at the figure below. What do you see? List as many things as you can that this figure might be. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better. Place a comma after each response. For example: ball, blue, running home.

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End of Block: Block 4

Start of Block: Block 5

Appendix C: Eighth Grade Capstone Projects Content Analysis Codebook

Name	Description
Aesthetic Sensitivity	Evaluation based on the value a song possesses in virtue of its capacity to bring positive or negative value when appreciated or experienced aesthetically.
Dissonance	
Imagery	
Major	
minor	
Positive affirmation	
Repetition	

Name	Description
Emotion	A state of mind
At a loss	
Battle with innerself	
Devotion	
Isolation	
Lack of feeling	
Lack of progress	
Longing	
Mind Negative	
Pining	
Questioning	
Self-Reflection	
Environment (Negative)	Surroundings
School negative	
Traffic	
Existence	The state of living
Time	
Time Change	
Finance	Money
Financial- negative	
Musical Craftsmanship	The evaluation of color

Name	Description
Drum	
Drum mix (soundtrap)	
Electronic	
Folk music	
Garageband EDM DJ Equipment	
Guitar	
Hip Hop-Rap	
HipHop Dj Equipment (GarageBand)	
Instrument effects	
Keyboard	
Keyboard effects	
Voice	
voice echo	
Voice effects	
Musical Originality	Something unheard of
ABABCDA	
Alarming	
Augmented Chord	

Name	Description
Reverb	
Musical Syntax	A set of rules that organize musical events
A B A B A B	
ABA	
ABBB ABBB Coda	
People	Based on outside individuals
Overcrowding	
People negative	
People positive	
Physical	The body
Begin task	
Physical negative	
Physically active	