Full STEAM ahead

Arts integration and the Common Core

A Research Project

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Chapter 1

Since 2003, the Gallagher Bluedorn Performing Arts Center at the University of Northern Iowa, along with the Waterloo Community School District, Waterloo, Iowa, has collaborated with the John F. Kennedy Performing Arts Center in Washington D.C. in a program which provides classroom teachers with useful tools for using the arts to enrich the core curriculum, such as math and creative writing. Recently, the Gallagher-Bluedorn received a statewide grant that addresses the *Iowa Governor's STEM Advisory Council.* This project has connected teaching artists and educators, providing teachers with the resources and tools to engage students with kinesthetic learning.

Purpose of Study

The purpose of this study is to conduct a comprehensive literature review, examining the role of arts strategies and its effect on student and teacher learning in a kindergarten through twelfth grade school setting. Additionally, the review examined the relationship between arts teaching strategies and classroom curriculum, specifically mathematics. Do students who participate in regular art instruction (music lessons, dance class, etc.) perform better on tests? What are the effects of arts education on youth? How does arts participation impact student's empowerment and sense of accomplishment? Why are arts integration strategies in the classroom effective? And, how can movement enhance math learning? This paper reflects the effectiveness of arts strategies with classroom curriculum.

Research Questions

1. How do arts strategies affect K-12 learning and teaching?
2. What are the effects of arts strategies and STEM (Science, Technology, Engineering, and Mathematics) education?

Significance of the Study

America's education system is constantly changing, adapting to the demands of the workplace and global competition. There are high expectations set by society, businesses, and government for students, classroom teachers, and administrators to perform better than *good*. How can we as a nation prepare students for greater success? What systems need to be in place for this to be attainable for the wide range and styles of students that comprise the future generations?

The arts – visual, dance, music, theatre, creative writing – have a role in this conversation. Businesses and CEO's are demanding employees that can problem solve, work with others, and communicate clearly, with the ability to think outside the box. The Partnership for 21st Century Skills is a national organization that advocates for 21st century readiness for every student. *Critical thinking, communication, collaboration, and creativity* are one of four categories within the 21st century framework identified by the partnership (Partnership for 21st Century Skills). Sandra Ruppert (2009) of the Arts Education Partnerships states:

> Arts learning experiences play a vital role in developing students' capacities for critical thinking, creativity, imagination, and innovation. These capacities are increasingly recognized as core skills and competencies that all students need as part of a high-quality and complete 21st century education….one that includes learning in and through the arts... (para. 7)

In addition to the business community, another group is influencing the K-12 education system. STEM industries, professors, as well as the national government, are emphasizing the importance of STEM education and career readiness.

According to the U.S. Department of Education's report in 2007, 75% of the fastest growing occupations require significant science or mathematics training. Therefore, the importance and value of STEM education have resulted in the need for significant national reform in K–16 education and curriculum. The declining enrollment in STEM disciplines is expected to create a shortage of scientists and engineers in the U.S. workforce in the near future (Becker & Park, 2011).

Studies show that of the four STEM areas, math is most clearly defined as a formal subject. With wide recognition in schools and instruction, mathematics tends to be organized around students learning its formal organizational, substantive, and syntactical structures (Herschbach, 2011).

Gavin, Casa, Adelson, Carroll, Sheffield, and Spinelli (2007) reports that the Trends in International Mathematics and Science Study (TIMSS) showed how students in the United States continue to fall far below their international peers on the mathematics assessment. The gap increased from fourth to twelfth grade, by which time only two countries had students performing significantly lower than the United States. While 40% of eighth-grade students in Singapore and 38% of eighth-graders in Taiwan scored at the most advanced level on the 2003 TIMSS mathematics assessment, only 7% of U.S. eighth-graders scored at this level (Gavin et al.).

On the national level, results from the 2005 National Assessment of Educational Progress indicate that there is a shortage of students performing at the highest level. Only 5% of fourth-grade students and 6% of eighth-grade students performed at the 'advanced' level (Gavin et al.).

What role do the arts have in the conversation? Arts education in the United States plays a variety of roles in schools today (Gullatt, 2008). According to Gullatt, research by the National Endowment of the Arts identified five roles that arts play in academics:

- arts can foster the development of students who are actively engaged in learning;
- arts contribute to the development of a creative, committed, and exciting school culture of teachers, students, and parents;
- arts can help generate a dynamic, coordinate, and cohesive curriculum; and
- arts can build bridges to larger community, to broader culture, and to other institutions; arts can humanize the learning environment

Delimitations of the Study

1. The literature review served as a means of investigating the relationship between arts strategies and mathematics in the K-12 classroom and the effects of student learning and teacher instruction.

Limitations of the Study

1. The concepts of arts integration and STEM education has existed separately for decades, though bridging the two ideas together is relatively new. Therefore, the research was somewhat limited on this specific literature review content.

Definition of Terms

The following definitions provide assistance and understanding of various concepts in the arts and public education.

Arts – the expression or application of human creative skill and imagination, subjects of study primarily concerned with human creativity and social life, such as languages, literature, music, dance, visual arts, and theatre (Merriam-Webster).

Arts Integration – An approach to teaching in which students construct and demonstrate understanding through an art form. Students engage in a creative process, which connects an art form and another subject area and meets evolving objectives in both (Silverstein & Layne, 2010).

Cognitive – relating to, or being conscious mental activities such as thinking, reasoning, remembering, imagining, learning words, and using language (Merriam-Webster).

Common Core State Standards Initiative – is a state-led effort coordinated by the National Governors Association Center for Best Practices and the Council of Chief State School Officers and were developed in collaboration with teachers, school administrators, and experts, to provide a clear and consistent framework to prepare children for college and the workforce in the areas of mathematics and language arts (Common Core State Standards Initiative).

Curriculum – the courses offered by an educational institution (Merriam-Webster).

Moving Through Math – is a math-based curriculum designed through interactive approaches to teach mathematics, which brings to life conceptual parallels between music, movement, and math concepts (Daft, 2011).

Multiple Intelligences – A theory developed by Howard Gardner in 1983 that differentiates intelligence into specific learning modalities, rather than seeing it as dominated by a single general ability (Gardner, 1983).

Professional Development – refers to ongoing learning opportunities available to teachers and other education personnel through their schools and districts (Ed Weekly).

STEAM – an acronym that stands for Science, Technology, Engineering, Arts, and Mathematics

STEM – an acronym that stands for Science, Technology, Engineering, and Mathematics

Teaching Artist – A teaching artist is a practicing professional artist with the complementary skills, curiosities and sensibilities of an educator, who can effectively engage a wide range of people in learning experiences in, through, and about the arts (Booth, 2010).

Chapter 2

A Review of the Literature

Introduction

The purpose of this study is to conduct a comprehensive literature review related to examining the affect of the arts in a kindergarten through twelfth-grade education setting and its affect on student and teacher learning. Additionally, the review examines

the relationship between arts teaching strategies and classroom curriculum, specifically mathematics.

Role of the Arts on Youth

Throughout their kindergarten through twelfth-grade education journey, school children are exposed to the arts in a wide variety of curriculum and instruction. While some students experience or even participate in the arts, the arts instruction model differs between states, districts, and communities both urban and rural. For example, during the 1999-2000 academic school year the National Center for Educational Statistics conducted a survey regarding arts education in public elementary schools in the United States. The results concluded that music and visual arts instruction were available in most of the nation's schools, 94 and 87% respectively. Dance and drama were available in one-third of the schools responding to the survey (Burnaford, 2009).

The Arts Education Partnership is a national coalition of more than 100 education, arts business, cultural, government, and philanthropic organizations whose mission is to demonstrate and promote the essential role of the arts in enabling every student to succeed in school, life, and work in the diverse and global economies and societies of the 21st century. The primary focus of the Partnership is on the student, assisting every student to reach high levels of achievement and competence in the arts and in the other subjects and skills essential to their success in school, life and work (Arts Education Partnerships).

A number of researchers have conducted studies to learn the effects of arts education and arts participation on youth. One study developed by Norton, Winner, Cronin, Overy, Lee, and Schlaug ß(2005) demonstrated that music training enhances visual–spatial abilities in young children. This research suggests that music training may have positive effects on spatial, mathematical, verbal, and motoric ability (Norton et al.).

Other research findings show that the performing and visual arts challenge students to use reasoning skills, both concrete and abstract, to draw conclusions and

formulate ideas (Gullatt). Catteral and Peppler (2007) state how the arts are a means by which students become involved, active learners rather than passive. Other benefits of arts instruction allows students to construct their own meaning, as they are actively involved in learning (Catteral & Peppler).

Specifically, a 2007 study conducted by Harris sampled 200 students from ages three to five and placed them into two separate groups, one group receiving music instruction consisting of three, half-hour weekly sessions for six months, with the other group receiving no music instruction. The study was designed to measure mathematical achievement, using the Test of Early Mathematics Ability to determine if the music instruction had any effect on students' math test scores. The findings indicated that youth who received music instruction had significantly higher math scores. In conclusion, this study proved how an arts-rich curriculum has a significant positive effect on youth student's academic achievement (Harris).

Arts strategies not only benefit a child's academic performance but it also develops one's character development and human growth. Catteral and Peppler discovered two main themes in their research study when they observed third grade students in three states who received regular visual arts instruction from skilled artists. By observing and collecting children's responses, researchers discovered that participation in a sustained program of high quality visual arts instruction is linked with the growth of self-efficacy in youth, as well as creative, original thinking. Additionally, they claim that original thinking and self-efficacy are linked and influenced by artistic learning, which may impact or transfer to original thinking more generally. They further conclude that high quality arts instruction evokes feelings of accomplishment in the arts and creates a diverse, positive interaction with peers (Catteral & Peppler).

Catteral and Peppler discovered that representation is how people learn and how they express their understandings. The researchers concluded that arts give people a way to express themselves through a visual, auditory, or kinesthetic form of representation.

According to Burton, Horowitz, and Abels (2000), experience with the arts promote eight outcomes in students - creative thinking, fluency in thought, originality, focused perception, imagination, risk taking, task persistence, and ownership in learning. Their study explored if cognitive skills developed through arts, such as higher order thinking, have an effect on learning and thinking in general as well as in other educational content areas.

Their study involved over 2000 children in grades four through eight from twelve schools. The researchers designed a series of questions and identified three main ideas – cognitive, socio-culture, and personal learning indicators. When analyzing the data for *cognitive* development, the researchers were looking from students the ability to express ideas, imagine new possibilities, and to consider other points of view. Burton et al. discovered schools with the strongest arts learning provided evidence of these *cognitive* indicators, such as expression of ideas and feelings, multiple or alternative view points, construction and organization of meaning, and focused perception. Middle school science, drama, and English teachers described how the arts enhance personal learning through construction and organization of meaning (Burton et al.).

Themes of cooperative learning and school climate characterized a *socio-culture*. Support for the outcomes of compassion and empathy, cooperative learning, and positive school climate came from the qualitative studies to represent *socio-culture* (Burton et al.). And finally, risk taking, confidence, self-esteem, and competency described the theme *personal learning* (Burton et al.). In an arts-rich school settings within the same study, Burton et al. found qualitative support for *personal learning* indicators, such as risk taking, confidence, ownership, and persistency. According to Burton et al. (2000), an example of ownership of learning is teachers having students do a visual project:

> This is another way they understand what is going on. They bring their own perspective in to it and it gives them ownership. They feel that they own the work, it's their work and it's not what I taught them (p. 243).

Teachers from many schools described children involved in the arts as positive risk takers and a willing to take a chance (Burton et al.).

Findings of the study suggests that learning in the arts and in other subjects each contribute in their distinctive ways to a degree of higher order cognitive capacities. Additionally, young people in arts rich schools also tend to enjoy demonstrating their learning to others and have a higher academic self-concept than children whose arts learning experiences have been of a shorter duration and less rich in provision (Burton et al.).

Additional research on the value of the arts for influencing learning and teaching is currently being reported in the professional literature. Supported by the Dana Foundation, Gazzaniga (2008) summarizes a number of conclusions that discuss preliminary findings that the study of the arts impact brain functioning by influencing the development of sequencing, manipulation of semantic information, and motor learning skills. Furthermore, Hetland, Winner, Veenema, and Sheridan (2007) conducted a meta-analysis of studies that attempted to show a bond between student participation in the arts and improved academic performance. Their work reveals a causal relationship between the arts and non-arts based cognition in both drama and music. Causal relationships found in drama improve reading readiness, reading achievement scores, oral language skills, and story understanding (Podlozny, 2000).

According to Economidou, Chrysostomou, and Socratous (2011), more and more research studies show the importance and uniqueness of the arts in children's lives and education. The arts represent ways of knowing, approaches to learning, paths for self-expression, and, above all, integral parts of our being (Economidou et al.).

Howard Gardner

Howard Gardner's theory of multiple intelligences serves an influential structure in support of interdisciplinary approaches in teaching and learning and has been used to justify the inclusion of the arts at the core of education. According to Gardner's theory all

eight intelligences - naturalistic intelligence, visual-spatial intelligence, kinesthetic, logical, verbal intelligence, and musical intelligence (Gardner, 1983) - are necessary in order for individuals to develop, be educated, and able to communicate with the world around them (Economidou et al.). According to Gardner, teachers should strive to provide a wide range of entry points to learning (Economidou et al.).

Gardner's multiple intelligences theory suggests a relatively different school environment in which individual differences play an important role in defining how curriculum is organized and implemented. Several researchers and theorists have supported Gardner's multiple intelligences theory. According to Gamwell (2005), Eisner emphasized the need to develop a more personally referenced curriculum that would place less emphasis on putting all children "through the eye of the same needle" (p.107). Suggested by constructivist theorist Jean Piaget in a study conducted very late in his life, he observed that children demonstrate different ways of understanding when producing an activity, modeling their perceptions of the act, and reflecting on their actions (Aaron, 1994). Gardner has suggested that humans have many different intelligences, all of which are distinct and possess independent capacities (Gamwell).

Gardner's work raises consciousness about how best to create a genuine understanding of concepts in learners rather than a "rote, ritualistic, or conventional performance" (Gardner, p. 9), and nudges educators to seek new pedagogical strategies to enhance meaningful learning (Pool, Dittrich, & Pool, 2011).

A 2011 study by Pool et al. explored the use of Gardner's multiple intelligence theory with pre-service teacher's education training. As one education major observed (Pool et al., 2011):

> It is important to vary teaching practices to reach every student as well as not bore all the students. Also, it's important to integrate multiple intelligence in assessment because students may actually know the material but not be able to present it in the way [format] in which it is asked [framed]. By including a variety

> of assessments it allows the teacher to know whether or not all students understand (p. 6).

Arts Integration

Essentially, how do students learn best? Students learn best when they are active constructors of their own knowledge and when they connect classroom concepts to experiences in arts strategies (Aaron). The term arts integration has many meanings, though defined by Silverstein and Layne of The John F Kennedy Center for the Performing Arts in Washington DC as "an approach to teaching in which students construct and demonstrate understanding through an art form. Students engage in a creative process which connects an art form and another subject area and meets evolving objectives in both" (tab 1-6).

In today's educational climate, arts integration increases academic achievement and student retention while nourishing teachers personally and professionally, helping them to move toward 'highly qualified' criteria, and be effective and innovative in the teaching profession (Bellisario & Donovan, 2012).

Bellisario and Donovan conducted a two-year study at Lesley University, which examined the importance of arts integration in today's educational climate from the perspectives of teachers who completed a graduate program in arts integration at the university. The study included 204 teachers in 19 states through a survey, focus groups, interviews, and classroom observations and documented the benefits of arts integrated instruction identified by the teachers. The study also featured teachers' observations of the impacts of arts integration on student learning and reported how arts integration stimulates deep learning, creates increased student engagement, and cultivates students' investment in learning (Bellisario & Donovan).

When observing students, teachers learned that arts integration leads to deep learning, increased student ownership, and engagement with academic content, according to Bellisario and Donovan. Additionally, an arts integrated lesson provides a variety of

strategies for accessing content and expressing understanding as well as creating learning opportunities that is culturally responsive and relevant in students' lives. Twenty-first century learning also occurred in the lessons, including creativity, innovation, and imagination, while students also developed empathy, an awareness of multiple perspectives, and cultural sensitivity to others (Bellisario & Donovan).

The researchers discovered benefits for the classroom teachers as well. Arts integrated teaching provides hands-on experiential learning through arts-based professional development that engenders engagement in the creative process that mirrors the process teachers' students will engage in. It also allows teachers a means for providing dynamic and creative instruction to facilitate deep learning. The lessons enable teachers to differentiate their instruction to meet the needs of all learners and provide pathways for culturally responsive pedagogy, which recognizes the cultural backgrounds and individuality of all students. And finally, arts integrated lessons rejuvenate teachers who were on the verge of burnout and renew teachers' commitment to teaching (Bellisario & Donovan).

Bellisario and Donovan discovered the challenges and constraints some classroom teachers experienced when developing and implementing arts integrated instruction. Lack of space, supplies, funds, lack of support from administration, increased testing pressure, and scripted curriculum are a few basics barriers. Some teachers, however, found ways to integrate the arts into their curricula despite these obstacles and cite that they help generate the support they need to do so by providing research and advocacy on arts integration to their administrators, building a network of allies within their schools, and thoroughly documenting the outcomes of their students' achievement learning in arts integrated lessons (Bellisario & Donovan).

While using both an art form and another curricular content to enhance a student's understanding of subjects, what do arts integrated lessons look like in the classroom? For example, students can use the elements of dance (body, action, space, time, and energy)

to learn the water cycle, systems of the human body, and rock cycle. Another arts integrated lesson applies drama strategies to explore history and literature told from a particular point of view. Specifically, when recognizing the variety of perspectives when analyzing events and literature, students understand the complexity of issues and develop critical thinking skills. Through creative drama strategies, students better analyze characters and situations. By enacting texts and journaling students explore different points of view on the same event and expand their empathy for others (The Kennedy Center).

Through the use of music strategies, students can use these elements for improving their ability to recognize sound and rhythmic patterns in language and their overall reading fluency. Expressive strategies build students' comprehension, develop their understanding of inference, and bring both descriptive and figurative writing to life (Kennedy).

Arts integration strategies have been occurring in the classroom for some time now. A study conducted by Pellegrini and Galda (1982), encompassed 108 children in grades kindergarten through second from a rural school in northeast Georgia. Teachers, some on three separate occasions, read students three books. After reading, the students were exposed to one of three ways for processing and exploring what they heard, such as fantasy play, discussion, or drawing. Pellegrini and Galda discovered that children became more active, interactive, and information explorers when acting out a story than when reviewing the story through adult-led discussions or when drawing to illustrate a scene or theme from a story.

Other studies have found that when children have been involved in the process of integrating creative drama with reading they are not only able to better comprehend what they have read and acted out, but they are also better able to comprehend what they have read but do not act out, such as the written scenarios they encounter on standardized tests (DuPont, 1992).

Research suggests an arts integration approach to teaching provides students the opportunity to construct meaning of content-related material through the use of the visual, dramatic, and musical arts. The Harvard University study, conducted in 2008 by Winner and Hetland, *Reviewing Education and the Arts Project* examined articles that illustrated a relationship between arts and academic achievement. Of the 11,467 articles, conference papers, reports, theses, books, and unpublished papers and data examined, 188 reports were used for the research study. These reports investigated the relationship between one or more art forms to one or more academic areas (Gullatt).

The researchers conducted a set of 10 meta-analyses on the selected reports. The purpose of these analyses was to determine the relationship of the arts, as it enhances academic performance. It was established that three areas showed clear links to academic outcomes. The first was a causal connection between listening to music and spatial-temporal reasoning, the second a relationship between learning to play music and spatial reasoning, and third, a causal link between classroom drama and verbal skills (Gullatt).

Herschbach (2011) describes a similar means when combining content areas. The integrated curriculum design attempts to capture the interrelationships within and between subjects. Not only is learning thought to be enhanced, but also it is considered to be more relevant. The student learns how knowledge is applied.

Additional findings from Gamwell (2005) suggests that arts based learning experiences can contribute to children's engagement in their learning, critical thinking and problem solving skills, empathy and tolerance for others, ability to work, and self confidence.

Additionally, research supports that knowledge and experience are not compartmentalized, particularly in the early ages. Therefore, learning should not be offered in small fragmented pieces labeled 'mathematics,' 'language' or 'sciences' (Economidou et al.). Because of the way the brain works and how knowledge is acquired and retained, some suggest how the brain resists the learning of fragmented information

Furthermore, knowledge is acquired more easily and is remembered for a longer period of time when connections are created between ideas and concepts (Economidou et al.).

As 21st century learning becomes more and more relevant in the classroom, a renewed focus on the influence and impact of the arts provides value in the attempts to understand and address the newest and most difficult challenges associated with teaching and learning (Pool et al.).

Arts and STE(A)M

Most recently the focus of STEM careers and education has been a hot topic both regionally and nationally, streaming from CEOs, government, and industries to keep America competitive in the global workplace. In an effort to help reaffirm the United State's position as a global leader in education, the America COMPETES Act of 2010 authorized various programs to strengthen research and education in the United States related to STEM (The White House).

Essentially, how do students learn STEM concepts best? Is there a relation between STEM and the Arts – STEAM (Science, Technology, Engineering, Arts and Mathematics)? With the STEM program in full swing at the local and national level as an ingredient for a better, well-prepared student, an additional item added to the recipe for success has gained attention – the arts.

Jim Brazell, (2011) a technology forecaster, strategist, and public speaker who focuses on innovation and transformation suggests, "Advocates from both the world of science and the world of the arts have converged in a grassroots movement. The movement is about transformative practices in education that unify knowing and doing – theory and application" (p. 8). Countless studies will conclude the importance of both STEM programs and arts instruction is vital in a child's K-12 educational journey. However, what does the data tell us if the two forms are combined and, most importantly, what does it look like?

Becker and Park studied the findings from existing research on the effects of the

integrative approaches among STEM subjects on students' achievement. The results revealed that integrative approaches among STEM subjects have a positive effect on the students' achievement. Specifically, the effects of integrative approaches by grade levels indicated that early exposure might produce higher achievement scores among STEM subjects. These outcomes reflect that integrative approaches among STEM subjects may be better suited to young learners (Becker & Park).

Education undergraduate programs also find value of integrated approaches between subject matters. When pre-service teachers experienced and observed arts integrated math instruction they immediately reflected on their own learning of mathematics as an elementary students. Pool et al's (2011) research suggests how most students learned math through traditional means "without the benefits of creative pedagogy or arts integration" (p. 3). "Maybe I would understand math better, if I had been taught it through a different means" (Pool et al., 2011, p. 8).

Let us step into a typical or traditional elementary math classroom. When teaching and studying mathematics, it is largely structured with fairly little emphasis on conceptual development and discovery (Stodolsky, Salk, & Glaessner, 1991). Additionally, math instruction tends to follow a pattern in which the standard is teacher explanation of concepts to the whole class, followed by sessions of individual student practice through seatwork exercises. The ability to engage in group work is very rare as is exposure to materials other than the textbook, worksheets, and the blackboard (Stodolsky et al.).

According to Stodolsky et al.'s research through student interviews when discussing math, students expressed strong feelings about learning and their own proficiency, in comparison to stories about other school subjects. In particular, bad math experiences were illustrated by feelings of anxiety, shame, and inadequacy.

Stodolsky et al. discovered that every student mentioned doing math problems, such as those found on the practice pages of textbooks, as a typical classroom activity. In

addition, students listed checking work and homework, playing games, answering questions from the teacher, and taking tests as other math activities. The descriptions of solving problems as seatwork or at the board are very consistent with accounts of math classes based on observational studies. Moreover, some of the students' remarks suggest that the talking in math essentially consisted of teacher explanations and student answers or questions. Stodolsky et al. (1991) discovered one student's frustration, "We ask questions; we don't have a conversation" (p. 107).

According to the researchers when describing classroom activities, few students mentioned situations in which they worked together. Though the primary occasions in which interaction occurred were when playing games in math.

When learning math skills became hard and they were unsuccessful, students didn't like math and they felt frustrated and anxious (Stodolsky et al.). Through a series of interviews, Stodolsky et al. (1991) discovered that most students recalled disliking a time in math because it was difficult:

> When we were first learning decimals [Probe: Why was that?] because it was confusing – it didn't really make sense. It took me two years to learn how to tell time...it got me really frustrated, and I hated it! When I got an answer wrong three times in a row, it was either in probability or percentages, and I was getting really jittery. Then…I felt like slamming my head on the desk (p. 103).

The researchers noted that students are usually exposed to a more restricted range of instructional forms in math than in social studies. Stodolsky et al. (1991) found how one student mentioned, "but I guess the way math is now [is] the way it's going to be" (p. 109).

The study found how students define math primarily in terms of arithmetic computation and doing problems. Math seems saturated with a 'given' quality in which it is implicitly seen as being fixed and immutable – few students and perhaps not many

teachers can conceive of ways that it could be any different. Ease and success, or difficulty and failure, characterize the relationship students maintain with the subject. Most students feel they could not learn new materials in math on their own, and they also feel dependent on someone to show them how to do math correctly. When thinking about math, students expressed how it focused on 'correctness' (Stodolsky et al.).

The usual instructional pattern in math classes establishes an expectation on the part of students that they will be 'told' math. Whereas application, experimentation, discovery, and inquiry create mathematical activities that do not necessarily involve following a prescribed procedure or obtaining one right answer. This example, though, rarely exists in elementary math classrooms. In conclusion, Stodolsky et al. believe that instructional experiences for students are a central ingredient in the development of beliefs and attitudes.

Common Core and Mathematics

The National Council of Teachers of Mathematics outlined what students should learn, but also how they should learn mathematical content. This shift encourages students to problem solve, communicate, reason, make connections, and use different representations as they engage with mathematics (Gavin et al.).

In 2010, the National Governors Association Center for Best Practices and the Council of Chief State School Officers revealed the Common Core State Standards, which provided a consistent, clear understanding of what students are expected to learn in the areas of mathematics and literacy (Common). The new standards are designed to reflect the real world, reflecting the knowledge and education today's students need to succeed in college and in the job force (Common).

Unlike previous state standards the Common Core State Standards enable collaboration between states on a range of tools and policies, including the development and implementation of common comprehensive assessment systems to measure student

performance annually that will replace existing state testing systems and changes needed to help support educators and schools in teaching to the new standards (Common).

Specifically, implementing Common Core State Standards in Mathematics (CCSSM) in kindergarten requires more deliberate teaching of math so students will work at higher levels of mathematical thinking. Purposeful instruction does not have to eliminate the sense of playful discovery that occurs in a kindergarten, first and second grade classroom. As teachers begin to implement CCSSM, their teaching of math can increase in rigor and expectations. The characteristics of CCSSM reinforces this integrated approach to curriculum and can be accomplished in such ways as incorporating mathematics into other content and tapping into students' interests while connecting new learning to prior knowledge (White & Dauksas, 2012).

According to White and Dauksas, to truly represent the purpose of CCSSM teachers may have to alter their instruction and environment while thinking differently about how children learn mathematical skills and concepts. Most teachers will not experience a big change in what they teach but in *how* they teach it. The focus will be on the process, not the results. Children will be expected to engage in higher-level thinking and will be able to make connections, discoveries, work together, ask questions, and pose problems— revealing their prior knowledge. The demand for more rigorous thinking can be met if children are engaged in mathematical situations that allow them to compare, analyze, examine, compose, design, develop, assess, justify, and predict throughout the school year (White & Dauksas).

The researchers believe that teachers should encourage students to discover and use mathematics across content areas. For example, in social science classes, students can use the skill of measurement when they read and draw a map. During art class, students can reinforce their knowledge of shapes, emphasizing names and attributes as they create collages and symmetrical designs. Young children will be better able to use and recall mathematical skills and terminology when they have had opportunities to apply them in

more than one context (White & Dauksas).

Common Core and Arts Education

Embracing the common core may be a survival strategy for the arts in schools, considering how much time, energy, and resources districts and schools are devoting to the standards. The connection of the arts and the common core is on the radar of many national associations, including Washington-based Arts Education Partnership and the Americans for the Arts. Together, these organizations propose arts advocates to connect the common core with arts strategies as a means of gaining support from school administrators (Robelen, 2012).

On the ground level, school districts are finding means to link the two together. Susan Rilery, a curriculum specialist with the 77,000-student Anne Arundel County District in Maryland, works with teams across academic departments with implementing the new standards. "I see the common core as a great platform for the arts to really rise and share their importance in the educational fabric of a school. There are a lot of natural connections" (Robelen, 2012, p. 18). With an arts integration background, Rilery and the school district are developing resources to assist teachers make classroom connections between the common core and other disciplines, including the arts (Robelen).

More specifically, the Anne Arundel County District has produced materials to help teachers integrate the arts with common-core math concepts. For example, a flyer has been developed for fourth-grade curriculum with hyperlinks to math and state arts standards. Furthermore, this document suggests for the math common core of *operations and algebraic thinking* that students "compose and analyze melodic and rhythmic patterns" or "create a movement pattern and then depict it through drawing" (Robelen, 2012, p. 18).

Another common core and arts connection merges an artist and geometric concepts. At the Integrated Arts Academy at H.P. Wheeler, a magnet school in Burlington, Vermont, a fourth-grade unit bring connects the painter Wassily Kandinsky

and his abstract work with geometric concepts. Identifying various angles in the Russian's work, students then created their own art inspired by his work, and labeled the types of angles they use (Robelen).

Collaboration and planning time for teachers is key for the success of merging these two fields. "This is the only way to ensure integrity in both aligning the standards and in their execution and application" (Robelen, 2012, p. 19).

Moving Through Math

A recent studied gauged the effectiveness of arts integrated instruction and math concepts. The math curriculum Moving Through Math (MTM), developed by Marcia Daft, is an active, conceptual, and creative approach to teaching mathematics. Students explore mathematical concepts and their relationship to language, spatial reasoning, rhythm, body movement, and the imagination. When students experience MTM, they learn math concepts visually, aurally, spatially, kinesthetically, verbally, and socially (Daft, 2011).

The purpose of this study was to gauge teachers' learning on the lesson strategies of Moving Through Math. The results would link the effectiveness of teaching arts integration strategies and its influence on student achievement. The lessons designed in Moving Through Math address the Waterloo Community School District's (WCSD) goals and objectives. According to Daft, the purpose of the MTM curriculum is to provide an active, conceptual, and creative approach to teaching mathematics. Students explore mathematical concepts and their relationship to language, spatial reasoning, rhythm, body movement, and the imagination through MTM.

The benefits of the MTM approach to teaching offers active experiential learning, engages the whole body, the whole mind, and the whole learner. MTM also inspires student creativity, excitement, and enthusiasm. The lessons guide students to develop higher-order thinking skills in addition to deeper, long lasting student learning (Daft, 2011).

Moving Through Math Research

Forty-three kindergarten teachers at the Waterloo Community School District in Iowa received MTM professional development training during the 2011-2012 school year. Their training began in August 2011, with a three-day summer institute with MTM Kennedy Center teaching artist Marcia Daft. Once the school year started, teachers began implementing MTM lessons as it aligned with the district's math curriculum map. Following the Iowa Professional Development Model, Daft came back three months later to provide follow-up classroom demonstration lessons with kindergarten teachers observing. After each classroom demonstration, time was allotted for the teachers to discuss and reflect with Daft.

From November 2011 to February 2012, teachers practiced the MTM lessons with their students. Daft came back for the third and final time in March 2012 for additional classroom demonstration lessons as well as side-by-side classroom coaching for those teachers further along in the MTM training.

A quantitative questionnaire was designed to gauge teacher's learning throughout the MTM professional development training. Teachers were asked to participate in the survey four different times as they were implementing the lessons, 1) February 2012 (before Daft's March visit), 2) March 2012 (after her visit), 3) September 2012 at the beginning of the 2012-2013 school year, and 4) January 2013. The following evaluative questions were asked each time:

1. By using this approach to instruction I know the difference between mathematical memorization and comprehension.
2. By using this approach to instruction I know how to articulate mathematical thinking through clear and concise language.
3. By using this approach to instruction I am able to facilitate lessons in which students collaborate with their peers to represent and explain mathematical concepts.

4. By using this approach to instruction I am able to facilitate lessons in which students collaborate with their peers to represent and explain mathematical concepts.
5. By using this approach to instruction I appreciate the joy of learning mathematics from a creative and experiential perspective.
6. By using this approach to instruction I appreciate how different students can represent mathematical thinking in diverse ways.

The MTM curriculum is one of two math strategies in the kindergarten math curriculum at the Waterloo Community School District. Because MTM is a district-wide initiative it was essential to learn of the lesson's effectiveness on student learning as well as the teacher's ability to implement the lessons with fidelity in order to serve its purpose.

The primary method used to collect the teacher evaluations was through the online survey resource, surveymonkey.com. Emails were sent to 43 kindergarten, a total of four times throughout the 2011-2012 and 2012-2013 school years to gauge the implementation process over the course of two academic years. Thirteen teachers participated in the first evaluation in January of 2012, exactly one week prior to Daft's visit. The second of four evaluations occurred four weeks after Daft's visit, which allowed time for teachers to effectively implement the MTM geometry unit in their classroom. Seventeen teachers participated in the March 2012 evaluation. The September 2012 evaluation included 24 teachers while the fourth and last evaluation occurred in February of 2013 with 17 teachers participating.

The sample frame of this study are kindergarten teachers of the WCSD in Waterloo, Iowa, all of which have received training in the Moving Through Math program during the 2011-2012 academic school year.

Of the kindergarten teachers who participated in the survey, all are female with 33% having taught a total of 21-26 years and 44% teaching in the WCSD for 13 or more years.

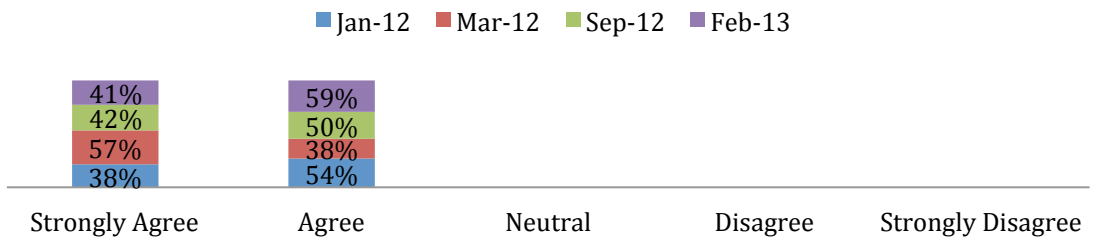
Two questions in three different categories were asked, 'Through the Moving Through Math lessons, what do you 1) know, 2) are able to, and 3) appreciate, as it relates to your experience as learners of the MTM lessons and your observations as teachers implementing the MTM lessons.' Teachers were asked to rate six questions on a five-point likert scale, with the categories of strongly agree, agree, neutral, disagree, or strongly disagree. Overall, the majority of teachers used the category strongly agree and agree in all six questions.

TEACHER KNOWLEDGE

The first two questions focused on what teachers would be able to know once they completed the training and began implementing MTM in the classroom, 1) knowing the difference between mathematical memorization and comprehension (table 1) and 2) how to articulate mathematical thinking through clear and concise language (table 2). Moving Through Math is specifically designed for classroom teachers to shift their teaching strategies from student worksheets and memorizing facts to active, engaged student learning. All four surveys revealed how all the teachers strongly agree and agree to this approach.

Table 1: By using this approach to instruction I know the difference between mathmatical memorization and comprehension.

Table 2: By using this approach to instruction I know how to articulate mathematical thinking through clear and concise language.



TEACHER INSTRUCTION

The theme for questions three and four focused on how teachers will be able to 3) facilitate lessons in which students use their bodies to represent mathematical concepts, (table 3) and 4) facilitate lessons in which students collaborate with their peers to collectively represent and explain mathematical concepts (table 4). The greatest gain appeared with question three, from January 2012 to the March 2012 and September 2012 surveys. January 2012 had 54% of teachers strongly agreeing, which jumped to 71% and 75% in March and September of 2012, that they were able to teach lessons which students used their bodies to represent math concepts

Table 3: By using this approach to instruction I am able to facilitate lessons in which students collaborate with their peers to represent and explain mathematical concepts.

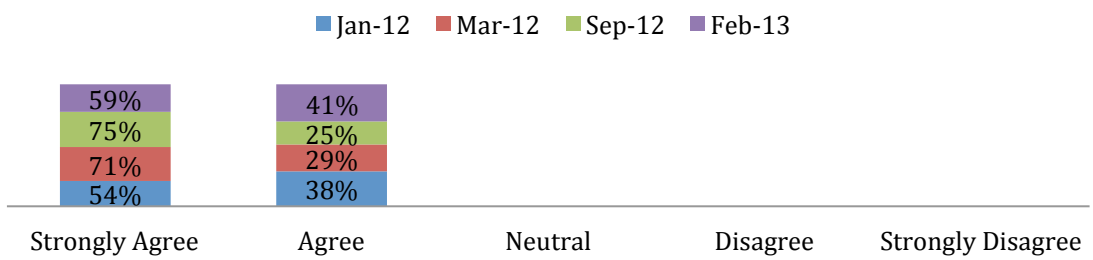
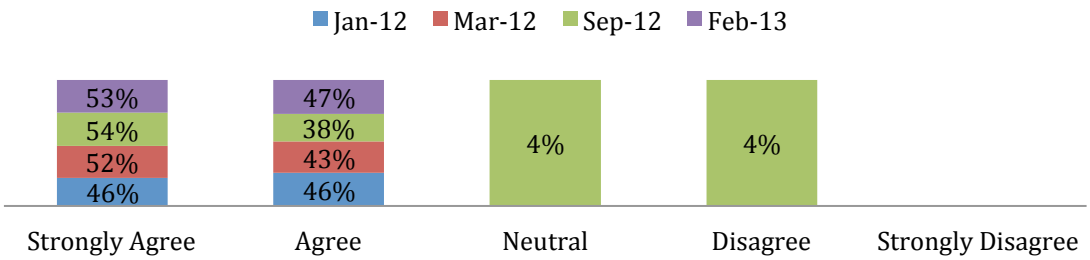


Table 4: By using this approach to instruction I am able to facilitate lessons in which students collaborate with their peers to represent and explain mathematical concepts.



TEACHER APPRECIATION

The final section focuses on value and appreciation of the MTM strategies. In particular, by using this approach to instruction teachers will appreciate 5) the joy of learning mathematics from a creative and experiential perspective, (table 5) and 6) how different students can represent mathematical thinking in diverse ways (table 6). These two questions are the most important section of the study. Because teacher's attitudes and beliefs are key factors when making any kind of changes, when the January 2012 and November 2012 surveys revealed that of the 23% neutral shifted to strongly agree or agree to the appreciation of learning mathematics in a creative and experiential environment it validated the belief of the arts integration of movement with mathematics.

Table 5: By using this approach to instruction I appreciate the joy of learning mathematics from a creative and experiential perspective.

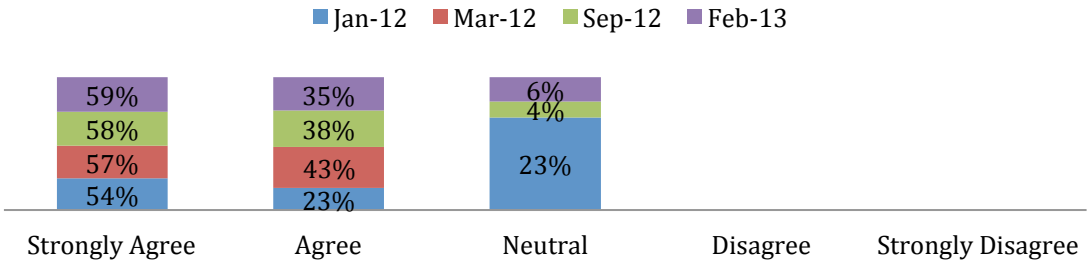
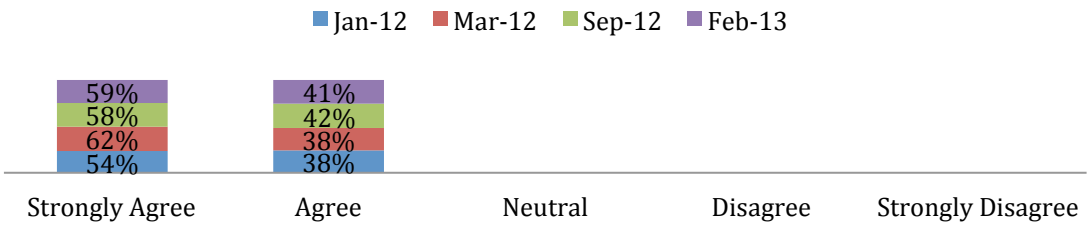


Table 6: By using this approach to instruction I appreciate how different students can represent mathematical thinking in diverse ways.



When asked what observations they have made of their students with Moving Through Math lessons, teachers expressed how much the students enjoy the activities. One teacher mentioned how "more students are sharing their thinking" through active participation. Another teacher observed how "the moving in the lessons helps students remember concepts much easier."

Other teachers believe that Moving Through Math and the arts integration strategies "carries over to different aspects of learning." "The experiences that my children have when doing MTM are long lasting and they are able to apply knowledge of skills and concepts to other areas in math, literacy and science." Overall, the strategy "helps students grasp the understanding of concepts in an active, engaging, and age-appropriate way."

"I like how Moving Through Math is definitely using the *gradual release of responsibility* method of instruction." The students "are also able to retain more of the information." Another teacher has "been amazed at the way my 'low' students are able to grasp the concepts after repeated practice with language and movement. I like seeing this transfer to what I am doing" with the other classroom math curriculum. One teacher observed how "learning through movement helps in fostering student understanding."

In summary, the online evaluations demonstrated the views from the Waterloo Community School District kindergarten teachers the value of arts integration with mathematics. All four evaluations confirmed the criteria with the majority of teachers

agreeing or strongly agreeing of the MTM effectiveness. Moving Through Math confirms the assumption that arts integration allows students to learn math in an active, creative, and experiential learning environment.

21st Century Learning with Moving Through Math

Businesses and CEO's are demanding employees that can problem solve, work with others, and communicate clearly, with the ability to think outside the box. The Partnership for 21st Century Skills is a national organization that advocates for 21st century readiness for every student. Critical thinking, communication, collaboration, and creativity fall under one of four categories within the 21st century framework identified by the partnership (Partnership).

The art strategy of Moving Through Math develops each of the four C's. Through active arts learning, students use their *critical thinking* skills through the use of reasoning (inductive and deductive) and thinking (convergent and divergent). Additionally, students reflect critically on learning experiences and processes, analyze how parts of a whole interact with each other, solve problems in both conventional and innovative ways, and analyze and evaluate major alternative points of view (Daft, 2005).

Through arts learning, students learn how to *communicate* new ideas to others effectively, are open to diverse perspectives, and incorporate group input and feedback into their work (Daft, 2005)

Developing the skill set for *creativity*, MTM allows students to brainstorm and create new ideas. Students are also elaborate, analyze, and refine their own ideas in order to improve and maximize creative efforts. Most importantly, students learn that creative work is a long-term, spiraling process (Daft, 2005)

CHAPTER THREE

Introduction

In summary, this comprehensive literature review examines the role of arts strategies and its affect on student and teacher learning in a kindergarten through twelfth-grade school setting. Additionally, the comprehensive review examines the relationship between arts teaching strategies and classroom curriculum, specifically mathematics. This paper reflects the effectiveness of arts strategies with classroom curriculum and its relationship with STEM initiatives. Chapter three provides a summary analysis of the literature review, implications for professional practice, and recommendations for further research.

Three main ideas were introduced in chapter two, arts education, mathematics, and the connection between the two disciplines. This summary analysis will afford a means for implications for professional practice of arts organizations and school districts and recommendations for these two partners to explore with an arts integrated approach to curriculum.

Synthesis and Analysis

We've discovered how America's education system is constantly changing, adapting to the demands of the workplace and global competition. We've also explored how we as a nation can prepare students for greater success. We've learned what systems need to be in place for this to be attainable for the wide range and styles of students that comprise the future generations.

The arts have a seat at the table for conversation. As Sandra Ruppert (2009) of the Arts Education Partnerships eloquently states:

> Arts learning experiences play a vital role in developing students' capacities for critical thinking, creativity, imagination, and innovation. These capacities are increasingly recognized as core skills and competencies that all students need as part of a high-quality and complete 21st century education….one that includes learning in and through the arts... (para. 7)

Catteral and Peppler state how the arts are a means by which students become involved, active learners rather than passive. Another benefit of arts instruction is that students are enabled to construct their own meaning because they are actively involved in learning (Catteral & Peppler). Arts-rich curriculum has a significant positive effect on youth student's academic achievement (Harris). Additionally, young people in arts-rich schools also tend to enjoy demonstrating their learning to others and have a higher academic self-concept than children whose arts learning experiences have been of a shorter duration and less rich in provision (Burton).

Arts strategies not only benefit a child's academic performance but it also develops one's character development and human growth. Catteral and Peppler discovered that representation is how people learn and how they express their understandings. The arts give people a way to express themselves through a visual, auditory, or kinesthetic form of representation (Catteral & Peppler).

Teachers from many schools described children involved in the arts as positive risk takers and a willing to take a chance (Burton et al.). Findings of recent research suggests that learning in the arts and in other subjects each contribute in their distinctive ways to a degree of higher order cognitive capacities (Burton et al.).

According to Economidou et al, more and more research studies show the importance and uniqueness of the arts in children's lives and education. The arts represent ways of knowing, approaches to learning, paths for self-expression, and, above

all, integral parts of our being (Economidou et al.).

Students learn best when they are active constructors of their own knowledge and when they connect classroom concepts to experiences in arts strategies (Aaron). Arts integration holds relevance in today's educational climate for both students and teachers, leading to increased academic achievement and student retention while nourishing teachers personally and professionally, helping them to move toward 'highly qualified' criteria, and be effective and innovative in the teaching profession (Bellisario & Donovan).

Arts integration leads to deep learning, increased student ownership, and engagement with academic content. Additionally, an arts integrated lesson provides a variety of strategies for accessing content and expressing understanding as well as creating learning opportunities that is culturally responsive and relevant in students' lives (Bellisario & Donovan).

The lessons enable teachers to differentiate their instruction to meet the needs of all learners and provide pathways for culturally responsive pedagogy, which recognizes the cultural backgrounds and individuality of all students. And finally, arts integrated lessons rejuvenate teachers who were on the verge of burnout and renew teachers' commitment to teaching (Bellisario & Donovan).

Research suggests an arts integration approach to teaching provides students the opportunity to construct meaning of content-related material through the use of the visual, dramatic, and musical arts. Additional findings from Gamwell suggests that arts based learning experiences can contribute to children's engagement in their learning, critical thinking and problem solving skills, empathy and tolerance for others, ability to work, and self confidence.

Additionally, research supports that knowledge and experience are not compartmentalized, particularly in the early ages. Therefore, learning should not be offered in small fragmented pieces labeled 'mathematics,' 'language' or 'sciences'

(Economidou et al.). Because of the way the brain works and how knowledge is acquired and retained, some suggest how the brain resists the learning of fragmented information Furthermore, knowledge is acquired more easily and is remembered for a longer period of time when connections are created between ideas and concepts (Economidou et al.).

This paper also explores how art strategies enhance STEM education. With STEM programs in full swing at the local and national level as an ingredient for a better, well-prepared student, an additional item added to the recipe for success has gained attention – the arts.

STEM programs and arts instruction is vital in a child's K-12 educational journey. Research has indicated how an integrative approach among STEM subjects has a positive effect on the students' achievement (Becker & Park).

Looking at math instruction, most students learned math through traditional means (Pool) ie, teacher explains concepts to the whole class, followed by sessions of individual student practice through seatwork exercises (Stodolsky). When interviewing students, they define math primarily in terms of arithmetic computation and doing problems. Math seems saturated with a 'given' quality (Stodolsky).

The demand for a more rigorous thinking can be met if children are engaged in mathematical situations that allow them to compare, analyze, examine, compose, design, develop, assess, justify, and predict throughout the school year (White). Arts strategies allow students to understand the 'why' of math, rather than accepting the answers.

Implications for Professional Practice

A partnership between an arts organizations partner and a school district or school building is a common practice throughout the United States. Many performing art centers provide artist residencies or master classes for teachers and students, while other centers might provide a school-matinee series at its venue. However, a partnership to provide professional development for teachers on how to use arts strategies to teach

common core curriculum as an unpracticed field is not as common as other types of programming.

Why would school districts want this type of partnership? Why would arts organizations want to provide their resource this type of programming? If an arts organization is interested in pursuing an arts integrated partnership with a school district what are its first, second, and third steps?

An obvious first step is for an arts organization to learn of the school districts success, accomplishments and challenges as it addresses student learning. Reading its annual report, test scores, conversations with school board members or meetings with curriculum staff or teachers can accomplish this first step.

The second step, after identifying as an arts organization and school partner its needs, investigates local and national resources to accomplish this goal. At the local level there might be arts staff in the district, professors at the university, or artists with an arts organization who would provide the means of arts integrated strategies. Are their local resources available? If not, what statewide or national organizations can assist with this implementation?

Nationally there might be associations to provide successful planning strategies for implementation. Planning, and lots of it, is the third step of developing an arts integrated professional development workshops for teachers. In Iowa, we look to the Iowa Professional Development for implementation strategies and evaluation. Nationally we can look at the Kennedy Center's model of planning, presenting, and evaluating to assist with the implementing arts integration.

Even after resources are identified, it's important for both the superintendent and the CEO of the arts organization to agree to the objectives - focusing on the learning outcomes of students while increasing student achievement and understanding. In this day and age communities are largely responsible for the success of students and their school, not solely the school district.

The strongest motivation to use the arts is to increase the awareness of the diversity of learning styles and needs among students. Research conducted by Oreck (2004) concluded how teachers articulated a variety of ways in which arts-based professional development experiences encouraged them to bring their creativity into the classroom, expand their teaching repertoire, and find effective ways to incorporate the arts in the academic curriculum.

Recommendations

While analyzing and collecting the scope of the literature and connecting it to the on-going conversation of the kindergarten through twelfth-grade education system, additional questions emerged. By continuing the research efforts of the effects of arts integration strategies on student learning, specifically mathematics, we can better make informed decisions as an arts organization provider, teaching artist, classroom teacher, and school district.

1) Why haven't school districts adopted an arts integration model?

One theory suggests that when the arts serve as a means to other subjects, a danger exists that the arts will not be valued for their distinct contributions to education (Winner, 2000a). Although arts educators have tried to strengthen the position of the arts by claiming that the arts enhance learning in other subjects, Winner and Cooper (2000a) argue that it is foolish to expect the arts to be as skilled in teaching of those subjects themselves. Furthermore, "advocates should refrain from making utilitarian arguments in favor of the arts [because] as soon as we justify arts by their power to affect learning in an academic area, we make the arts vulnerable" (Smithrim, 2005, p. 111).

Time might be another reason why school districts have not implement an arts integrated curriculum. Intense pressure for immediate test score results drives teachers toward the most directive forms of drill and repetition. A highly prescriptive, even scripted method such as Direct Instruction and Success for All show quick results, but undermines the creativity and independence of both teacher and student. The abundance

of new standards and curriculum, while highlighting the development of higher order thinking skills and creativity, can overwhelm teachers and prevent their use of creative, open-ended explorations and in-depth projects. Many teachers have reported that they lack the time to use the arts and that their jobs will be in jeopardy if they do not follow the given structures or scripts (Oreck).

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Moving Through Math

Waterloo Community School District / Gallagher-Bluedorn Performing Arts Center

Kindergarten Teachers

Feb 2012: Prettest - Mar 2012: Posttest

Table 1: By using this approach to instruction I know the difference between mathmatical memorization and comprehension.

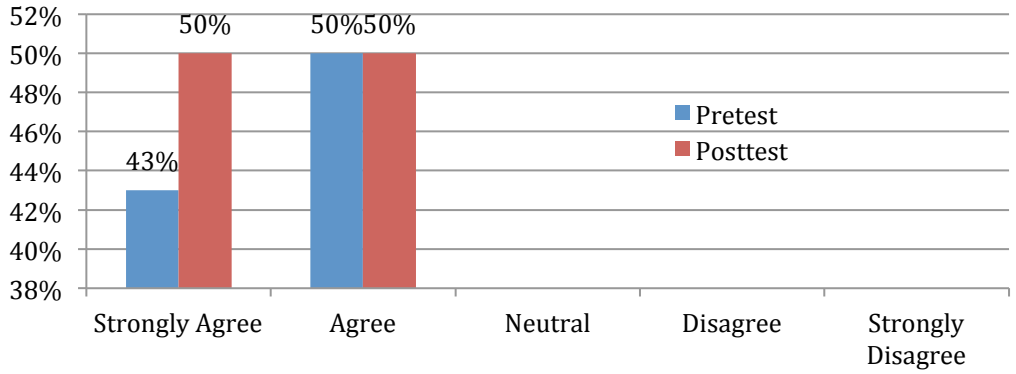

Table 2: By using this approach to instruction I know how to articulate mathematical thinking through clear and concise language.

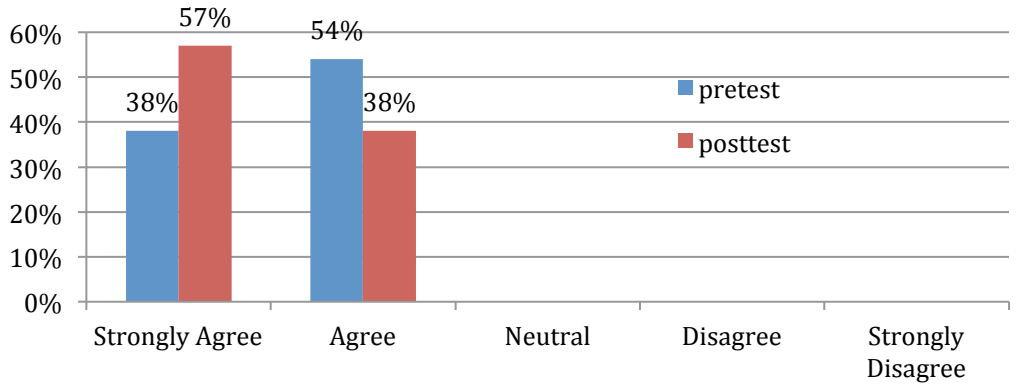

Table 3: By using this approach to instruction I am able to facilitate lessons in which students collaborate with their peers to represent and explain mathematical concepts.

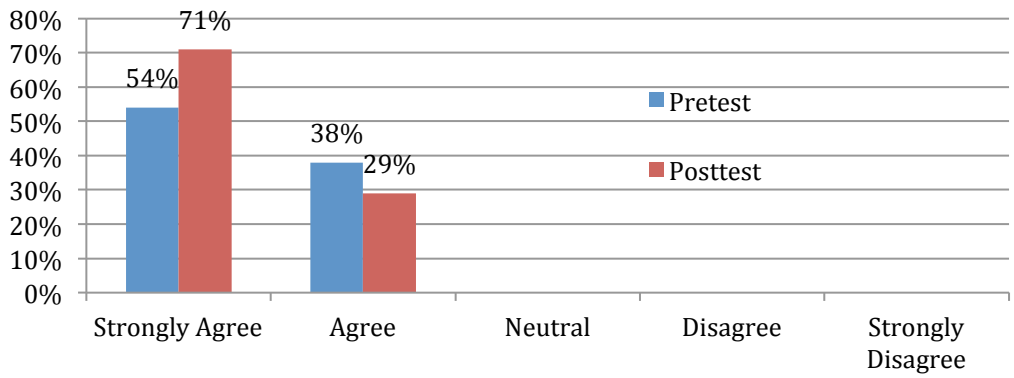

Table 4: By using this approach to instruction I am able to facilitate lessons in which students collaborate with their peers to represent and explain mathematical concepts.

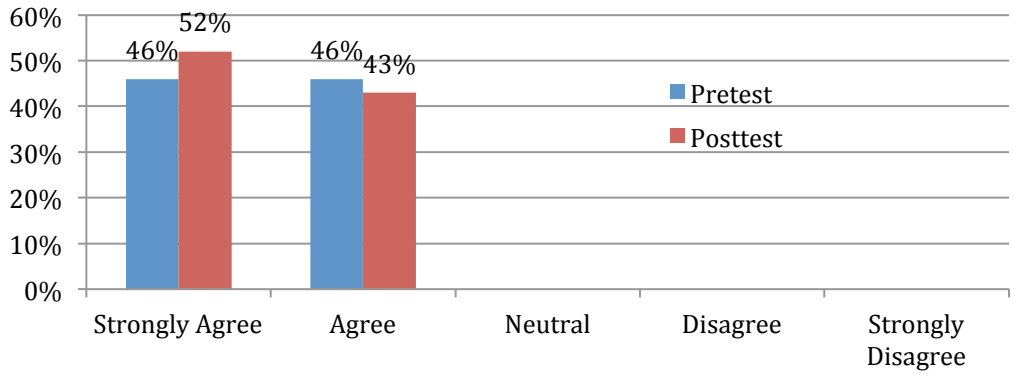

Table 5: By using this approach to instruction I appreciate the joy of learning mathematics from a creative and experiential perspective.

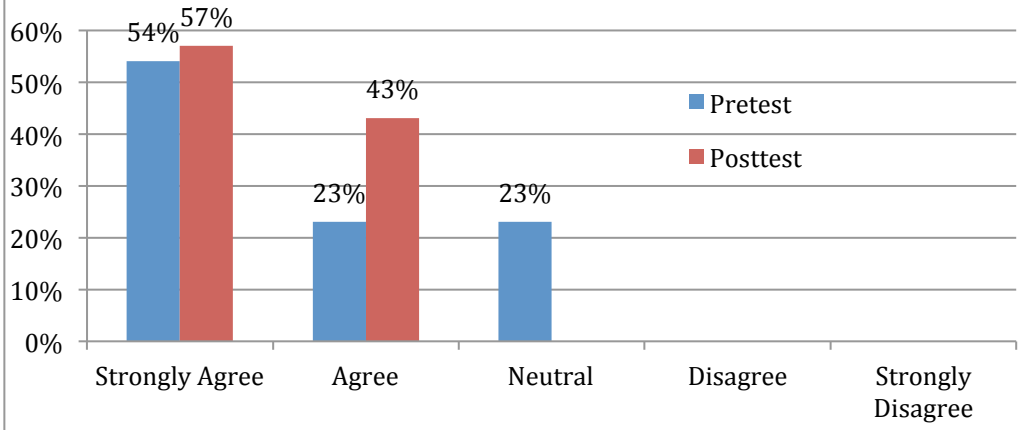

Table 6: By using this approach to instruction I appreciate how different students can represent mathematical thinking in diverse ways.