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THE FORGOTTEN INTELLIGENCES:
UTILIZING MOVEMENT AND MUSIC
TO ENHANCE MATHEMATICAL INSTRUCTION

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ABSTRACT

This qualitative research study explored the observed and reported experiences of primary aged students when songs and movements were used to instruct mathematics. The bodily-kinesthetic and musical intelligences were studied in detail. Twenty pre-school, kindergarten, or first grade students participated in the study that involved singing and moving to learn mathematical concepts. The study focused on such mathematical topics as skip counting, telling time, measuring, using money, and making patterns. Analysis of the data indicated that student engagement and student achievement increased. Findings resulting from the study suggested that using scaffolding through different groupings, connecting multiple intelligences, and modifying instruction based on the needs of the class would help to increase student achievement and student desire towards learning. Results from the pre-test and post-test indicated that moving and singing in a classroom had positive implications on student success.

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RESEARCHER STANCE

Overview

As a young child, I always loved school. My favorite subject was math due to the games and puzzles that had to be solved, as well as the systematic rules that were followed to complete problems. As school continued, my studies of mathematics became more mundane and focused primarily on performing mathematical tasks and learning how to solve similar problems. Although this systematic approach to math worked well for me, many of my friends struggled to understand the concepts that were needed to solve more complicated tasks. As a young child, I did not understand why my friends could not comprehend or enjoy math until I got older and began having difficulties in different subjects.

Although math was not an area in which I struggled, English provided many frustrations for me throughout my schooling. My sixth grade English teacher helped show me ways in which I could learn the rules of English with more ease. She incorporated songs with prepositions and grammatical rules to teach us English. To this day, I still remember those songs and find myself singing them at random times. Little did I know that singing academic concepts would help me throughout my life.

It is important to mention that music has always been an integral part of my upbringing. At the tender age of three, I began dancing and continue to dance today as a dance instructor. Dance is an outlet for me to explore, create, and

enjoy life. Whenever I struggled in school as a child, I looked forward to going to dance class. It gave me an opportunity to perform in a way that school did not allow me to explore. For example, I was able to express different emotions I was feeling through movements, which was much easier for me to do than expressing emotions through words. Throughout my life, I have used songs and movements to help me through difficult subjects at school, a skill taught to me by that notable sixth grade teacher.

As I grew up and entered high school, I knew I wanted to become a teacher because I loved working with children and finding different ways to help friends learn. Upon graduating from Moravian College, I achieved my goal and became a first grade teacher in the Springfield School District. Over the past four years, I have had the opportunity to work with classrooms full of children that learn in different ways.

All of my experiences in pre-student teaching classrooms, my first grade classroom, and the dance classroom have shown me that all students can learn if given the right tools. For instance, in my first grade classroom, we were learning about three dimensional shapes. A group of students in my class were very strong linguistically and learned best by reading about the shapes and then putting their knowledge into their own description about what the shape looked like. There were other students who learned by touching the shapes and finding shapes that were similar to the original three-dimensional shapes in a magazine. In both

examples, the students were demonstrating to me their knowledge of the three-dimensional shapes. Throughout my four years as a first grade teacher, I have found it imperative to enhance textbook lessons to give students a chance to explore new and reviewed information through many lenses. I have seen too many students “crash” when presented material strictly by the text book.

Background for the Study

This past year, I was having a hard time finding ways to help struggling students remember basic math facts. A co-worker suggested adding songs to the facts. I took her idea and ran with it. My students seemed to truly enjoy the singing and were performing better on daily activities and assessments. One morning, a student started singing a math song during our morning physical exercises. From that day on, we incorporated movement and singing into the world of math. I am happy to say that all my students were proficient in mathematics at the end of the year, even students who received math support.

For this reason, I have decided to focus my question on my love for movement and music, as well as my love for mathematics. I believe my research question will provide a different insight into the instruction of math. My interventions do not require a new program. Rather, the songs and movements that I have created and found may be modified and incorporated into any classroom or curriculum.

The math program that I have had the most experience with at Springfield is very interactive and meets most of the multiple intelligences described by Howard Gardner. However, I still find that the musical intelligence is not utilized in the program. Children are not asked to sing or use rhythms to solve mathematical problems. The bodily-kinesthetic intelligence is only addressed through the use of manipulatives. I would like to extend the bodily-kinesthetic intelligence even further by having students be physically active during songs to help relate knowledge to body movements. Your body is the only manipulative you always have with you.

As I have previously stated, I believe that all students are capable of learning. By giving the students the ability to choose which method or intelligence works best for them to learn, I am hoping to help students realize their potential. I do not think it is fair to teach lessons that incorporate only linguistic and mathematical intelligences. I have had too many teachers that were afraid to deviate from the prescribed lesson to incorporate activities that would benefit students. I believe teachers should teach towards all students' strengths, even if they are not the teacher's strength.

Research Question

My research question is meant to add to current curricula, not replace them. Each song and movement takes a minute or less, yet may provide students with the ability to remember knowledge for a lifetime. The purpose of my study

is to explore the kinesthetic and musical intelligences and possibly find another successful method of instructing mathematics. Therefore, my research question is: What are the observed and reported experiences of students when bodily-kinesthetic and musical instruction strategies are utilized to instruct primary level students?

LITERATURE REVIEW

Introduction

A journey of a thousand miles begins with a single step (Chinese Proverb).

Educating the youth of today, especially in mathematics, may seem like a daunting task. It takes a teacher who is dedicated and determined to try new ideas and/or theories to meet the needs of the diverse learners that make up current school systems. Using Gardner's theory of Multiple Intelligences allows for teachers and students to work together to provide an education for students that allows them to be successful (Gardner, 1991). Following are reasons why educators should try new methods of instruction with support from well-known theorists who support meeting the needs of diverse learners and examples of schools that have implemented multiple intelligences, specifically the musical and kinesthetic intelligences, into a mathematics classroom.

Best Practices in Primary Mathematics

Multiple Intelligences

Gardner (1993) defines multiple intelligences as an unknown number of intelligences that make up human capabilities to learn. There are currently nine intelligences outlined by Gardner, which include: linguistic, logical-mathematical, visual-spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalist, and existential (Campbell & Campbell, 1999). Beliavsky (2006) states that the, “[Multiple Intelligence] theory claims that there are multiple ways to understand

the world around us. Not one potential but many different potentials exist inside the brain” (p. 6). This theory moves beyond the traditional idea that there is only one way to learn and to solve problems, and points out that people have many potentials, or intelligences, that help them learn.

No two individuals, even twins, have the same strengths, weaknesses, or combinations of intelligences (Beliavsky, 2006; Jordan, 1996). For this reason, Gardner suggests instructing students in various teaching strategies and providing students with multiple views of the social, physical, human, and artistic world (Beliavsky, 2006). By providing students with opportunities to experience learning in various forms, teachers are giving every student the chance to develop and eventually succeed in each intelligence (Gardner, 1993).

If students are to be productive members of society, teachers must provide students with the knowledge of different intelligences that they can use to solve problems that occur in every day life, and this may be done through modeling, or explaining, during instruction (Gardner, 1993). Gardner believes that students need cultural opportunities and real-world experiences to help develop the different intelligences that exist within each individual (Beliavsky, 2006). Without real-world application, students may not make the connection between the information they are learning and areas in which they could apply that information (Jordan, 1996).

If students are given more opportunities to acquire understanding through the use of multiple intelligences and real life experiences, they are more likely to recognize and conceptualize material that is presented in a classroom setting (Gardner, 1991). Too often, teachers teach through the linguistic and mathematical intelligences, leaving students who have strengths in other areas feeling defeated (Beliaovsky, 2006). For this reason, Gardner (1993) suggests that we should use all forms of intelligences in the classroom to allow all students to be successful and feel successful. During instruction, teachers should focus on the students' abilities rather than disabilities to drive instruction and encourage positive outlooks on learning (Jordan, 1996).

The combination of intelligences has been used in schools in a variety of communities. In a research study completed by Bielsker, Napoli, Sandino, and Waishwell (2001), first and second grade students at two different rural schools were instructed using Touch Math, musical/rhythmic intelligence, bodily-kinesthetic intelligence, and mnemonics to help memorize math facts. Each intervention was employed over a four-week period for 15 minutes a day, at both sites, identified as A and B. Site A was predominately Caucasian with 100% parent communication. It was located in a rural community. Site B was more diverse. The student population on the school consisted of 41% Caucasian, 46% African American, 9% Hispanic, and the remaining percentage of students were of other ethnic groups. The school was located in a rural setting where the

majority of students resided in Section 8 housing. This school also had 100% parent involvement. Bielsker and her colleagues were concerned with the low math scores that students had received on basic computation assessments at both schools and hoped to improve their test scores through implementing the instructional strategies listed above.

Through the use of Mad Minute tests, tests consisting of 30 addition or subtraction problems to be solved in one minute, the study indicated students in first and second grade at site A and site B improved on both types of facts. A checklist given to students prior to and following the study indicated that more students used pictures, counters, and Touch Math to help them solve addition and subtraction facts at the conclusion of the study than had used them initially. Results of the student survey indicated that students felt more comfortable solving math facts after the different modes of teaching were introduced. While parental post-survey response was limited, the researchers did note that parents from all four classrooms generally saw an increase in their child's ability to solve mathematical problems (Bielsker et al., 2001).

Due to multiple modes of instruction taking place in this study, no single method could be given full credit for the increase in academic performance on the Mad Minute tests. However, due to the surveys and student checklists, the researchers were able to summarize that the use of multiple intelligences, specifically the musical/rhythmic and bodily-kinesthetic intelligences, helped the

majority of students in all four classrooms improve on their Mad Minute assessments. Touch math was more useful for first grade students and students who had initially received lower grades on the Mad Minute tests. The researchers found that second grade students in both sites used Touch Math less frequently than the other strategies they were instructed in. Mnemonics was more useful for second grade students, and first grade students often found mnemonics to be confusing (Bielsker et al., 2001).

Although creating lessons that involve multiple intelligences takes time and practice, they are worth the effort (Adams, 2000/2001). Teachers do not need to incorporate each intelligence into every lesson they teach. Rather they must provide experiences in all intelligences and allow students to feel comfortable solving problems using their strengths. In a study completed by Goral and Wiest (2007), students learned about fractions through the use of poetry, movement, and songs. When asked about fractions the following year, the majority of the students referred to the song and/or movements they learned to help understand fractions. The researchers suggest that the students most likely found movement and music to be intelligences that helped them succeed in their knowledge and understanding of fractions (2007).

Bodily-Kinesthetic Intelligence

Gardner (1993) states, “Bodily-kinesthetic intelligence is the ability to solve problems or to fashion products using one’s whole body, or parts of the

body” (p. 9). Many people utilize their body to solve problems without even knowing they are doing so. Babies are born with the ability to use their kinesthetic intelligence and often use this intelligence to solve problems in early childhood (Pica, 2006). Children normally develop a greater mathematical and linguistic intelligence once they enter school because the majority of instruction takes place within these two intelligences in school settings due to testing mandates. However, Pica believes that the kinesthetic intelligence needs to be developed in greater detail when children enter school because most children excel in the kinesthetic intelligence from birth.

Kinesthetic learners should be instructed in a manner that allows them to actually do or partake in an activity, which may be through the use of manipulatives, or these types of learners may not learn the information required (Sarasin, 1999). The brain and body must work together, not separately, in order to learn to one’s fullest potential (Pica, 2006). Dewey (1997) reiterates the importance for students to use their “hands and other parts of the body beside the brain” (p. 63) when learning. Dewey (1938/1997) reiterates the importance for students to use their “hands and other parts of the body beside the brain” (p.63) when learning. The use of the body to learn is a freedom that should be given to all students (1938/1997). Teachers ought to provide students with the opportunity to explore new information actively, perhaps through manipulatives, not just through lecture and drill (Sarasin, 1999). The more students use their hands and

bodies to participate in activities, the more likely they are to enjoy the activity and both recall and apply their knowledge at a later date (Bedner, Coughlin, Evans & Sievers, 2002; Jensen, 1997).

One way to incorporate physical activity into a general education classroom would be to have general education teachers and physical education teachers work together to design lessons, which could incorporate physical activity and mathematical learning in a cohesive lesson (DeFrancesco & Casas, 2004). By having the teachers collaborate, or work together, each teacher may share his or her level of expertise to design lessons that incorporate academics and movement. Learning is most beneficial when students are having fun and are motivated to learn, because negative feelings about a subject are then reduced. Adding movement to traditional classroom lessons might allow for students to use parts of their body and brain that are normally not called upon by traditional school lessons (2004).

Different forms of exercise and activity may be used within classrooms to meet the needs of kinesthetic learners. For example, Werner (2001) compared classrooms from a Performing Arts school ranging in grades from second through fifth. Half of the classrooms used dance once a week and regular math instruction the other days of the week to teach mathematics, while the other classrooms provided the regular math program every day of the week. Using surveys and interviews, the researcher found increased motivation in students when dance was

used to teach mathematics. The teachers of the students who participated in the dance program to learn math observed increased problem solving abilities. This example of a non-traditional method of instruction shows how different aspects of kinesthetic learning might be implemented to foster greater engagement and achievement in mathematics.

The idea of using movement to instruct students also transfers into a music classroom. Emile Jaques-Dalcroze dedicated his life to improving the instruction of music (Mead, 1996). He believed that music should be taught through movement, a theory he has titled Eurythmics. Jaques-Dalcroze has found that teachers who do the least amount of verbal instruction and provide a learning environment with musical and kinesthetic instruction produce students who learn more (Caldwell, 1993). His theory also entails teachers modeling the outcome which they wish to observe, but allows students to make changes to the music and/or movements to help them make the information their own. Although Jaques-Dalcroze's theory of Eurythmics was initially meant primarily for music education, his theory for learning has stretched to dance, actors, general educators, and therapists (Mead, 1996).

Another example of adding movement into a music classroom is provided in Ruhf's (2004) study. Ruhf used kinesthetic learning in her second grade music education classroom to increase the amount of "fun" her students were having to help motivate them to learn music. She found that high achieving students

continued to excel. She also found that students who were low achievers and who had a higher level of physical activity were more engaged during the lessons. This increased amount of engagement could be due to the endorphins that are released when physical activity is involved in the learning process (Jensen, 1997). Exercise and active learning boosts the amount of oxygen to the brain, which in turn increases the amount of endorphins, or “good-feeling” drugs that a person’s body releases.

Musical Intelligence

The musical intelligence encompasses the “ability to understand and use musical concepts” and the ability to develop an appreciation for music (Adams, 2000/2001, p.87). The use of music to help students memorize information for further application has been suggested by many authors (Jensen, 1997; Munro, 2004). The importance of using patterns in music, due to their repetitive nature, can help students memorize information in a fun manner, rather than just basic repetitious exercises (Campabello, De Carlo, O’Neil, & Vacek, 2002). When music is used to instruct students, they often are able to transfer information learned into other subjects and real-life situations by recalling songs (2002). Auditory learners need to repeat information as they work in order to complete a specific task (Sarasin, 1999). They are normally successful at memorizing material because auditory learners break down information into little pieces prior

to understanding a complete concept. It is the teacher's job to present information in a verbal form, which could be singing, and in little pieces of information.

Bryant-Jones, Shimmins, and Vega (2003) conducted a study where music was used to help instruct mathematics to struggling students in second and fourth grade. The second and fourth grade classrooms that were studied scored below average on national and state assessments. In the school, 48.1% of the children were Caucasian; 39.8% of the children were African American; 11.3% of the children were Hispanic; and 0.8% of the children were Asian. Free lunch was given to 90% of the participants in this study due to the low socioeconomic status of their families.

Teacher-made songs were designed to introduce or revisit mathematical concepts to students. These songs were practiced and revisited during instruction. The post intervention data indicated that all students improved in the targeted academic areas, even students with learning disabilities. The researchers found that students in fourth grade improved their academics more rapidly, which may have been due to the fourth grade students requesting to add motions to their songs. The researchers noted that students retained information over a period of time, which they predicted was due to the repetitive singing of the songs they learned (Bryan-Jones et al., 2003).

Music is present in life on a daily basis, which gives students a general understanding of music. For this reason, some teachers choose to use music in

their classroom to help increase academic achievement and motivation (Paini, 2006). When Paini introduced new grammatical concepts using songs, her students were interested and participated more in class, although their overall academic performance did not increase greatly. She believed that improving motivation to attend class and learn new material promoted life-long learning and would lead to greater academic success in the future. By including musical components in a lesson, a teacher is more likely to reach students in ways that exceed pure linguistic modes of teaching, including the desire to learn (Eisner, 2001).

Using Multiple Intelligences to Motivate Students

Motivation, “in plain language, [is] what gets you going, keeps you going, and determines where you’re trying to go” (Slavin, 1994, p. 347). Motivation is needed to keep students engaged in a particular lesson. Pure lecture is often the least effective mode for mathematical instruction because it often does not produce life-long learners who are motivated to learn (Klein, Pfleiderer, & Truckenmiller, 1998). In order for students to be motivated to learn, multiple modes of teaching and learning must occur within a classroom.

Bednar et al. (2002) used techniques, such as song themes, clapping patterns, sounds, and body movements to motivate learners in mathematics from kindergarten through fifth grade in two major Midwestern cities. Initially, students were not achieving academic success to the degree their school would

have liked and did not exhibit great motivation to learn mathematics. After implementing multiple intelligence strategies, they found their students to be more motivated and excited to be able to explore different modes of learning. In addition to increased motivation, there appeared to be an increase in academic performance based upon grade level tests. The use of multiple intelligences in the classroom gave each student the opportunity to excel in his or her particular areas of strength. Bednar and her colleagues credit the daily use of multiple intelligences to the increased student achievement and overall desire to learn mathematics in the research participants (2002).

In another study of multiple intelligences and motivation, high school students were given the opportunity to choose which intelligence they wanted to use to solve problems and complete projects in their mathematical classroom (Klein et al., 1998). Through teacher observation, journals, and student surveys, the researchers noted that the students' motivation increased when multiple intelligences were taught and utilized in their classroom. To illustrate the importance of using a variety of intelligences to keep learning exciting, one student stated, "when it's fun you usually remember it better" (p.65). All students, ranging from students with special needs to gifted students, can benefit from using multiple intelligences in classrooms (Swann-Hudkins, 2002). Not only does motivation increase when students are given the opportunity to learn using all of their intelligences, self-esteem and perseverance may increase as well.

If an educator's goal is to help individuals love learning, he or she has the responsibility to make each student feel successful. Using multiple intelligences in a classroom is a great way to accomplish this task. Activities need to be prepared that are within a student's ability. Too often instruction does not meet the needs of learners, therefore leading to frustration and lack of motivation (Smith & Wilhelm, 2006).

Multiple Intelligence Schools

Campbell and Campbell (1999), Swann-Hudkins (2002), and Elliot (1998) gave examples of schools that have implemented multiple intelligences into their curriculum. Each example showed how teachers have developed lessons that give choice to students when deciding how to complete a project or learn new material. Music and movement, in addition to the other intelligences, were used in every school to instruct students on how these intelligences can broaden their educational experience. Making connections to different subjects through utilizing multiple intelligences in the classroom allowed for students to see how learning is interrelated (Adams, 2000/2001). Learning how information relates to one another, or connects to other subjects, is a very important skill to help solve problems and increase learning in the future.

Campbell and Campbell (1999) described one elementary school that used multiple intelligences to lead instruction. Located in an inner-city area of Lexington, Kentucky, Russell Elementary School had a population that consisted

of 65% minority students and 94% of the student body receiving free lunch. Prior to the implementation of multiple intelligences, the teachers taught mostly in a teacher-directed, verbal format. On standardized tests, the students scored in the 30th percentile with over 50% of the students at the “novice” level. The school identified a need for a reform to help all students achieve and turned to multiple intelligences to make a difference.

Russell Elementary School gradually implemented the theory of multiple intelligences from 1991 though 1996. The teachers taught using student-driven curriculum and integrated the arts into daily lessons to provide the children a variety of learning experiences. Every child was labeled “multi-talented” and was given the opportunity to experience success through lessons that focused on their strengths. Separate classes were offered to students as electives in the intelligence area in which they felt most secure. Basals and textbooks were used as resources instead of becoming the *defacto* curriculum. The results included test scores that doubled from the 1992 through 1996 school years with no child performing at the “novice” level (Campbell & Campbell, 1999).

Other schools have integrated the arts into general education classrooms because specialist areas were cut from curriculum to help children meet the requirements set forth by the No Child Left Behind legislation (Jehlen, 2008). These teachers integrated the arts to help develop the imagination and creativity of their students. The community also supported the arts through a poll, which

told the teachers that creativity and imagination were just as important as grades on standardized tests to the general public (2008). Teachers at the schools have noticed that “integrating the arts into academic lessons helps students learn more deeply because they use more senses and different ways of thinking” (p. 25). Integrating the arts, which encompass intelligences that are often forgotten in a general education classroom, was exciting for the teachers and developed their creativity and imagination, as well as their students’ ability to use these skills to solve problems within the classroom setting.

Curriculum and Instruction

Although many of the above research studies are success stories, there are many more schools that are in need of change. According to the National Center for Education Statistics (n.d.), there has been no measurable change in the average mathematical tests scores for fourth grade students between 1995 and 2003.

Perhaps more alarming are the results that show that fourth graders in the United States scored lower on the mathematical test in 2003 compared to 1995, relative to the competing 14 countries that partook in the study. This stagnation in test scores could be due to the pressure that teachers feel to prepare students for tests instead of providing meaningful learning experiences (Sanchez & Ice, 2004).

Preparation for tests is taking a considerable amount of time away from actual instruction. Teachers often teach the isolated skills on a test in more detail than other standards. Although many teachers want to teach using constructivist

methods to engage their students, many find the curriculum to be too full of concepts, which prevents deep exploration of material (Sanchez & Ice, 2004).

Many teachers resort to a lecture type of instruction, which may hinder the learning process for students because the mode of instruction does not meet the various learning capabilities of the students (Sarasin, 1999).

In addition to full curriculum, No Child Left Behind has caused some schools to resort to the primary use of direct instruction because of the pressure to succeed on the standardized tests (Lopez & Schroeder, 2008). Many of these schools are not succeeding and are in need of a reconstruction of their instructional techniques. Hampden-Thompson, Herring, and Kienzl (2008) suggest using both *teacher directed* and *student directed* instruction, as well as the use of *real world* examples to properly instruct students. Teacher directed instruction is often referred to as *direct instruction*, or the teacher's responsibility to design effective lessons, give corrective feedback, and provide many opportunities for practice (Snowman & Biehler, 2003). In contrast, *student directed*, or constructivist teaching, refers to teaching practices that provide opportunities for students to create new ideas based on their previous knowledge. Teachers scaffold material for students and permit students to have some control of their instruction (Brown, 2008). Constructivist teaching allows students to share control of the classroom and gives students the opportunity to individually explore and discover new concepts. "Student centered instruction is a form of

active learning where students are engaged and involved in what they are studying” (Brown, 2008, p. 30).

Autry (2002) completed a study that compared the direct-instruction and constructivist approach to teaching in two different first grade classrooms. She found no significant difference in standardized state test scores between the two classrooms. Due to the results of the study, Autry believes that teachers need to provide students with a variety of learning experiences to reach all children and help them to gain mathematical competency. Teachers should provide opportunities that use different multiple intelligences and different teaching strategies in order to provide a learning environment that will foster academic success for all learners (Adams, 2000/2001).

Whether using direct instruction or student centered instruction, teachers must scaffold instruction, or give hints or helpful clues to reach an answer without actually giving the answer itself in order to meet the needs of various students (Snowman & Biehler, 2003). Scaffolding provides opportunities for students to learn information they would not be able to learn on their own. Although a great amount of support is initially needed, the support is gradually removed to allow students to take more responsibility for their learning (Slavin, 1994).

Traditional textbooks in the field of mathematics vary instruction minimally and are often unforgiving to the needs of individual students (Gardner, 1991). This is not to say that teachers should abandon textbooks completely and

present every lesson in the various forms of intelligences. Instead, every child should have the opportunity to present or manipulate material in a variety of activities and grouping styles throughout a day (Dewey, 1938/1997; Pennsylvania Department of Education, 2008). Young students need the opportunity to discover their interests and capabilities through exploratory activities (Gardner, 1993).

Education should move away from the notion that all children should learn the same information in the same way and be tested in the same manner by providing various ways to learn and display one's knowledge (Gardner, 1991). Dewey (1938/1997) believes that an educator needs to "survey the capacities and needs of the particular set of individuals with whom he is dealing" (p.58) with and direct instruction to meet their needs. Students learn differently and their needs should be addressed throughout instruction and assessment (Dewey, 1938/1997; Gardner, 1991; Pennsylvania Department of Education, 2008). In order to meet each student's potential in mathematics, instruction should be integrated with multiple activities that include the arts and various intelligences to reduce the chance of students feeling thwarted due to stereotypical instruction (Jordan, 1996). The teacher must give students the support needed to succeed and the opportunity to challenge students' knowledge to meet their fullest potential (Dewey, 1938/1997; Slavin, 1994).

Lev Vygotsky's concept of The Zone of Proximal Development (ZPD) is one method that can be used to help modify curriculum to deliver more beneficial instruction for all students (Snowman & Biehler, 2003). Vygotsky believed that conversation and collaboration between individuals were needed to reach a child's ZPD, therefore leading to higher cognitive functioning (Slavin, 1994). Social interaction with higher cognitive leveled peers or adults gives students the ability to internalize information and develop their knowledge until that information is comprehended by the student (Beliavsky, 2006). If teachers were to use a variety of lessons based on various intelligences to meet each child's ZPD, students would most likely learn more and become more interested in learning (Beliavsky, 2006).

ZPD encompasses the belief that "well-designed instruction is like a magnet. If it is aimed slightly ahead of what children know and can do at the present time, it will pull them along, helping them master things they cannot learn on their own" (Snowman & Biehler, 2003, p. 55). This goal can be accomplished by finding the different cognitive levels of each student, discovering students' likes and strengths, and designing lessons to enhance combinations of intelligences.

Summary

Although the research shows that meeting the needs of diverse learners through Multiple Intelligences can be rewarding both in academic achievement

and motivating learners, many teachers still find it difficult to implement different teaching strategies into lessons that are prescribed by current curriculum (Sanchez & Ice, 2004). The integration of Multiple Intelligences into curriculum does not need to be a complete overhaul of current curriculum; rather, one or two Multiple Intelligences can be addressed within a few lessons throughout the day (Gardner, 1991). We are not so much concerned if you are slow as when you come to a halt (Chinese Proverb).

RESEARCH DESIGN AND METHODOLOGY

Introduction

Prior to the start of my study, I submitted my proposal to the Human Subjects Internal Review Board (HSIRB) of Moravian College for approval of my study and data collection methods. Once I had made minimal changes to my proposal, the HSIRB accepted my study (see Appendix A) and allowed me to continue on my journey. Following the approval of the HSIRB, I then went to my supervisor and presented her with my proposal. She eagerly signed the permission form (see Appendix B) and allowed my study to begin.

Setting

My study took place in my kindergarten and first grade dance classroom. The dance studio is located in the Northeastern United States and has approximately 300 students. The studio is part of a rural/suburban community. The racial/ethnic classification of the students at the dance studio is approximately 93.2% Caucasian, 2.0% Hispanic, 1.3% Black (non Hispanic), and 3.5% Asian/Pacific Islander students. The socioeconomic status ranges from lower middle class to upper class.

My class of kindergarten and first grade students was held in the smallest of three dance studios. The walls were bare with the exception of a clock and six stars on the walls to help children focus when they spin. There were mirrors along the front wall to help students see themselves as they were dancing. Ballet

bars were along the remaining three walls and a tall stool stood in the corner for the teacher. The classroom contained no desks or chairs for the students. The room was plain, yet alive in activity.

During the study, I brought pencils, papers, rulers, posters, and manipulatives for the students to use throughout class. For the majority of our class, the mirrors were covered with posters of the songs we were learning and utilizing during our lessons.

Participants

The class consisted of 20 Caucasian students and 1 Spanish student. The majority of students in my study attended the Happy Valley School District; however, 4 students attended other neighboring school districts. Of the 21 female students, 10 were in kindergarten, 10 were in first grade, and 1 was in pre-school. A permission form was not returned for 1 child. Part-way through the study, 2 children joined our class. The participants ranged in age from 4 years old to 7 years old.

The students in my study danced with me once a week for 1 hour. Within that hour, the class was split into two 30 minute sections of ballet and tap. The majority of the study took place within the first 45 minutes of class, leaving the remaining 15 minutes to learn and rehearse dances for the recital. There were 3 students who were new to dancing. The remaining 18 students had previous dance experience.

My overall feelings about the academic abilities of my class were that the students were performing at a lower level than I had initially expected, based on the pre-test given the second week of class. This was most likely due to the fact that over half of the class had not been exposed to many of the concepts because they were just entering pre-school or kindergarten. Due to the study not taking place in the students' schools, I was not able to learn about any Individualized Education Plans (IEPs) that students may have had.

Procedure

Data collection began in September of 2008 after obtaining permission from Moravian College's HSIRB and my supervisor. In order to inform parents in a personal manner, I held an information session for all parents and students a week before class began. Prior to the meeting, I sent home a letter inviting families to a pizza party (see Appendix C) in addition to permission forms (see Appendix D and Appendix E) to sign. One permission form pertained to the children and the other permission form pertained to the parents. At the information session, I explained what mathematical concepts would be taught and how they would be instructed. I also described how I would be collecting data and what would happen with the data at the end of the study. Once I had permission from the HSIRB, my supervisor, and the parents, I began my data collection.

I gave a pre-test (see Appendix F) prior to instructing students with songs and movements. The results of the pretest allowed me to decide which topics needed to be instructed first in order to provide a beneficial learning experience for my students. The post-test (see Appendix G) was given at the end of the study as a non-objective form of assessment to measure the academic growth of my students.

Weekly lessons included songs and movements, as well as group and individual activities (see Appendix H) that instructed mathematics. All songs were repeated in weeks that followed the initial instruction of a topic as review.

Data Sources

The following are the different forms of data collection I used to complete my study.

Field Log

MacLean and Mohr (1999) state, “Log writings are data from your teaching life” (p. 14). The field log should include comprehensive information about how the intervention was implemented, any surprising events, and responses from the students (Hendricks, 2006). In my field log, I kept record of conversations, interviews, and observations that occurred during my class. I carried my notebook around with me to write down as many observations and direct quotes as possible. By writing down observations, behaviors, and statements that my students had made, I was able to reflect upon my teaching and

the events that occurred. These observations helped guide my instruction during my study.

In order to organize my field log, I created two columns. In the left column, I wrote my observations and specific statements I heard children say. In addition to observations in the left column, I also wrote instructional methods that I had used throughout the day to reflect upon my teaching strategies following the instructional period. In the right column I wrote my reflections and feelings about the events that occurred. By creating my log in two columns, I was able to separate the facts from my opinions. This was very helpful when analyzing my data and writing the story about my study.

Student Interview

I chose to conduct informal individual interviews with my students to learn more about them and their feelings about the new instructional techniques I was using in class. The interviews were conducted in a semi-structured setting (Hendricks, 2006). I decided to use two questions to guide my interviews (see Appendix I). The initial two questions focused on the thoughts students had about using music and movement to learn, as well as their thoughts on creating their own songs and movements to learn. The interviews continued based on the student responses. Each child was interviewed once during my study. The information gained from the interviews gave me valuable data to help guide the process of writing my theme statements.

Student Work

MacLean and Mohr (1999) state, “Student work may be the centerpiece of your data, helping you to understand and interpret all the rest” (p. 47). In order to observe growth on a weekly basis, I used Review and Revisit (R & R) worksheets (see Appendix J). These worksheets were quick and gave me another method of observing students’ abilities to utilize the information they were learning through the songs and movements. I used my observations and the worksheets as a guide to better instruct students in the following weeks. In addition to the R & R worksheets, I gave a pre-test and a post-test as a measuring tool of academic success. I read the directions for each section of the test as the students worked individually.

Throughout my study, students worked in one large group, several small groups, or partners to complete tasks. These small projects gave me an opportunity to see what my students could do with the aid of others. I wanted to give students the opportunity to demonstrate what they had learned in various group settings. At the end of the study, I also had small groups of students create their own songs and movements to teach the rest of the class a concept. This task allowed students to utilize the idea of using songs and movements to help them learn. They took the methods of instruction that I had used throughout the study and created their own instructional tool to help others learn.

I photocopied and kept examples of student work to remind me of progress that had been made and to guide my decisions for future goals in my classroom. All of the summative assessments provided me insight to the readiness of my students for further learning experiences and gave me an opportunity to modify my instruction as needed.

Parent Survey

“Surveys and questionnaires are good alternatives to interviews and focus groups when time constraints are such that interviewing is impossible or when the researcher is seeking responses to a predetermined set of questions” (Hendricks, 2006, p. 94). I decided to give my students’ parents surveys because I wanted to measure the outlook parents had on their child’s desire to learn and their motivation towards learning through movement and singing (see Appendix K).

The survey consisted of five questions through which parents rated their child’s likes and dislikes, as well as their overall math performance at school. In addition, there were two open-ended questions where parents were able to write their feelings about using music and movement to teach academics and any changes they had seen in their child since the start of the study. This information was very important to me because the parents were able to give me insight into their child’s world outside of the dance studio.

Trustworthiness Statement

Establishing a positive relationship with parents and students was a priority in helping to create a trusting environment (Holly, Arhar, & Kasten, 2005). I kept all lines of communication open throughout the study and provided opportunities through interviews and casual conversations for students or parents to address concerns. Instruction was presented in a manner that made my students feel comfortable and welcomed.

In order to establish trustworthiness, I obtained signed permission forms from my students' parents allowing their child to participate in my study (Holly et al., 2005). In addition, I obtained a permission form from the parents allowing me to survey them about their child's behaviors. Both permission forms included information about the study, why I thought the study would benefit their child, and any risks that might be associated with participating in the study. Also included on the permission forms was my phone number, as well as the phone numbers of my college advisor and business owner. These numbers were included to give parents and students an opportunity to have questions answered about the study or provide a method to remove a child from the study if desired. A meeting was held with parents and students to explain the risks and benefits associated with the study (Holly et al., 2005).

In order to protect the identity of the students, I used numbers and pseudonyms to represent each student within the written research and graphs

(Holly et al., 2005). The students' names were hidden for all student examples.

All data and observations were kept secure at my house. At the completion of the study, all collected data and observations were destroyed (Hendricks, 2006).

To establish credibility in my study, I triangulated data that was collected and analyzed (Hendricks, 2006). I utilized tests, observations, and interviews. In addition, weekly R & R worksheets were completed to help determine the progress students were making with the mathematical concepts. By comparing many forms of data, I was able to remain open-minded and diminish biases due to the confirmation or non-confirmation the multiple forms of data. Multiple methods of research helped generalize information and make my study more worthwhile to an increased amount of people. Without using multiple approaches to research, the validity of any outcome would be jeopardized (Hendricks, 2006).

During my study, I also asked the participants if I was interpreting their behaviors correctly (Hendricks, 2006). For example, Jess always wanted to work with others, I assumed it was because she did not understand the information. However, when I asked her why she wanted to work with others, she replied, "Its more fun with other people to talk to so you don't gotta talk to yourself." By checking if my assumptions aligned with the actual feelings of my students, the validity of my findings was more accurate. My interviews helped to confirm my research findings and eliminate any biases I might have had.

Constant reflection of my work also helped me remain truthful to the findings. In addition to my individual reflection, I also had the help of my research support group. By reading findings and observations to my support group, I was better able to determine if I was interpreting my results correctly. My research support group gave me their opinions on my findings and helped me eliminate any biases I may have had.

Biases

As I entered into this study, I was aware of a few biases that I had developed over my years as a student and as a teacher. My first bias was that people would learn by incorporating movements and songs into instruction. Music and movement have always helped me learn. I have seen this combination help many students in my years as a classroom teacher and dance instructor. In order to decrease the effect of my bias on the study, I interviewed students and asked if they believed music and movement helped them learn mathematics. I also used a pre-test and a post-test to measure the amount of academic growth that had occurred during the period of my study.

Another bias I possessed was that students would enjoy singing and moving in front of others. I had been performing in front of others since I was three years old. I acknowledged that not all students would enjoy singing and moving in front of their peers. To help make students more comfortable, songs

were completed as a class, unless certain students requested to complete a song individually.

Summary

Each week I was blessed to work with my research support group. These individuals helped me analyze, code, and develop forms of data collection. My research group taught different disciplines and age groups, which provided collegial balance to my work in my individual classroom (MacLean & Mohr, 1999). Their support and guidance helped me better my study for my students. Our discussions covered all forms of data collection. Their insights and suggestions can be seen throughout my study.

MY STORY

Introduction: How it all Began

There I was, anxiously awaiting the arrival of parents and students, in a dance studio lobby with pizza on the front desk as a bargaining tool. The rugs had the new clean smell they always do before the school year starts. The walls were freshly painted a slight off-white color and new dance clothes filled the racks in the lobby. Pictures of dancers were hanging on the walls above the chairs. Trophies were proudly displayed on shelves that can be seen from the front door. Suddenly the smell of pizza seemed a bit out of place to me. Hopefully math in a dance class does not seem out of place to the parents and students.

I asked all of the parents and students in my class to attend a meeting over the summer to hear how dance class would be taught this year. As the cars started to pull up, I became more nervous. How would the parents and students react to such a different concept? Would parents and students enjoy the idea of learning math at dance school? Would they hate it and want to switch to another class?

As I looked through the large windows, I saw Khloe and her mom getting out of their car, both with smiles on their face. As Khloe was walking through the door she asked, "Hello Miss... What's your name?"

"It's Miss Christine. It's nice to meet you! And what is your name?"

Khloe smelled the pizza pies and looked at the cookies as she happily

said, “Khloe!” Her friend Peyton arrived and they immediately began running around.

As people were walking through the door, I noticed some friendships that existed in the room. Girls were hugging each other by the oversized windows and seemed very excited to see each other. Two children, Cassidy and Liz, did not run around with the other girls. They leaned on their mothers and seemed very shy. I wondered how they would respond to singing in front of a group. I was happy to see most of the children were outgoing because I did not think they would have a problem singing and dancing in front of others.

“Thank you all for coming! Before we start the meeting, I would love for you all to eat. Please eat as much as you can.” As everyone began getting their food, I noticed a dad walking towards the door with two little girls. I previously learned that sisters would be in my class, one of which was in pre-school. This made me nervous because I originally designed my study for first grade students. Questions ran through my head. How would a pre-school student respond? Would she even know what numbers look like? The two little girls, Jess and Dana, were skipping into the studio and immediately went to the food with the rest of the group.

As parents and students were eating on the floor and in chairs, I quickly went over in my mind how I wanted to present the information. I didn’t want my ideas to seem too abstract. I had previously hung up posters on a tack board in the

lobby to help guide me during my explanation. The students were mostly finished eating. Children can really eat fast.

I decided to begin by explaining that I was attending college to become a better teacher and asked for all of the students to join me in front of the tack board. “For the last four years, I have taught first grade. Math has always been my favorite subject. This year I will be teaching you math in dance! I think this will help me become a better teacher.” Lilly seemed excited and had a smile on her face. All of the students were looking at me very quietly. They seemed like good listeners so far.

I showed the students and parents the poster of math topics we would be covering during the study. I explained that we would be learning how to count by 10’s, 5’s, and 2’s. I also showed the children a ruler and explained that they would be able to use the ruler to measure objects in inches and centimeters. Many students looked confused at this point with their eyebrows scrunched tightly. I reminded them that I didn’t expect them to know this math information now. We would be learning new things together. Their faces relaxed a little.

I quickly showed the students the clock and told them that they would be able to tell time using an analog clock. The last two topics we would be covering were patterns and money. As I continued through my explanation of topics that would be covered, I began to feel more comfortable and discussed the songs and dance steps that I would teach with the math facts. Many more faces had smiles

across them and the students seemed to be less concerned. Just then, Peyton's hand quickly shot up into the air. "I want to sing by myself! I'm a good singer."

"I'm happy to hear that! You will be able to sing by yourself if you would like to, but most of the time we will sing as a group," I replied with a smile on my face. Peyton smiled back at me.

"Good," said Lilly with a relieved look on her face. I'm getting the feeling that Lilly is not very excited about singing.

As I wrapped up why I thought the study was important, I asked if there were any questions. Amy's mom asked, "What happens if our kids haven't learned this stuff yet? It seems pretty hard for my daughter who is going into kindergarten." Other parents shook their heads in agreement.

I thought this might be a concern. I told the parents that I knew that many of their children had not been exposed to some of the concepts. I reinforced that although the study was primarily designed for first grade students, the exposure to the different concepts would only help their children in school.

Peyton's hand went up in the air as she began asking, "Will we get grades for this stuff?" She was now inching closer to me on the floor by pushing herself up on her knees and then sliding forward.

I told the group of children that they would not get grades. I explained that I would be checking to see how well they did in order to help me become a better teacher. With that, smiles came across all of the students' faces.

As the parents and students began to leave, Liz's mom approached me and said, "Your study seems very interesting and innovative. Congrats on doing something different." Liz's mom made me feel wonderful. Her statement gave me the boost I needed to start my study on a positive note.

Singing and Dancing to Math?

5:15 p.m. - It was time to go to my first class with my new kindergarten and first grade students. As I walked into the smallest dance room, six students were sitting with their snacks waiting for a story to be read to them. There was a short break between a previous class they had taken and my class. In the happiest voice I could use I said, "Hi girls! How are you today?"

"Good!" they all said. The rest of my class would arrive within the next 15 minutes. My nerves were building. I wondered if other teachers still feel like this on their first day.

5:17 p.m. – Hannah was standing by the door with her mother. She was crying and would not let go of her mom. "Hi Hannah! I'm happy to see you! Would you like to come into the classroom with me?" She shook her head no. Her mom explained that she was very tired because she did not sleep much the previous night. "We are going to have a lot of fun today, and we would love for you to join us." I took her hand. She hesitantly walked in the room with me, after giving her mom a hug, and put her bag in the front of the room. I hoped she would make it through the class.

5:20 p.m. – More students entered the classroom. Joan and Alyssa were rolling around the dance floor and other girls were talking to each other. “Girls, how do we listen to stories?”

“Quietly”, replied Cassidy, looking at herself in the mirror as she spoke.

“That’s correct. If you would like to share with the class, please raise your hand so all of us can listen to your connections to the story.” No one raised their hand for the remainder of the story.

5:30 p.m. – All of my class arrived and was sitting in front of me, some nice and tall, others slouched. “Hi girls! It’s nice to see you again. This year at dance is going to be a little different. Do you remember how I told you we would be learning dance this year?”

Lilly excitedly said, “With math!” I explained how we would do dance steps and sing songs about math to warm-up. Lilly raised her hand again, this time much less enthusiastically. “Do we have to sing alone? Because I don’t want to.”

I explained that we would be singing as a big group or in little groups. Many children smiled. Joan was lying against the baby balance beam at the front of the room by my leg.

“Ok. Good.” The smile returned to Lilly’s face.

5:33 p.m. – “Before we start our lesson today, I am going to ask you to fill in as many answers as you can on this paper.” I held up the pre-test.

Peyton said, "Hey, this is like school. Is this a test?"

"It is not a test that counts for a grade. It is a paper that will show me how much you know about these math topics and give me a better idea on how to teach you. You will be helping me complete a project at school to teach me how to become a better teacher." Many of the students' faces looked relieved. I handed out colored pencils and a paper to each student. They found their own private place to take the test. Many of the students faced the walls and covered their paper with their body.

5:39 p.m. – After Jess took her paper, she yelled out, "Me and my sister don't know anything about math!" I took that opportunity to tell my students that they did not have to answer any question that they did not understand. "I want you to try your best. I will be proud of you if you do that." Jess said, "I will try, but I really don't know anything." This might have been true, but by the end of the study, I hope it was not.

5:41 p.m. – As I read through the directions for each section, students worked individually on their problems. I noticed Jill, Dana, and Amy looking around the room. "Remember to keep those beautiful eyes on your own paper." They quickly stopped looking around. Alyssa, Lilly, Mary, and Peyton were working ahead.

Throughout the test, I would hear, "I don't know how to do this." from different girls. I redirected their behavior by saying, "All I want you to do is try

your best. If you don't know how to do it, just leave it blank." Later I would realize that many questions were left blank. I would rather see questions left blank than have students get frustrated that they are not able to answer a question. These students were helping me become a better teacher. I did not want to add undue stress to their lives.

5:55 p.m. – As students began finishing the last section on patterns, they brought their test to me. "That was easy," Peyton said, jumping up and down.

Jordan eagerly asked, "How did I do?"

Liz asked me quietly, "Can I keep this pencil?"

"Great to hear; I'm sure wonderfully; Sure," I replied all at once. Most of the students seemed relaxed as they were bringing me their tests.

5:58 p.m. – As I was putting all of the papers and pencils back, I had the students join me in the front of the room once again. I asked the class, "Did you all try your best just now?"

"YES", my class yelled.

"That's great! Give yourselves a big hug." Alyssa gave Lilly a hug while the rest of the class wrapped their arms around themselves. I told the class that the next week we would begin our first song and dance. Joan, Peyton, Hope, Liz, and Jordan clapped loudly. The rest of the class looked at me with a blank face.

10:07 p.m. – As I wind down from a long night of work, I begin looking over the pre-tests (Table 1). My initial reaction was disappointment with the amount of students who were performing below the proficiency level. I then had to remind myself that I had designed my study around curriculum intended for first grade. Over half of my students were in kindergarten and had never been exposed to the majority of the material on the test.

The varied grade levels in my class would explain why all of my preschool and kindergarten students were performing at the below basic (BB) proficiency level, which is less than 59%. My first grade students performed on a higher proficiency level with 1 student proficient (P), between 70% and 89%, 4 students basic (B), between 60% and 69%, and 4 students BB. No students were advanced (A), above 90%, on this test.

The average score out of 16 possible points for my pre-school and kindergarten students was 3.22 points, with a range from 0-7 points. Compared to these results, my first grade students had an average score of 8.22 points, with a range from 4-12 points. The results left room for improvement.

Table 1

Pre-Test Results

Pre-K/ Kindergarten Name	Score out of 16	Proficiency Level	1 st Grade Name	Score out of 16	Proficiency Level
Hannah	2	BB	Lilly	11	B
Joan	1	BB	Hope	12	P
Laney	4	BB	Kaila	4	BB
Liz	7	BB	Amy	5	BB
Cassidy	0	BB	Peyton	6	BB
Jess	2	BB	Laura	10	B
Dana	5	BB	Alyssa	5	BB
Gabby	6	BB	Jordan	10	B
Jill	2	BB	Mary	11	B
Average:		3.22	BB	Average	8.22
					BB

Jump Start in 10's

The whole class jumped into the air and yelled, “100!” Smiles were on every child’s face, probably because they just sang the *Counting by 10’s* song in a “man’s voice”. It took five times of watching me bend my legs half way for the first two lines of the song, then bend my legs until I almost touched the floor while flicking both hands (to show 10) during the counting with a large jump on the number “100”, and following my singing until the majority of students were singing and moving on their own. However, I did spot a few movers without a voice.

Counting by 10's

I can count by 10's up to 100,
I can count by 10's, ready hear I go.
10, 20, 30, 40, 50, 60, 70, 80, 90, 100!!

Figure 1. Counting by 10’s song.

“Class, can anyone tell me when you might be able to use our new song?”

Hope said, “In school on those tests.”

Jordan replied, “When we count how many fingers are in the room.” She started looking around at all of the children in our class. It seemed that she was trying to figure out how many fingers there were in our room; but what would happen when she realized that the song did not go high enough for the amount of fingers in our classroom?

“Why could we use the song for that activity?” I asked.

“Because everyone has 10 fingers. You can just do that song and point to every person and then you would have an answer. Can we try it?” I was hesitant because this was their first experience with a song, and I did not want to scare students away with a song not being able to help them solve a problem.

“Sure,” I answered. I asked the class to split into two groups to see which side of the room had more children. I explained that we could then count everyone together.

As the class split down the middle, Lilly took charge of her side of the room. “Let’s count guys,” she said. They all started singing their song and doing the dance steps. When it came time to count by 10’s, Lilly pointed to each person on her side until they reached 90.

Joan yelled, “100”, but Lilly was quick to correct her.

“It’s not 100 because we don’t have that many fingers,” Lilly explained.

Joan made a face. “I know. I just like yelling that number,” Joan said. Lilly seemed satisfied with her answer. Their side of the room joined the rest of us to report the amount of fingers they had counted. Mary raised her hand and reported that her side of the room had 80 fingers. Lilly’s side had 90. But how could we figure out how many we had all together?

“Let’s just sing that song and figure it out,” Peyton said. Peyton stood up and sang the song, moving along each person, until she got to 100. The rest of the

class was doing the movements to the songs and singing with her. Peyton sang it again and kept moving on to the next person. She made it through the song once and then to 70 the second time through. Peyton looked very confused.

“I don’t get it,” Peyton said. “There is more than 70 fingers cause we had more on our side than that.” I did not think she was alone. As I looked over the sea of faces, many had a look of confusion wiped across them. But out of the corner of my eye I saw my shining flower Lilly with her hand raised.

“Yes, Lilly? Do you know how to help us decide what to do next?”

“Um, you can just put the numbers together,” she replied. She stood up and walked toward me. I had a paper hung up on the mirror. Lilly wanted me to write down the numbers 100 and 70. I did so by putting them on top of each other. She told me to add them together. I went through and had the class answer the addition problems. Our answer: 170 fingers.

“Wow, that’s a lot of fingers,” Laney said. She had a large smile on her petite face.

I pulled out an R & R worksheet for the class to complete individually or with a partner. Lilly was clearly excited and ran to be the first in line. “I love worksheets,” she exclaimed. She quickly sat down by the door and began working on her own.

Hannah did not seem as excited. Although she did not cry this week, she was still visibly unhappy. I decided to ask if she would like to work by my side.

She happily agreed. I also was joined by Jess, Cassidy, and Jill. This small group was struggling with the application of counting by 10's. We sang the song and did our motions together to solve the problems.

As I looked up at the rest of the class, I saw Lilly, Mary, and Peyton finished and drawing on the back of their paper. I asked to see their work, and sure enough, they did wonderfully. Throughout the room you could hear the buzz of singing. The students were actually using the song to help them solve problems!

My happy thoughts were interrupted by Jess. "Miss Christine, what does a 10 look like?" Time to make posters.

New Counting Songs to Sing

"We're getting a new song today," said Alyssa to the class. She was running towards the mirror. "See! It's a poster for a new song. Cont, I mean *Counting by 2's*. We are going to count by 2's!"

**Skip to My Lou -
Counting by 5's**

5, 10, 15, 20,
25, 30, 35, 40,
45, 50, 55, 60,
65, 70!

**Yankee Doodle -
Counting by 2's**

2, 4, 6, 8,
10, 12, 14, 16, 18,
20, 22, 24, 26, 28,
30.

Figure 2. Counting by 5's song.

Figure 3. Counting by 2's song.

The new poster was hung on a wall by the *Counting by 10's* and *Counting by 5's* poster. I decided to make the posters so the students could look at the numbers as we were singing the songs. In addition, students who were unfamiliar with how numbers look would then be able to locate the numbers on the poster.

"That is true. Does anyone notice anything special about our *Counting by 2's* song that they would like to share with the class?" It seemed like two minutes before someone raised their hand, although I am sure it was more like 20 seconds.

"There are a lot of 0, 2, 4, 6, and 8's there," Jordan said with an inquisitive look on her face. She continued to stare at the poster as if she wanted it to tell her more.

Khloe's hand shot up in the air. "It's a pattern," she yelled excitedly. When asked to explain what she meant, she said, "The last numbers go 0, 2, 4, 6, 8, and then they keep repeating, just with a 1 or 2 in front of the pattern numbers." She came up to the poster and showed the class what she meant. Joan was rolling on the floor during her explanation, but popped her head up and shook it in agreement with Khloe. I was not sure that Joan really understood what a pattern was.

I wanted to take this discussion a little further. "Girls, Khloe just explained what a pattern is. If I tap my shoe like this; *toe, toe, heal, heal, toe, toe*, what would come next?"

The class yelled, "Heal, heal!"

I had volunteers come to the room to tap us a pattern. I was amazed with how well the students were continuing patterns. Was it because of the noise with the tap shoes? Was it because the students are moving to the pattern? Was it because they had previous knowledge of patterns? I did not know for sure, but I did know that they did a great job and were smiling through our activity.

As we refocused on the *Counting by 2's* song, Lilly came up with a dance step for our song. The funny thing was it was the exact same step I was planning on teaching them.

"Let's jump in the air every time we sing a number in the song," Lilly said. I agreed that this would be a great idea. I explained that when they jumped in the air, they could whisper the number 1 and then sing the number 2 when they landed. If they kept this pattern, they would be singing by 2's. When we tried the song, most of the children just sang the numbers as they landed. The poster on the mirror was being relied on heavily by many of the students.

After we sang the song twice, I asked the students to fill in the missing number.

6, 8, 10, ___, 14

Without prompting, Mary said, "Let's sing the song".

Lilly interjected, "We could also whisper 1, then say 2, whisper 3, then say 4, and keep doing that until we get the missing number." She was looking at me with eyes which were seeking approval.

I told them that they were both great ways of solving our problem. I encouraged the students to solve the problem however they thought was best. The majority of the class was joining Mary in singing the song.

“2, 4, 6, 8, 10, 12,” they sang. “It’s 12,” many of the girls were yelling.

Laney asked if she could write 12 in the blank. She walked through the class towards the mirror. As she wrote the number in, the two was written backwards.

Mary said, “You should switch your 2 around so it looks like the poster. It’s backwards now.” Laney quietly crossed out her two and wrote it the correct way. She was skipping back to her seat.

It's the Same Thing Over and Over

Field log entry: October 7, 2008: Patterns, oh patterns. Amazing. It is amazing how the children took this concept and ran with it. They were finding patterns everywhere. I wonder if they have had a lot of experience with patterns. My absolute favorite explanation of patterns was when Lilly said, “It’s the same thing over and over and over and over and over. Get it?” I wanted to laugh. It is just as easy as that. I wish everything was that easy.

Pattern hunts were a favorite activity of our class. The students tried finding patterns everywhere. One day the students were working in partners and needed to find patterns throughout the room. They only had one minute to find as

many patterns as they could. When we came back together as a group, I asked them to try and share a pattern that another team had not already said.

Laney and Peyton wanted to start. Laney said, “The ceiling tile goes: tile, bar, tile, bar.” She pointed towards the ceiling as she was explaining her pattern.

“What would come next,” I asked.

The class yelled, “Tile!”

Lilly said, “How about Dana’s shirt cause it’s red, yellow, green, red, yellow, green, red.”

“Her striped shirt is a great example. What would come next?”

“Yellow,” exclaimed the class! This time a few students jumped in the air when they said the answer.

Hope was raising her hand quietly. I asked Hope if she and Kaila had a pattern they would like to share.

Hope quietly replied, “Well, we made one. Is that OK?” She looked at me with questioning eyes.

“I would love to see the pattern you made!” I was excited that they would think of making their own pattern. Hope and Kaila stomped their feet twice and clapped their hands three times. They then repeated the stomping and clapping. When they stopped, the class yelled, “Stomp, stomp!” They did not even wait for me to ask what came next.

After the other children shared their patterns, we made many more patterns using sounds. Although I did not have a specified song to help students utilize the concept of patterns, we created many patterns using noise and our bodies. The students also created patterns on their R & R worksheets. Some students were creating patterns with shapes, while other students were using numbers or alphabet letters. Many first grade students were making more complex patterns involving double objects and single objects. This can be seen in Lilly's first row pattern where she uses two circles, a square, and a triangle to make her pattern (Figure 4). Lilly's second row pattern shows four individual shapes that repeat. In contrast, most kindergarten students created patterns with two single digits that repeated themselves, as seen in Jess's pattern (Figure 5).

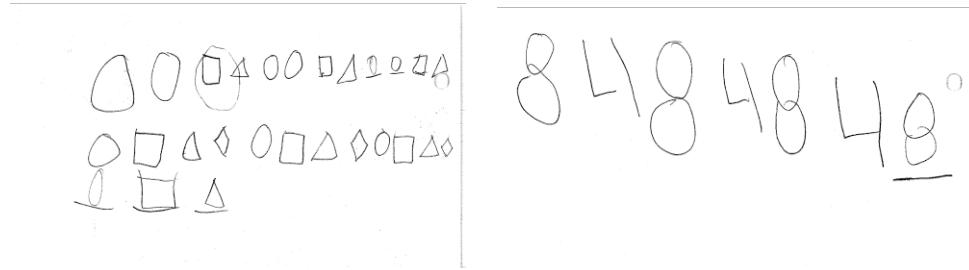


Figure 4. Lilly's pattern.

Figure 5. Jess's pattern.

In addition, each child was given the opportunity to make a pattern for the class using their bodies. Making patterns on paper was nice, but I was looking forward to the students using their creativity through their body and sounds. The children were giddy with excitement and silly at times, but completed the task with ease. Some examples included: arms up, side, down (repeat); jumping jack,

jumping jack, tuck jump (repeat); heal, toe (repeat); and clap, snap, pop sound with mouth (repeat). I loved watching the children create their own patterns. It amazed me to see their creativity.

My amazement turned into curiosity. The most controversial pattern was last. Mary and Laura stood up as Mary said, “I help you and you help me. I help you and you help me.” I was completely taken back. I did not know what to say. Was this a pattern?

“Very interesting! What do you think? Is this a pattern?” I was interested to know what the children would think since I was having a battle within my own brain. I could fight the battle either way.

“‘I help you’ comes next, so it is one,” said Laura.

“Yah. It keeps going the same over and over,” said Lilly.

I asked the question, “Are they doing the same thing over and over? Are they helping each other the same way all of the time?”

“I don’t know, but they are still helping one person and then the other person. It keeps happening cause we help each other. Cause it keeps happening over and over, that should be a pattern,” replied Kaila.

I was still not sure.

“I need your help.” (Jill to Kaila)

“I’ll sing the song with you.” (Dana to Jess)

“Miss Christine, can you help me?” (Jess to Miss Christine)

“You need to start on the black line like the song says.” (Jordan to Joan)

“I’ll give you a clue.” (Cassidy to Gabby)

**“If you draw the straight dotted line you can
tell the time better you know?” (Lilly to Amy)**

“Would you like some help?” (Miss Christine to Dana)

“Ready, sing with me.” (Kaila to Hannah)

Figure 6. Pastiche: Our “pattern” of helping.

Little or Big Steps?

“The measuring one is fun cause of the little steps and big steps. I like the inch steps more because you can move faster with them. They are bigger than the little centi thing ones.” Laura, a rather quiet little girl, gave me this response when I asked her to tell me about the songs and movements we do in class during an interview. I was surprised that she had mentioned this song because I had just taught the class about measuring the previous week. Not one child in my class was aware of a centimeter.

When I first started teaching about measuring, I held up a ruler and asked students what I had in my hand. Many smiles came across their faces with “Ohhs” accompanying the flying hands.

“A ruler,” exclaimed Gabby.

When I asked what rulers were used for, Alyssa said, “To hit things with.” She was giggling and enticed a few giggles from the rest of the crowd. Fabulous. This was not the answer I was hoping for, but it did provide an opportunity to go over safety rules.

I asked the class again what rulers are used for and Darby said, “To measure things.” There were no giggles this time, just Alyssa rolling on the floor.

When I asked what they could measure in the room, Alyssa sat up and began waving her hand in the air. I called on Laney and she said, “The book.” Alyssa’s hand went down by her side with a “huff.” Other responses included their feet, the trash can, and a pencil. This was a good start.

I decided to hand the students a ruler and asked them to tell me what they noticed.

Gabby said, “There’s holes in it.”

Dana said, “There are lot’s of numbers.” I was happy Audrey said something about numbers because in the beginning, she did not think she knew anything about math. Now she was volunteering answers!

Khloe said, "These small things are the size of my pinky!" Khloe noticed the centimeters. This was a perfect opportunity for me to teach the song. Each of the students stood up with their rulers in hand and sang the song with me. I told the class that we would use big steps and small steps during the song.

	<p>Twinkle, Twinkle Little Star – Measuring Song</p> <p>Ruler, ruler, measure me, A centimeter is what you'll see. I am smaller than an inch, Start on the black line – a cinch! Ruler, ruler, measure me, On you there will be thirty.</p> <p>Ruler, ruler, measure me, I am the big inch you see. Again you start on the black line, You are doing just fine. Ruler, ruler, measure me, 12 of me is what you'll see.</p>	
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Figure 7. Measuring Song.

"Do you think we should take big steps for the inches or the centimeters?"

Most of the students looked down at their rulers. Joan was twirling hers.

"The inches cause those are the big ones," Lilly remarked.

"Then I guess we will use small steps for the centimeters because they are the smaller ones," I said. As we completed the song, everyone was doing the motions. This was the first song that everyone completed on the first attempt.

We sat down as a group in the front of the room, and I asked the students to share one thing they learned about measuring from our new song. Some responses included: There are 30 little things and 12 big things; You can measure lots of stuff and they aren't the same length all the time; Measuring is more fun than money; and You have to start on the black line cause the song says so. These answers seemed to indicate that my students were ready for some partner work with measuring.

The partners each had a paper with two lines on it. Once each line was measured using centimeters and inches, the partners could go on a measurement hunt and look for objects that were three inches long. I thought this would be a fun activity, but I noticed quickly that some students were not ready.

Joan, who was sitting right next to me, was confused on which side was a centimeter or an inch. Her partner, Cassidy, helped her by pointing to the words on the ruler. When that still did not help, Cassidy put the ruler down on the correct side to measure the line for Joan. Joan pushed the ruler back a little and said, "You put in on the black line, not the end of the ruler." Joan was pointing to the song hanging on the wall when she made this statement. Cassidy did not argue.

I looked up and saw a few pairs roaming the room looking for objects that were three inches. When I checked their lines on the front of the paper, many of them were not measured correctly. I was quickly feeling that this lesson was not

going to be successful. Perhaps I should have spent more time introducing how to measure correctly.

A worried voice was interrupting my thoughts. "This is confusing me," said Peyton. I did not think she was alone. The class quickly came back together, and we measured objects as a group. Next week I would have to improve my lesson because this was not successful.

The following week we did review measurement. We were measuring objects that were three inches and three centimeters. If the students became confused, they sang the song and did the movements to figure out which side of the ruler to use. The little and big steps helped the students because they could then look for the little spaces or the big spaces on the ruler.

Joan came up to measure an eraser in centimeters and started at the 30 end of the centimeters. I asked her to look at the ruler and tell me why she wanted to start at that end. She said, "I like 30." Her honest answer reminded me how egocentric young children are. I told her that 30 was a nice number, but we should start at the end that has the 1. I asked her why she thought we should do that. Joan said, "Because that's how we count." This answer was true, but not as cute!

Hannah volunteered to measure a book for us and began at the end of the ruler. Alyssa raised her hand and said, "You should start at the first black line because that's what our song says." Hannah moved the ruler and measured the

book correctly. I like when students help each other rather than me correcting students because I think some students respond better to their peers helping.

Students completed another measurement hunt on their R & R worksheet at the end of class. Students were working alone or with a friend. They were buzzing around the room putting their rulers against anything they could find. Their goal was to find six inch objects. Most of the students were doing great. I saw some students taking big steps and looking at their ruler, as if to double check that they were using the correct side. If there was a problem, it was that students were starting at the end of the ruler rather than the first black line. I would ask them where they should start and they would always reply, "On the first black line." This little reminder to a few students was all they needed to be successful. Below are two examples of results from the measurement hunt in Figures 8 and 9. Peyton found a water bottle and a ballet shoe while Hope found a street shoe and a book.



Figure 8. Peyton's 6 in. objects.

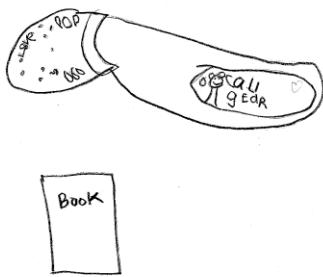


Figure 9. Hope's 6 in. objects.

What's it Even Worth?

Hope was shaking her hand high above her head. "We use money in school. We put dimes on our desk and then pennies and then raise our hands to tell how much is there. I use the money song to help."

"That is very exciting. Can you tell me more about that?"

"You know too Lilly. I sing, 'The quarter is the biggest worth 25 cents.' Then I know it's worth 25 cents. Then I sing, 'The copper penny is worth 1 cent.' Then I know I have to put one more on 25 and get 26." Lilly was shaking her head in agreement.

Peyton was yelling out, "Hey, sometimes I use that money song too."

"Will you share with us how you use the money song?"

Peyton took a deep breath and quickly said, "Cause sometimes I don't know which coin it is. But the song tells me that the little one is the dime and then the really big one is the quarter and the copper one is the penny, and then bigger coin, but not the BIGGEST one is the nickel."

I was very impressed and asked the class how knowing what coins looked like could help them learn. Peyton has a confused look on her face. Then she asks, "Well if I didn't know which coin it was, how am I supposed to count it?" That is a great question. I guess she told me.

I have to take you back a week earlier. The conversations were not as productive. In fact, I was frightened. The students were unsure, to put it lightly,

on what coins looked like and their worth. I showed the class each coin, they examined each coin, and we discussed what each coin looked like. These were the descriptions given by my students:

Penny: Brown, Abe Lincoln, kinda smaller

Nickel: Bigger than the penny, silver

Dime: Really small, silver, bald guy

Quarter: The biggest, silver

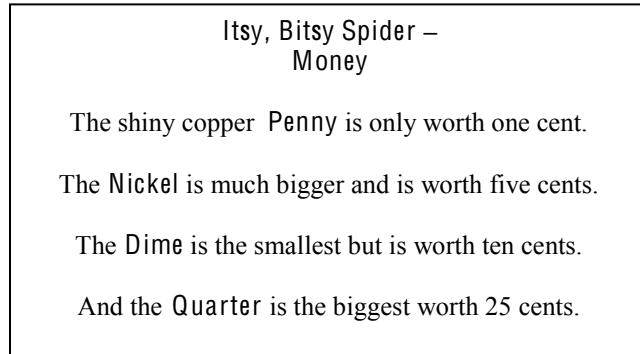


Figure 10. The *Money* song.

The class learned the *Money* song and really enjoyed singing it. “It’s like the *Itsy, Bitsy, Spider* song,” said Alyssa. That was true. It was to the same tune. The students held a finger up when they sang about the penny, raised one hand in the air while standing on their toes for the nickel verse, jumped into the air with both hands above their head during the dime verse, and jumped with their hands and feet out to the side with an extra hand forward on the landing to show 25

cents during the quarter verse. I was happy with how quickly the students learned the song, but then disaster struck.

I had put two pictures of dimes on the mirror and asked the class if they could tell me how much these coins were worth so we could figure out how much money we had. Many students did not recognize the dime when they had no other coin to compare it to. Students told me they were pennies, nickels, quarters, and last, a dime. It seemed to me like a guessing game. At this point a red flag went up in my head. It was as if I was trying to drive a truck down a road that did not exist. It was time to build that road.

The following week, I brought a bag of coins for each student. Before I handed out the coins to students, I asked them, “Why might you need to know what coins look like?”

“So we know if we are actually getting what we’re supposed to,” said Alyssa, in a matter-of-fact way. I wanted to know where she was going with this statement. She continued, “I get a quarter when I loose my teeth and I want to make sure it’s a quarter.”

Lilly said, “So we can do good on tests.”

Hope added, “So we know how much money we have to buy stuff.”

Mary smiled, “So we can be smart.”

Those were all great reasons. We were moving in the correct direction. Now we had to continue to drive. I asked the students if they thought they would

be able to hold up the correct coin as I sang our money song. I reminded them to listen to the clues in the song. All of the students, except Hannah, shook their heads up and down.

Sure enough, as I sang the song, the students held up the correct coins. There was little confusion when it came to the dime and the nickel. I asked the class how they could tell them apart. “Remember the dime is the smallest one and it has a bald guy on it. The other coins have hairy headed boys,” helped Hope.

I wanted to see if my students could make different amounts of money using coins. I posed this question, “How many ways can we make 10 cents?” I thought I might be pushing my luck, especially with the younger children. Yet I wanted to stretch their thinking.

Laney, a brave kindergartner, started, “Use two pennies.” I drew two pennies on the paper.

Mary burst out, “But you need more. Keep drawing them.” As I kept drawing a “P” for penny, Mary and some other children counted up: 3, 4, 5, 6, 7, 8, 9, 10. Mary seemed happier now. “See,” she said, “You need 10 pennies to make 10 cents.” We counted the pennies as a class to make sure. Laney and Mary gave each other a high-five. Could there be another way to make 10 cents?

Hope slowly raised her hand. “I think you could use two nickels.”

“How could we check? Do you remember how much a nickel is worth?”

“It’s worth five cents. How about that 5’s song up there,” Lilly asks. She was pointing to the poster in front of us.

“I think that is a great idea! Let’s sing the Counting by 5’s song for the first two numbers to see how much two nickels would be together.” Some students stood up and tapped their foot as they sang.

The class sang, “5, 10”. We made two nickels and added a dime to our paper when it was suggested by Cassidy. Many of the students were holding up their hands to check the amounts we were writing on the poster, using the motions from the *Money* song.

Now it was time to stretch our learning road even further. I split the class into three homogeneous groups. Each group was to make the amount of money on the top of their paper as many ways as they possible could. As I split the groups, I was wondering if homogeneous grouping would be the best choice for this activity. At that point, I decided to have each group share their solutions at the conclusion of the activity.

The 20 cent group got right to work. Lilly told Khloe to write 2 dimes on the paper because $10 + 10 = 20$. Khloe wrote two “D’s” on the paper. They already had four nickels on the page when I went to observe their group. I asked the group, “What could you do if you were only allowed to use one dime?”

Khloe wrote down one dime and then added two nickels. When I asked her why she decided to add two nickels, she replied, “Because $10 + 5 + 5 = 20$.” She sang the *Counting by 5’s* song until she reached 20.

Mary had another idea. She took the pencil from Khloe and wrote 1 dime and 10 pennies. The group counted on from 10 until they reached 20. This group was working well together. It was time for me to move on to the next group.

When I looked at the five cent group’s paper, I was a little disappointed. I should have gone to their group first. There was nothing on their paper. Jill was rolling on the floor; Hannah was playing with the pencil; and Joan was staring at the 10 cent group. I quickly asked, “Do any of you know of a coin that is worth five cents?”

Joan and Jill shook their heads “No”, but Hannah said, “A nickel.”
Hannah wrote the “N”.

“How did you know a nickel was worth five cents” I asked the group.
Hannah spoke again. “Well, in the song, the song says so. We put up one hand too.” She showed me her one hand. The other group members looked at their own hand, as if checking to make sure they also had five fingers.

I asked the group if they could think of another way to make five cents. All three girls looked at me with a blank face. They looked defeated. Joan finally said, “Dime.”

Jill held up both of her hands and counted her 10 fingers. She said, "It's too much cause we hold up two hands for a dime and that is 10." Jill was referring to the movements we do in the money song for a dime. In the song, the children reach towards the ceiling with both hands as they sing about the dime. Before moving on to the 10 cent group, I asked the 5 cent group to try and decide how many pennies they would need to make 5 cents.

At the 10 cent group, they already had a "D" on their paper and two "N's". As I was standing behind Laura, she was writing two "P's" on the paper. She put the pencil down and Laney picked it back up. "We need more pennies," she said. She began making more "P's". I encouraged the group to count how much money Laney was making. When they reached 10 cents, Laney laid down the pencil.

Once all of the groups completed their task, they shared their work with the other students. Their work can be seen in Figures 11, 12, and 13.

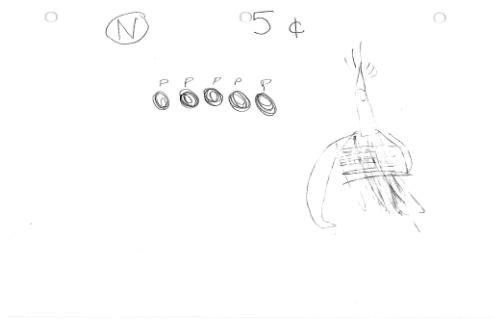


Figure 11. The 5 cent group's work.

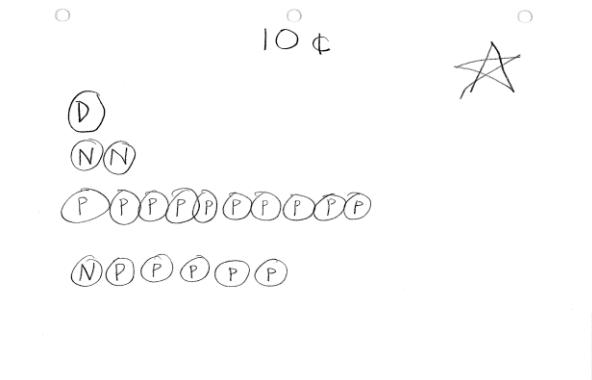


Figure 12. The 10 cent group's work.

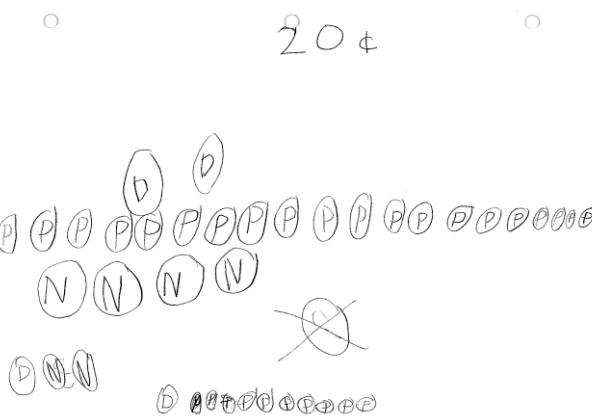


Figure 13. The 20 cent group's work.

I asked each group to share what skills they used to solve their problem.

Many hands were waving in the air.

Hannah said, "My fingers and hand."

Hope replied, "The songs. The money and the fives one."

Laney said, "We just knew it."

In weeks that followed, students completed numerous tasks using money.

Although not all students used the song to solve problems, many of the students

did. The students that had already memorized what the money looked like and how much it was worth no longer needed to use the song. Khloe was an exception and chose to sing the song at every possible chance even though she knew what coins looked like and their worth. I guess some of us are just singers at heart.

That Dotted Line to Tell Time

Every lesson was starting the same. We sung the songs and did the movements that we had previously learned and then either learned a new song or had a week of review and enrichment. This week would be a new song week.

As I was telling the students that we would be learning a new song, Lilly said, “Is it to count by 1’s?”

“No” I said. “It is a song to help us tell time.” Normally when I told the class about a new song we would be learning, they were excited. Instead of smiles; however, I saw a lot of worried faces. I heard, “I don’t know how to tell time,” from many students. This was the most negative reaction I had received from introducing a new song. I did not hear one child say that they were aware of how to tell time using an analog clock.

Hoping to eliminate a negative start to our lesson, I quickly sang the song to the students and demonstrated on a paper clock as I sung the song.

The Wheels on the Bus Go Round and Round – Time

When you want to tell time, tell time, tell time.
When you want to tell time, find the small hour hand.

Draw a dotted line, dotted line, dotted line,
Draw a dotted line, from the hour hand.

Now find the long hand, the long hand, the long hand.
Now find the long hand, this is the minute hand.

The minute hand is on the 12, on the 12, on the 12.
The minute hand is on the 12, when it's an hour.

The minute hand is on the 3, on the 3, on the 3.
The minute hand is on the 3, when it's quarter after.

The minute hand is on the 6, on the 6, on the 6.
The minute hand is on the 6, when it's half past.

The minute hand is on the 9, on the 9, on the 9.
The minute hand is on the 9, when it's quarter to.

Figure 14. The *Time* song.

Alyssa was starting to make “Ohh” sounds and called out, “It sounds like *The Wheels on the Bus Go Round and Round*.” More children were now smiling. “That is true! I made our clock song to the same tune as the *Wheels on the Bus* song.” I asked the children to sing the song with me. As we were singing, our right arm circled in front of our bodies in a clockwise direction. After each verse, we stopped and decided which part of the clock we were singing about or what time we were singing about. Our hands stopped where a pretend 12, 3, 6, or 9 would be. I drew a dotted line from the hour hand on our plate clock and the children helped me find what hour it was. I put my finger on the 12 and circled

around the clock until I got to the dotted line. The class did the same motion with their arm, as if they had a huge clock in front of them. The class yelled, “4!”

We completed the same activities for quarter-after, half-past, and quarter-before. I asked for volunteers to come up front to hold the clocks for the class. Jill, Kaila, Amy, and Lilly came up. I asked the class to call out the person’s name that was holding 4 o’clock, then quarter-after, half-past, and quarter-before. As the class called out each person’s name, the clock holders had smiles beaming across their face. More students seemed to enjoy telling time as the lesson progressed forward.

Although it seemed that most students had a basic understanding of telling time, the review sheet would give me a better idea of who still needed assistance. Jill, Hannah, Jess, and Joan, my small group of students who often needed assistance, were struggling with telling time. They began off task behaviors of rolling around and talking about princesses as I walked towards their group.

“What can we do to help us with this clock,” I asked the group.

Jess looked at the other group members and said, “Use that dotted line.” The girls quickly drew the dotted line from the hour hand. When Joan drew the line from the minute hand, Hannah put down her pencil and reached towards Joan’s paper.

“You need to do it from the short hand. That one is the hour hand. Look at the song,” Hannah helpfully said. Joan did just that and walked up to the poster

and saw the short hour hand with the dotted line. She came back and fixed her paper.

It was then time for us to tell time. We sang the song together and the four girls followed the directions given in the song. Hannah then stated, “It is half-past 4.” She showed us by moving her finger around the clock until she went past four to get to the dotted line. All of the girls drew invisible lines around the clock until they reached the dotted line as Hannah did. The dotted line seemed to help the students because they then knew where to stop. This was true for the rest of the class as well.

In the weeks that followed, whenever we went into the time song, the students remembered the clocks and asked to hold them for the class. They also called our *Time* song, *The Wheels on the Bus* song because of the tune. Although time initially was an area where students felt insecure, they quickly grew to excel. The students seemed to enjoy singing the song because of the familiar tune. This was a great lesson for me. Pick songs that students know and enjoy!

Singing vs. Dancing

Throughout my study, I was noticing more students singing the songs to help them solve problems than using the motions. This was very interesting because we were in a dance classroom! I thought the students would move more than sing.

As I reflected on lessons, I would often try to hypothesize why singing was used more frequently than the motions to solve problems. Was it because the students were sitting? It is harder to move when seated and students are often not allowed to stand up during lessons, especially to jump around. Were the children bringing their school rules into the dance classroom? Was it because the words were more helpful in solving problems compared to the motions? The majority of motions that were used helped solve problems dealing with the money and measuring songs. The children would hold up their fingers and hands to show them how much a coin was worth, or take big and small steps to measure. Even then, the students were also singing the song along with the motions.

Were the motions just helpful in reducing behavior issues? I know some of my students had a hard time focusing, but they always completed the physical motions to songs. It seemed like a relief to these active students to be able to move around. It appeared to give them a break from non-physical activities. Perhaps adding the motions to songs helped stimulate the students' ability to think.

After hours of wondering if the motions or songs were more helpful to the students, I decided to ask them. Their responses were enlightening and reinforced the need for both tools of instruction. Their answers confirmed that different multiple intelligences do need to be used during instruction.

Tell me what you think about using

songs and movements in our classroom.

"I don't like singing a lot. Moving is better."

"We get to sing loud and do silly dance steps!"

"*They helped me know stuff I didn't know before.*"

"I like to scream the songs."

"You can be silly when you sing."

"Singing's better than papers because you can be more goofy and not boring."

"I think about learning."

"I think about learning dance cause I've never done it before."

"*I sing them to mom and dad.*"

"It makes our heart go fast."

"I learn cause we sing it over and over."

"Makes me feel good because I do well on stuff and exercise."

"*I like when my body moves and I get exercise because it makes me feel better.*"

"I don't know."

"Cool because they teach me stuff like the Measuring Song."

Figure 15: Student pastiche created from the question: Tell me what you think about using songs and movements in our lessons.

Moving and Singing in School... Just Maybe!

I was not sure when it became taboo to move and sing in a classroom.

Although I felt there was a need for more instruction in these two areas, I did not realize that many students felt as if they could not move or sing in their school classrooms.

One day, we were discussing different places the students may be able to use their songs to help them solve problems. Students said at home, in a store, when you play, and on homework. Inevitably someone else mentioned school. At that point, stories began circulating about positive and negative experiences they have had when sharing their songs and movements at school. I was honestly surprised at how many students said they would not be able to use their songs and/or movements in school. This made me sad. I had to hold on to the positive comments made from students and acknowledge differences in teachers.

I realized that all teachers are different and run their classrooms in a personal manner. Each teacher values certain modes of instruction. I also realized that I was getting information from very young children that might be skewed. Since I have inserted disclaimers, I would like to share conversations and statements that my students have shared about singing and moving at school.

Play: Mary and the Disapproving Teacher

Scene: Mary is talking with Miss Christine in the lobby of the dance studio. They are sitting against the wall under the tack board. Many parents are quickly putting on their child's jacket and rushing home for dinner. Mary's mom has not arrived.

Miss Christine: Would you like some company until your mom comes?

Mary: (Shrugs) I guess.

Miss Christine: (Sitting down on the floor next to Mary) Did you have fun in class today?

Mary: Yah. I like that new song with the rulers. (Smiling)

Miss Christine: That's great to hear! Do you get to share your songs with friends?

Mary: Well, I tried to at school, but that didn't go over so well. (Frowning)

Miss Christine: What do you mean? (In a confused voice)

Mary: My teacher is really mean. She won't let me sing. (Looking down)

Miss Christine: Do you think it would make her smile if you shared a song with her to show her you are learning something new?

Mary: Maybe. But she is really mean and doesn't smile that much. Kinda crabby. (She seems reluctant.)

Miss Christine: How about you give it a try. Maybe she will surprise you.

Mary: (A doubtful look on her face) OK. I will try, but don't hold your breath. I don't think she will smile at all. She doesn't like fun.

Tell me about using your songs and movements in school.

"She said, 'Good job girls!'" (Cassidy and Jordan)

"My teacher said, 'My goodness gracious! That was beautiful!'" (Alyssa)

"She said, 'Good, but sing it to yourself Liz.'" (Liz)

"My friends wanted to learn, so then I taught them." (Peyton)

"If I'm taking a test and I don't remember how to count by 5's, I can sing that song in school. Well, not loud though." (Lilly)

"They (the songs) help me remember stuff. Then I do good on tests at school." (Cassidy)

"I like this class cause we don't ever sing and dance in our real classroom at school." (Khloe)

"You can't do them dance steps in school you know." (Dana)

"I use the movements and the songs because sometimes I can just move my legs under my desk and whisper." (Mary)

"They help me remember things and solve these more bigger problems." (Khloe)

"My teacher says I can whisper songs if they help me." (Amy)

"I can count by 5's in class and the other kids can't." (Hannah)

"My teacher was surprised! She wanted me to sing more!" (Laney)

"I don't know." (Keira)

"We aren't really allowed to, but I just do it in my head secretly." (Kaila)

Figure 16. Pastiche: Tell me about using your songs and movements in school.

Their Very Own Songs

Khloe's New Song

Well, it's just so easy to make up a song. I just use stuff I know to remember things. Like today in school, I forgot how to write the fraction for four apples if one of the apples was red and three were green. I just did this on a test today. I kept writing 1, 4, 3, 4 next to each other. But then I noticed it didn't look right. I remembered a song that I sung to myself that told me to put the little number on the top of the big number. It's like, "The little numbers go on top. The big numbers keep them up." (Sung in a happy jingle) I put the little number on top like 1 over the 4 and 3 over the 4. Then it looked right. People should just do that, you know, make up a song, because it's easy. You should tell everyone that making songs is easy. You're a teacher. You can do that. It's simple cause you don't need anything but your mind. That's why I like making up songs. It's easy and you don't need lots of stuff to clean up.

$$\begin{array}{r} 1 \\ 4 \end{array} \qquad \begin{array}{r} 3 \\ 4 \end{array}$$

Figure 17. Vignette on Khloe's song.

Khloe's outlook on making up songs was refreshing. For such a little girl, she had big dreams about making up songs. I was hoping that the rest of the class would share her enthusiasm for creating a group song and dance to teach to the class. Part of me was hesitant to believe that this activity would go smoothly. During my interviews with students, numerous children said that making their own song would be very hard. Some told me flat out that they would not be

interested in making their own song. Perhaps the group setting would settle their fears.

As our class took the leap into creating songs, I had a checklist in my head that had to be completed before the groups could make up their songs.

Group Song Checklist

- ✓ Have the class brainstorm two songs the students could choose from: *Happy Birthday* and *Jingle Bells*.
- ✓ As a class, brainstorm ideas for their factual songs: colors, bunnies, dogs, left and right, books, adding, and dance steps.
- ✓ Split the class into three heterogeneous groups.
- ✓ Have one person be the recorder for the group.
- ✓ Explain that every member had to help create the song or decide upon movements for the song.
- ✓ Hand out paper and let the groups get to work!

Every item on my checklist was completed and the groups separated to three separate corners of the room. I decided to follow Khloe's group closely to see if her past experience of making her own song helped her group succeed in their project. As I circled the room to make sure all groups began deciding which topic they would sing about, Khloe's group was having a healthy debate.

Gabby: I want to write about bunnies.

Alyssa: But colors is better.

Gabby: No! Bunnies is better! (Her voice was getting louder.)

I could see that this was not going to be productive. Alyssa and Gabby were not working very well together and the rest of the group was not intervening to help. Instead they were looking at the two girls quietly. I decided to intervene.

Miss Christine: Gabby, could you tell me what you would write about bunnies?

Gabby: That they are cute. (Pretending to hug a bunny)

Miss Christine: Is that a fact or an opinion?

Khloe: Opinion. Let's do primary and secondary colors, like we learn in art class. That could be cool. (Gabby smiles and agrees with the rest of the group.)

Alyssa: Primary Colors (Sung to the tune of the *Jingle Bells*)

Jordan: Sing it three times.

Group: Primary colors, primary colors, primary colors.

Khloe: Yah! Then say the colors red and blue and yellow.

Alyssa: Find them anywhere. (Singing to herself)

Liz: Hey! (Liz jumps into the air.)

All of the children were smiling and giggling. Khloe was writing as quick as she could.

Miss Christine: What could you do with the secondary colors?

Khloe: Sing it again but put the secondary colors in and say secondary.

Jordan: Aren't those colors orange, green, and black?

Alyssa: No! They are orange, green, and purple. (Khloe wrote down the colors on their paper.)

Miss Christine: Great start girls! Try to think of motions to add to your song now.

Cassidy: Let's hold our leg in passé. (One leg is bent while standing on a straight leg. This helps learn how to balance.)

Liz: Then let's jump on 'Hey!' (All of the girls were smiling.)

This group did a great job working together and it was time for me to check on the other groups. Group Two was disagreeing about how to finish their song. They had decided to sing a song about left and right. They had come up with the first phrase, but could not finish the song. I asked them how they wanted to teach people their left and rights.

Peyton said, "You hold up your left hand to make an L."

We sang the first two verses together to the tune of *Happy Birthday*, then I asked what they thought should come next.

Lilly said, "Just remember with the left to use your left hand."

Amy questioned, "But what about making the L?" (Laura shook her head in agreement.)

Lilly answered, "How about 'Just remember with the left to make an L.'"

Peyton said, "I like 'Just make an L.'" Everyone agreed.

I then walked over to Group Three to see how much progress they had made. Group Three had decided to do the double addition facts in their song. They were trying to figure out how to end the song while Hope was writing down the words. Hope looked up from the paper and said, “Let’s ask them to sing along like some other songs do.”

In an asking voice, Laney questioned, “So why don’t you sing along?”

Joan interrupted and told me that the group was going to move side to side when they sang.

Dana added, “Then we jump in the air on ‘Hey’.” I asked them why they decided to use those motions and Dana said with a big smile, “Because you sway when you sing Christmas carols.”

I looked around as the groups were feverishly practicing their songs. I noticed that Hannah was sitting down on the floor. Lilly said something to her and Hannah rejoined the group. I wondered what she said.

“One more minute of practice time before we perform,” I reminded the class. I saw a few nervous jumps and a lot of quick rehearsals. It looked like a high school classroom where students were jamming as much information into their brain as possible before a big test. I needed to calm these little ladies down.

The minute was up, and it was performance time. I reminded the groups that this was for fun and that everyone was going to be very supportive. Group One asked me to sing with them. The other groups then wanted me to sing with

them too. I sang and danced behind each group as they performed. When every song and dance was finished, the audience clapped for them. Below, in Figures 18-24, were the songs written by the students and a typed version accompanying the students' work.

Group 1's Song:

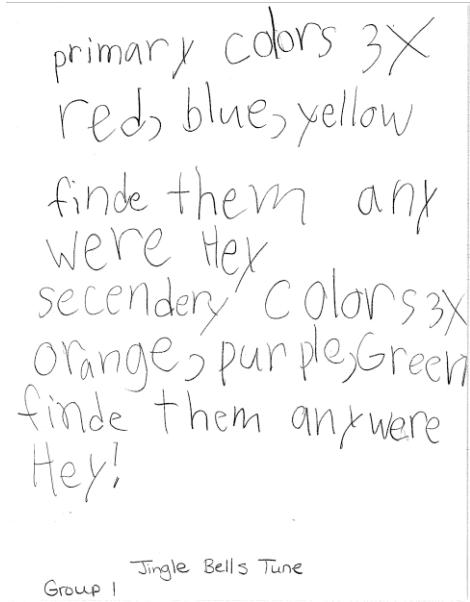


Figure 18. Khloe's written version of their *Color* song.

Colors – Jingle Bells Tune
(Balance on one leg, passé,
then jump on “Hey!”)

Primary colors,
Primary colors,
Primary colors,
Red, Blue, Yellow
Find them anywhere,
Hey!

Secondary colors,
Secondary colors,
Secondary colors,
Orange, purple, green
Find them anywhere,
Hey!

(Liz, Gabby, Jordan, Alyssa,
Cassidy, and Khloe)

Figure 19. Typed version of *Color* song.

Group 2's Song:

wi ra gowin to teh
 You ra left and
 - rat (2x) - - - - -
 just rime br wi h
 the Left just
 mac an L

Happy Birthday Tune
 Group 2

Figure 20. Peyton's written version of their *Left and Right* song.

Left and Right – Happy Birthday Tune

We're going to teach you our left and rights (Stomp left then right)

Repeat

Just remember with the left,
 Just make an L.
 (Hold out left hand with an L made.)

(Laura, Hannah, Lilly
 Peyton, Amy, Jill)

Figure 21. Typed version of *Color* song.

Group 3's Song:

1+1=2 2+2=4 Hey
 3+3=6 4+4=8
 5+5=10 6+6=12
 Now you no up to 6
 So why dont you ab
 along

Jingle Bells Tune
 Group 3

Figure 22. Hope's written version of their *Adding* song.

Adding – Jingle Bells Tune
 (Sway back and forth and jump on the “Hey!”)

1+1 = 2, 2 + 2 = 4,
 3 + 3 = 6, 4 + 4 = 8
 Hey!
 5 + 5 = 10, 6 + 6 = 12.
 Now you know up to six,
 So why don't you sing along?
 Hey!

(Hope, Laney, Joan,
 Keira, Jess, Dana)

Figure 23. Typed version of *Adding* song.

After the performances, all of the students gathered around my feet. I told the class that I was proud of them and asked them what they thought about making up their own song and dance.

Amy said, "It wasn't that hard."

Hope exclaimed, "It was fun."

Lilly sighed, "Not bad because I didn't have to sing by myself."

Khloe beamed, "That was fun; I'm going to do more of them!"

This experience seemed to be an overall enjoyable project for the students.

There were no terrible disagreements and every song was helpful and creative.

Although some groups struggled more than others, each group met their goal of creating a song and dance to teach the rest of their class a concept.

As I left work, I felt happy and satisfied. Many years ago, my English teacher taught me how to create songs to help me learn. If one student in my class can become more confident and learn more in school due to this new style of learning, I will be elated.

Summary: The End is Near, But not Here!

"I did it all by myself," exclaimed Laney with delight. In the final weeks of my study, many students began feeling more successful in our math activities. I no longer had frowns when R & R worksheets were completed. I no longer had questions like, "Do we need to sing by ourselves?" My students were excited to learn new songs and even more exited to share them with others.

When the students took the post-test, I did not hear “I can’t do it” from anyone in the room. Although some skills were not mastered by all students, every student in the room improved. During the course of the study, we had 2 new students: Kiera and Khloe. Khloe, a first grade student, joined us four weeks into the study and was able to quickly learn the songs she had missed. Kiera, a kindergarten student, came 10 weeks into the study and had a harder time learning the songs. The post-test results can be found in Table 2.

The average score out of 16 possible points for my pre-K and kindergarten students was 9.9 points, with a range from 5-14 points. Of these students, 4 were BB, 2 were B, and 4 were P on their test scores. Compared to these results, my first grade students had an average score of 14.6 points, with a range from 12-16 points. The proficiency level for my first graders consisted of 5 students who were P, and 5 students who were A.

Table 2

Post-Test Results

Pre-K/ Kindergarten Name	Score out of 16	Proficiency Level	1 st Grade Name	Score out of 16	Proficiency Level
Hannah	5	BB	Lilly	16	A
Joan	6	BB	Hope	16	A
Laney	14	P	Kaila	14	P
Liz	13	P	Amy	13	P
Cassidy	11	B	Peyton	16	A
Jess	6	BB	Laura	13	P
Dana	12	P	Alyssa	16	A
Gabby	13	P	Jordan	12	P
Jill	11	B	Mary	16	A
Keira	8	BB	Khloe	14	P
Average:	9.9	B	Average:	14.6	A

Every student improved their scores on the post-test. More importantly, every student was smiling while taking the post-test and did not have a defeated attitude. All students tried and very few questions were left blank. I could not have been any more proud of my students, especially my young students who met

the goals of a first grade student. In the beginning I asked all students to try their hardest and be open-minded. I do not believe any student gave me anything less than their absolute best.

Although I had accomplished a lot in the classroom, I was interested to see what the parents of my students thought about using music and movement to teach their children. I felt this would be an important insight to gain because I was instructing their child in an unconventional manner. I wanted to know if they had seen any differences in their child's behavior or academic performance. In Figure 24, I have included responses from the seven surveys that were returned. I found the parent's statements to be thoughtful and worthwhile.

Math time was her favorite part of dance.

I think it is a great way to teach children math in a fun and motivational way.

I think it is wonderful.

She enjoys singing the money song.

It made it fun for her to learn.

When she learned the songs for counting by 5's and 10's,
I think she only memorized it because of the songs. I don't know
that she truly understood the concept.

I've seen her advance a lot this year so far.

I've never seen her as excited and enthusiastic to learn as she is this year!

Dance, singing, and music are all tied together as each facet inspires the other.

She has a much keener interest in math
since learning outside the school setting.

Learning this way is perfect for this child. She has a hard time
sitting and learning rote, so this is a great alternative in learning.

Children seem to learn the words to a song fairly easily.

**My child loves to sing and dance –
learning while doing so makes it more fun!**

*She is in pre-school, so I am impressed that she can count by 5's and 10's,
understand the concept of telling time by a clock with hands.*

My child was singing a "Math Song" at home and I asked where she
learned that - She enthusiastically responded, "At dance class!"

*Figure 24. Pastiche: Please tell me what you think about using music and dance to
teach your child mathematics. (Parents' answers to survey question)*

My study has taken me through a rollercoaster of emotions. At first I was nervous; then I became excited. Throughout the study, there were days of astonishment that so much could be accomplished and then there were days of disappointment when I thought it might not work. All in all, I am pleased with the outcomes. My students have performed well, but more importantly are smiling and enjoy coming to class. Fellow instructors at the studio have showed interest in implementing academic songs into their dance classrooms. The end is near, but not here!

DATA ANALYSIS

Throughout my study, I analyzed many forms of data. Analysis of data took place when my observations were categorized, tallied, and labeled (Ely, Vinz, Anzul, & Downing, 1997). The largest amount of data that I collected was recorded in my field log. Once events and perceptions of events were recorded for a particular day, I read through my field log and wrote labels in the blank left-hand column of my paper. The process of reading and rereading a portion of data to provide labels is called coding (1997). Once all of the codes were completed for the day, I tallied the amount of times each code was written on a spreadsheet. This was an on-going process and continued throughout my entire study.

In addition to analyzing and coding my field log, I also took a very close look at student work to determine strengths and weaknesses. I analyzed weekly work to decide upon the following week's lesson. I also compared scores from the pre-test and post-test and analyzed their results through tables and graphs. I looked at each test based on state proficiency levels, as well as individual results for separate questions.

Student interviews were also coded and analyzed. Through the interviews, I was also able to member-check, which means checking my interpretations of the data with each participant (Ely, Anzul, Friedman, Gardner, & Steinmetz, 1991).

Member-checking helped confirm or refute general themes I saw occurring throughout my data. The interviews gave a personal insight into each child and their individual feelings and thoughts about using movements and songs to learn.

Parent surveys were analyzed by tallying the responses to questions to determine any patterns. General comments were also categorized to get an overall sense of parents' feelings about their child learning through the use of songs and movements.

In addition to the data collected during my study, I analyzed my data through reflective memos I wrote as I read the works of Dewey (1938/1997), Freire (2003), Delpit and Dowdy (2002), and Vygotsky (1978). For each researcher and philosopher, I found profound quotes that applied to my study and analyzed the quotes to determine how they supported my findings or methodology. Reading the works of Dewey, Freire, Delpit and Dowdy, and Vygotsky, gave me a diverse insight into my study and instructional practices.

Once the tallies of my labels for my field log, student work, student interviews, parent surveys, and reflective memos were complete, I looked at reoccurring themes and created bins to visually organize and sort my information (Figure 25). I combined the codes from all forms of data collection into one visual aid. By interweaving the data collection and analyzing its contents, the product shed light on possible outcomes (Ely, et al., 1997). Once the bins were

created, theme statements were formulated to capture the essence of each bin.

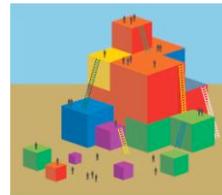
These theme statements framed the preliminary findings of my study.

Bins



Interconnectiveness of Multiple Intelligences:

- Musical
- Kinesthetic
- Visual
- Interpersonal
- Intrapersonal



Cognitive Levels of Activities:

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation



Monitoring Progress:

- Review and Revisit Worksheet
- Test
- Observation
- Guided Question
- Interview

What are the observed and reported experiences when bodily-kinesthetic and musical instruction strategies are used to instruct mathematical knowledge to primary



Scaffolding:

- Whole group
- Small assisted group
- Model
- Teacher assistance
- Peer helper



Negative Affect:

- Negative statements (school based)
- Negative feelings
- Student frustration
- Off-task



Positive Affect:

- Positive student response
- Outside practice of skills
- Positive parent response
- Increased motivation



Test Success:

- Increased test scores
- Positive outlook on post-test

Figure 25. Bins.

Theme Statements

Interconnectiveness of Multiple Intelligences - When instructing in the bodily kinesthetic and musical intelligences, incorporating additional intelligences may aid in the continued growth of the students.

Cognitive Level of Activities - The use of songs and movements provided an opportunity for students to reach various levels of Bloom's Taxonomy during their learning experiences.

Monitoring Progress - Monitoring progress through dialogue and observations was imperative to design curriculum that provided a beneficial learning experience for all learners.

Scaffolding - Scaffolding though different instructional groupings allowed for a variety of instructional methods to meet the needs of each learner.

Negative Affect - Factors such as not knowing information and outside frustrating experiences at school left students with negative feelings about learning.

Affect Success - The increased motivation and positive statements made by students about their experiences inside and outside of the classroom, as well as positive parental feedback, reinforced the relevance of using music and movement in classroom instruction.

Test Success – Improved test scores assisted in showing the positive effects of using movement and music to teach mathematics.

FINDINGS

Introduction

This research study sought to explore the observed and reported experiences of students when bodily-kinesthetic and musical instruction strategies were utilized to instruct primary level students. The purpose of my study was to explore the kinesthetic and musical intelligences and possibly find another successful method of instructing mathematics. I had hoped through observations and analyses of student work that I would be able to provide my students with a learning experience that both excited them and taught them basic concepts of mathematics. I constantly reflected on my work and began to discover results as my bins were formulating in front of my eyes. Figure 25 (p. 96) shows my bins and the categories within each bin that helped formulate my findings.

Connecting Multiple Intelligences

My study set out to investigate the need for more movement and music in a general education classroom setting. Throughout my teaching career, I had always tried to incorporate these two skills into my classroom due to my dance background. I agreed with Gardner and believed that students were more likely to conceptualize material that was presented through various forms of multiple intelligences (Gardner, 1991). For this reason, I choose to focus on music and movement, since I believed there was a lack of instruction in these two intelligences in a regular education classroom.

When I first began my study, I wanted to instruct primarily in song and movements. I was able to do this, but on a limited basis. I realized that I was hindering my students by not giving them visual aids. I needed the help of posters. I realized they would be important when Jess asked, “Miss Christine, what does a 10 look like?” This simple statement illustrated to me how important it was to incorporate as many intelligences as possible into instructional practices.

When instructing in the bodily kinesthetic and musical intelligences, incorporating additional intelligences may aid in the continued growth of the students. Gardner suggests that students should be instructed in all intelligences to promote life-long learning (Gardner, 1993). I wanted to prove that using movements and songs in a classroom were a valuable way to instruct students. I believe my study did suggest that these two modes of teaching are valuable. Yet, incorporating other intelligences also proved to be helpful in obtaining success for my students.

When I utilized different multiple intelligences in my classroom, students were able to relate their learning to different activities they completed in school in a variety of subject areas. When multiple intelligences are used in a classroom, students are able to make a connection across curriculums because they are afforded the opportunity to learn in various forms of instruction and intelligences (Adams, 2000/2001). For example, Jordan noted similarities to our class to her music class because they “also made up songs in music class.” This relationship

allowed Jordan to make a connection from outside learning to her school learning. In addition, many students shared stories about mathematical skills they were learning in school and how they applied their songs to help them learn or solve problems. When teachers instruct to the varying needs and interests of children, the mathematical learning is enhanced because students have more opportunity to succeed in their strengths (Adams, 2000/2001).

I also noted in my field log that many students made positive statements about the posters, songs, movements, math skills, and different groupings that my students worked in. All of my students were able to improve their test scores and many students seemed to increase their motivation to learn. I believe this outcome is due to the use of the arts and multiple intelligences in my classroom. My assumption is supported by a study completed by Swann-Hudkins (2002), where data showed that instruction in the arts increased self esteem and motivation to perform at higher academic levels. This researcher also used different forms of multiple intelligences during her study.

Teachers must give students the opportunity to learn and demonstrate knowledge in all intelligences in order for students to function appropriately in society (Gardner, 1993). All students, from students with special needs to gifted students, benefit from the use of all intelligences in a classroom because they are given the opportunity to learn and demonstrate knowledge in a non-conventional school setting (Swann-Hudkins, 2002). All of my students, ranging in grade level

and ability level, increased their test scores, utilized their knowledge outside of the classroom, and had a positive outlook on learning in our classroom. For this reason, I believe that all intelligences, including music and movement, need to be part of instruction at least once a day.

When incorporating movement and music into a classroom, students are actively learning. The brain and body must work in conjunction with one another in order for students to reach their fullest potential (Pica, 2006). Without an active brain, students cannot reach their fullest potential and feel successful. Following are examples of how music and movement helped my students feel successful.

Jordan stated, “I sing the song so much. It just kind of pops up in my head and then I know the answer.”

Khloe insisted, “They [songs and movements] help me remember things and solve these more bigger problems.”

Mary said, “I use the movements and the songs [in school] because sometimes I can just move my legs under my desk and whisper.”

Calling all Levels

My field log was filled with different cognitive levels of activities that my students completed throughout the study. **The use of songs and movements provided an opportunity for students to reach various levels of Bloom’s Taxonomy during their learning experiences.** In the beginning of my study,

many students were solving basic Knowledge level questions. However, by the end of my study students were creating their own songs and movements.

Vygotsky believed that students could reach various learning levels if students collaborated and conversed during the learning process (Slavin, 1994).

Collaboration and conversations were part of my study every day. Due to this fact, I believe my students were able to reach various levels of academic learning.

I choose to use Bloom's Taxonomy because it is a culmination of terms that describe cognitive objectives ranging from simple to complex matters of the mind (Slavin, 1994). In recent years, Bloom's Taxonomy has been revised to better meet the needs of educators (Anderson & Krathwohl, 2001). The first objective in the Cognitive Process Dimension found in Anderson and Krathwohl's Taxonomy is *Remember*. In this objective, students are expected to recall information from long-term memory, such as memorizing math facts.

Understand is the next objective, which requires students to interpret information and put the material into their own words. After that, *Apply*, requires students to implement their knowledge to solve problems. *Analyze* entails students looking at two or more sources and detecting how the parts are similar or different. Next, *Evaluate*, has students making judgments based on material in which they must defend. The last objective, *Create*, gives students the opportunity to make an original piece of work based on principals they have learned (2002).

Following are a few examples of how the students met the various Cognitive Process Dimension objectives from the revised Bloom's Taxonomy.

Remember: Many of my students used the songs to help with remembering facts. For example, Khloe stated, "I also had to use the money song on a test because I forgot how much a quarter was worth." This statement shows how the songs helped students remember basic facts that are needed to solve problems.

Understand: One way that students showed me they understood concepts was when each child described attributes of coins in their own words. Most importantly, students showed that they understood the material when they helped other students. This can be seen when Peyton said, "If you draw a dotted line from that little hand, you can start at the 12 and go around until that line. Then you will know what hour it is." Her explanation helped another student succeed in telling time.

Apply: Students worked in groups to make 5 cents, 10 cents, and 20 cents, as many ways as possible (see Figures 11-13, pgs. 69-70). These students took their knowledge of coin values and skip counting to combine coins to reach a specified amount. Another example of my students applying information can be seen in Figures 8 and 9. Hope and Peyton took their knowledge of measuring to find 6 inch objects around the room. In addition to students applying information in the classroom, they also applied information they had learned in school. Many

students told me how they used the songs and movements they had learned to solve problems on tests or papers.

Analyze: During the study, students analyzed how centimeters and inches were different. An example of these comparisons can be seen when Khloe stated, “These small things are the size of my pinky!” Lilly responded, “The inches are bigger, like a side-ways thumb.” Students also analyzed the differences between coins and counting songs.

Evaluate: An example of a student evaluating material comes from Kaila as she was defending her choice of preferring the 10’s song to the 5’s song. She stated, “I like the 20’s song better than the 5’s song. The 10’s song goes higher. It goes all the way to 100. The 5’s song only goes to 70. That’s why the 10’s song is better.” In a similar example, Peyton stated, “I like patterns with noise better cause they can be more fun. You can make up a lot more noises than you can shapes. You know there are animal noises and things like that, but only regular shapes.” These students are evaluating why they prefer a certain concept over another.

Create: The students were able to make up their own songs and movements as a group (see Figures 18-23, pgs. 85-86). The students began as a whole group and proceeded to create personalized songs in smaller groups. Some students also decided to make up their own individual songs to help them learn.

These student creations show that students have taken the instructional methods used, songs and movements, to help aid in instructing others and themselves.

Although there were many more examples of ways in which the students had reached the various levels of Anderson and Krathwohl's Taxonomy, these brief examples above capture the essence of how students reached various cognitive levels. By using music and movement, students were able to perform the most basic tasks, as well as create their own masterpiece. These two intelligences provided an enjoyable method for students to challenge themselves and feel successful. Music and movement also gave students the opportunity to reach the Factual Knowledge (isolated, specific pieces of knowledge), Conceptual Knowledge (larger theories and relationships of theories), and Procedural Knowledge (knowledge of how to do a problem) objectives in the Knowledge Dimension of Anderson and Krathwohl's Taxonomy (Anderson & Krathwohl, 2001). The Knowledge Dimension emphasizes what students know and how students think. With more instruction focusing on music and movement, I believe students would also be able to reach the most abstract Knowledge Dimension, Metacognitive Knowledge.

Changing Modes

When I began my study, I had it set in my head what needed to be accomplished and when it was to be done. I took curriculum that had been taught to students for many years and modified the mode of instruction to hopefully

increase the amount of retention and appropriate usage of the material. I was set and had my timeline all mapped out. Then I began my study and the well-planned timeline flew out the door. Monitoring progress through dialogue and observations was imperative to design curriculum that provided a beneficial learning experience for all learners. By observing my students, I was able to make educated decisions and revamp my curriculum to meet the needs of my students.

If I ignored my insight while observing students and did not organize lessons to help promote a positive learning experience, I would have disregarded my previous knowledge and not been the best teacher that I could have been. This would have been wasteful of my knowledge and would have hindered the education of the students. “There is no point in his being more mature if, instead of using his greater insight to help organize the conditions of the experiences of the immature, he throws away his insight” (Dewey, 1938/1997, p. 38). Instead, teachers should use their knowledge and follow what they believe will be most beneficial for their students.

In addition to using observations to help guide instruction, I also monitored dialogue students had with one another and with me. I again used my previous knowledge to help analyze the needs of my students through their dialogue. “Without dialogue there is no communication, and without communication there can be no true education” (Freire, 1984, p. 81). Freire is

talking about true dialogue, where individuals are discussing topics and all parties are participating. I agree with Freire and believe if only the teacher is talking, true learning will not take place.

Gardner and Vygotsky believe that learning is a social process and social interaction should occur between peers, as well as students and an instructor to foster intellectual growth (Belavsky, 2006). Communication, and therefore education, can only occur when the teacher and students, as well as students and students, are engaged in meaningful conversations. Out of these meaningful conversations comes insight into each child's world. This insight allows teachers to change their methods of instruction and/or curriculum to meet the needs of their individual students within a class.

All students possess capabilities in every intelligence (Gardner, 1993). It is the teachers responsibility to teach students in the varying intelligences to help students find their strengths and weaknesses, which aids students in their development. I was very naive to believe that I could instruct students only in the musical and bodily-kinesthetic intelligence. By paying attention to my students' needs, I was able to incorporate other intelligences into my classroom to provide a beneficial learning experience for my students. All intelligences are equally significant and need to be incorporated into instruction (Gardner, 1993). The focus needs to expand from the linguistic and logical-mathematical intelligences in a general education classroom.

Scaffolding

“The teacher is no longer merely the-one-who-teaches, but one who is himself taught in dialogue with the students, who in turn while being taught also teach” (Freire, 1984, p. 67). In this quote, Freire declared that through dialogue with students, a teacher no longer just disperses information to students. I learned that as a teacher, I could learn from students through discourse. When I listened to students, I was better able to scaffold material for students through instructional methods or grouping. Scaffolding through different instructional groupings allowed for a variety of instructional methods to meet the needs of each learner.

The teacher must survey the capabilities and needs of their students and arrange lessons that instruct students to meet their individual needs (Dewey, 1938/1997). During my study, it was important to learn each student’s strength and weakness in order to provide an education that was beneficial to that student. The teacher must give students the support needed to succeed and the opportunity to challenge students’ knowledge, through grouping and instruction, to meet their fullest potential.

My class had a variety of learning capabilities, including students ranging over three grade levels. Snowman and Biehler (2003) suggested scaffolding instructional strategies by providing instructional support through guiding statements and support from me and students’ peers. In my field log, I noted that

scaffolding techniques originally provided a great deal of support, but the support gradually disappeared until my students could perform tasks individually. Slavin (1994) would agree that support should be provided in large doses in the beginning, but wean off as students begin to master their own learning so students become more confident in their abilities.

During my study, I allowed students to work in a small group consisting of 3 to 4 students, pairs, or individually. For some activities, the grouping method was decided by me. However, for the review sheets completed each week, students could choose to work in a small group, with a partner, or individually. At the start of the study, many students decided to work in a group. These groups were mostly heterogeneous. I was pleasantly surprised that the students would form groups consisting of a variety of academic abilities.

Due to group practice questions, students gave helpful hints, such as, “Where does the song tell you to start on your ruler?” Students did not give answers, but helped other students find a correct method to solving a problem. Throughout my study, we used techniques as a class to help find answers, not give answers. This modeling helped students learn ways to help, or scaffold, learning for their peers. I told students that giving someone else an answer did not facilitate learning; instead it hindered learning. My class wanted to help each other succeed. They knew that learning in our classroom was not a competition. Instead, it was a team effort. Constructivist teaching allowed students to share

control of the classroom and afforded them the opportunity to explore new concepts by themselves or with peers (Brown, 2008).

By the end of my study, most students chose to work individually on their R&R worksheets and class activities. The students seemed to become more comfortable in their capabilities and tried more activities on their own. By the end of the study, students who initially needed a great deal of support helped others. For example, at the start, Jess needed support from me and fellow students for the majority of the learning activities. However, by the end of the study, Jess helped peers by singing them a song or pointing to the first black line on a ruler to help a friend measure an object correctly. I believe that scaffolding instruction through guided questions and different cooperative groupings allowed my students to reach higher levels of academic success and increased their affect to learn.

Negative Affect

Throughout the study, some of my students shared with me negative feelings they had about their learning experience at school. Kaila said, “We aren’t really allowed to [sing], but I just do it in my head secretly.” Kaila found the need to hide a method of learning that helped her succeed. In this instance, the teacher was not meeting the needs of Kaila, making her feel as if she had to hide her strengths. When instruction does not meet the needs of individual learners, they often become frustrated and motivation to learn frequently decreases (Smith & Wilhelm, 2006). Students tend to give up.

Mary was also upset when she stated, "My teacher is really mean. She won't let me sing." Many other statements were made by my students throughout the study illustrating their frustrations about not being able to use their new methods of instruction in school. They were trying to apply their new knowledge and were being shut down by a person who is supposed to encourage learning. When teachers instruct students, they should not just focus on one intelligence, but rather incorporate numerous intelligences to give all students the opportunity to feel successful (Beliavsky, 2006). By allowing students to perform in their areas of strength, an educator encourages a positive outlook on learning, rather than students feeling disappointment or defeated (Jordan, 1996).

Not being able to sing or dance in school was not the only mode of frustration I saw during my study. In the first few weeks of my study, many students did not feel they would be able to succeed. I often heard, "I need help" or "I can't do this." Joan once stated, "I don't like that song because it's hard." All of the students that made these statements were in kindergarten or pre-school. I expected these students to feel insecure in their learning, and I continued to tell them that they were very smart and would be able to learn our new facts. With the help of scaffolding and a positive classroom environment, all children did improve their academic performance level and seemed to try their best to succeed.

These examples show that factors such as not knowing information and outside frustrating experiences at school left students with negative feelings

about learning. As I have mentioned, these negative feelings in my classroom dissipated by the end of the study. Instead of hearing, “I can’t do this,” I heard children singing songs or asking valuable questions. I believe this was due to the fact that my students could choose which method of instruction they would like to use to solve problems.

“Development in children never follows school learning the way a shadow follows the object that casts it” (Vygotsky, 1978, p. 91). Formulated curriculums that drive learning in schools often do not take into consideration individual students and their individual needs. I believe, through my research, that teachers must deviate from prescribed lessons to meet the needs of their students, which includes using different modes of instruction. If students are showing interest in learning, no matter what mode of instruction it entails, teachers should follow the lead of the student in order to provide each student with the best education possible and reduce frustration.

Positive Affect

“I did it all by myself,” exclaimed Laney after completing an R&R review sheet individually. This simple example of pride illustrated how my students felt successful by the end of the study. The increased motivation and positive statements made by students about their experiences inside and outside of the classroom, as well as positive parental feedback, reinforced the relevance of using music and movement in classroom instruction. The students seized

the opportunity to move, sing, and break away from restraints that traditional schooling can place upon children.

All of my students seemed to enjoy singing and/or dancing their math facts. Some students preferred one method of instruction over the other, which can be seen in Figure 15 (p.76). Many students commented in interviews about liking the options to sing, especially in different voices, and act “silly”. I felt that using songs and movements in lessons helped me reach more students and made learning more entertaining and engaging. Eisner (2000/2001) would agree that pure verbal instruction would not have allowed my students to be as engaged and excited about learning due to the lack on engagement many verbal lessons entail.

In addition to songs and movements making learning more engaging, many students believed that exercising helped them learn more and stay healthy. Exercise does increase the amount of oxygen supplied to the brain, which in turn increases the amount of endorphins that a person’s body releases (Jensen, 1997). This made my students happier. Dewey (1938/1997) concurred that the use of one’s body, beside the brain, was imperative to learning and should be a freedom that all students could enjoy.

Although most of my students were excited about singing and moving, one student did prefer learning math skills. Lilly often asked about completing math worksheets and doing math activities. She did not consider singing and moving to math facts learning. She told me, “Math is my favoritist part of class!”

Lilly's motivation was completing the R&R worksheets individually to demonstrate the math skills she had learned. Due to students learning differently, Gardner (1993) suggests that we should use all forms of intelligences in the classroom to allow all students to be successful and feel successful. Lilly's success and motivation lied in the hands of the logical-mathematical intelligence.

Motivation is needed to produce life-long learners; and typically, lecture is the least effective mode of motivation (Klein, et al., 1998). Not one student in my class ever asked me to stand in front of them and talk about math. Instead, as many students walked through the door, they asked, "Are we going to do our songs today?" Their motivation and self-esteem seemed to improve when I gave them the freedom to use various intelligences to solve problems and learn new information. Swann-Hudkins (2002) would agree that the use of multiple intelligences allots students the opportunity to develop higher self-confidence and perseverance for learning due to the choices that students are given.

Many parents also expressed excitement about the study. Jess's mom approached me 3 weeks into the study and told me that she was so impressed that a pre-school student could count by 10's. She thanked me for doing something different to teach her child. This interaction gave me motivation to keep going. I noticed more parents asking questions and getting involved. I asked parents to complete a survey so I would get a better understanding of their viewpoint on their child's academic abilities and learning styles (Table 3).

Table 3

Parent Responses to Survey Questions

Survey Question	1 Do Not Agree	2 Somewhat Agree	3 Mostly Agree	4 Strongly Agree
1. My child enjoys learning math.	0	0	3	5
2. My child learns information by singing.	0	0	2	6
3. My child learns information by using movements.	0	2	2	4
4. I believe songs and movements help my child learn.	0	0	2	6
5. My child is a high achiever in math.	0	1	5	1

Note: One parent chose not to answer the fifth question because her daughter currently does not learn in-depth math skills in pre-school.

Parents had an overall positive experience with the study. Almost all parents that responded were overwhelmingly impressed and delighted with the new methods of instruction their child was receiving in math (see Figure 24, p. 91). Jordan's mother stated, "My child was singing a "Math Song" at home, and I asked where she learned that. She enthusiastically responded, "At dance class!" The positive parental feedback helped validate the need for a change in modes of instruction. If parents can become excited about learning, perhaps they will be more willing to assist in learning activities at home.

Test Success

I decided to analyze the pre-test and post-test to measure the difference in test scores. As I analyzed the results, I found that all students improved in telling time, measuring, and continuing patterns. All but two students improved in skip counting and recognizing coins. These two students answered the same amount of questions correct in these areas.

Overall improved test scores assisted in showing the positive effects of using movement and music to teach mathematics. Data from the pre-test and post-test support the academic gains that I had noticed on the weekly R&R worksheets. These two modes of formative assessment helped to illustrate the academic growth I saw occurring within my classroom.

As seen in Figure 26, all students improved a minimum of 2 questions on the post-test, while some students improved up to 11 questions. Students increased an average of 6.7 questions from the pre-test to the post-test. All but 3 students also increased at least one proficiency level. The students that did not increase a proficiency level were in pre-school or kindergarten.

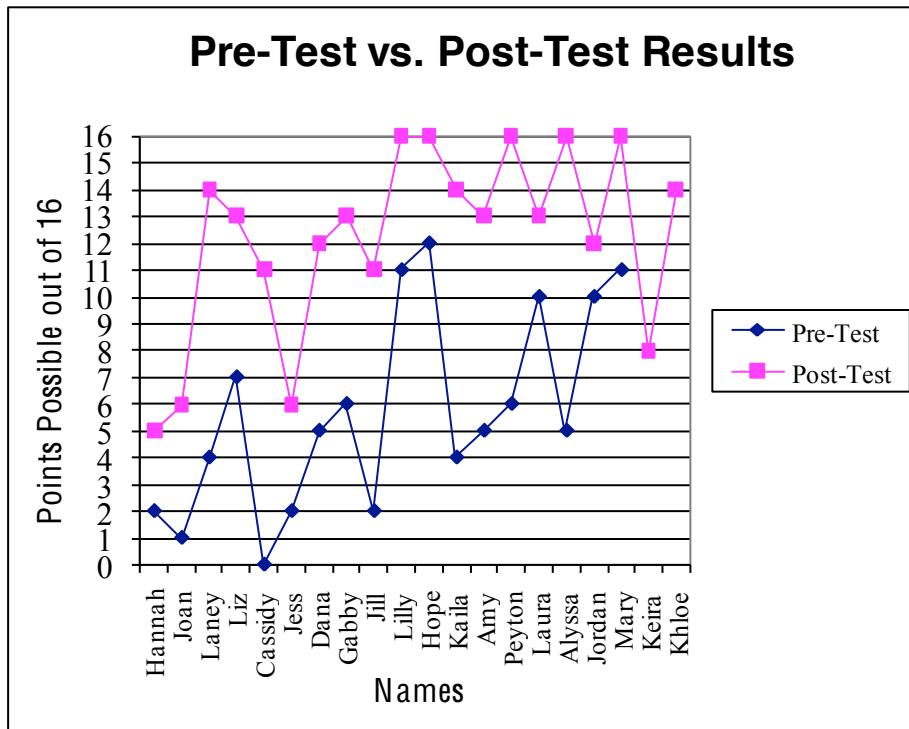


Figure 26. Pre-Test vs. Post-Test Results.

It is important to note that during the post-test, many students were whispering the songs to help solve problems and a few students were completing movements. In addition, no student said that they were unable to complete a problem, as I had heard frequently during the pre-test. During the post-test, every student was working individually and did not try to look at other tests. The students seemed to be more confident in their abilities and knew they had the freedom to whisper their songs quietly and do the movements to the songs if they desired.

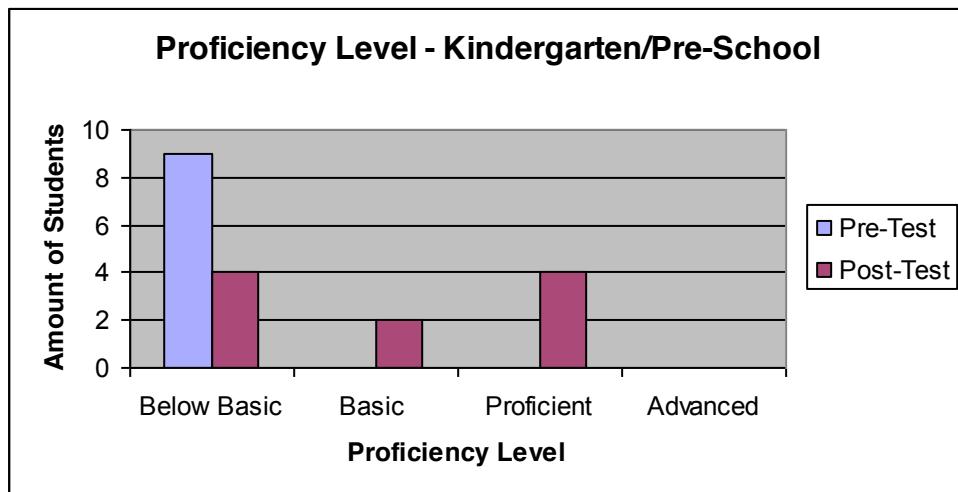


Figure 27. Proficiency levels of kindergarten/pre-School students.

As seen in Figure 27, my pre-school student and kindergarten students were all below basic (BB) on the pre-test, scoring below 59%. However, on the post-test, only 3 of these students remained on the BB proficiency level. Kiera also performed on the BB level on the post-test. It is important to note that she joined us with only four lessons left and did not get to participate in the entire study.

I am very pleased that 4 students were able to perform on the proficient proficiency level on the post-test, scoring between 70% and 89%. These kindergartners were meeting the educational goals of first grade curriculum at the end of December in their kindergarten year. Their increased test score is notable.

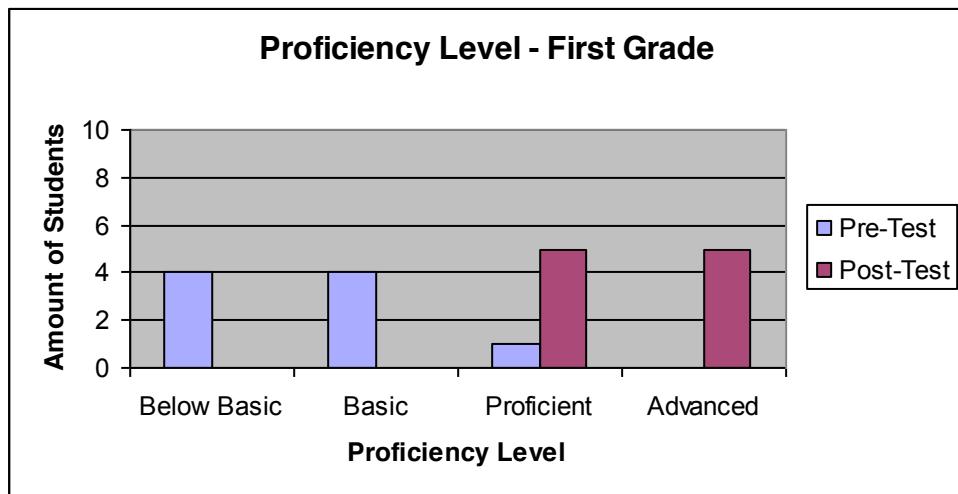


Figure 28. Proficiency levels of first grade students.

On the pre-test, only 1 student was proficient, while the remaining students were performing below state proficiency levels. Following the study, my first grade students were all proficient, scoring between 79% and 89%, or advanced, scoring 90% or higher, on the post-test. All of my first grade students met the state proficiency levels for the material they were instructed. This is a great accomplishment. Their academic growth was noteworthy.

Delimitations

My study was not able to specify whether academic growth occurred simply by the use of songs and movements. Due to not being in the traditional school setting with my students, I did not know the curriculum my students were learning in their regular school setting. I was only able to observe my students

within my classroom and observe the changes I had seen in them throughout the study.

In addition, my study consisted of only female participants. Due to this constraint, my study did not take into consideration the effect songs and movements would have on the instruction of male students. Male students may not be as open-minded to the suggestion of using songs and movements to learn.

My study consisted of a small sample group. With only 1 pre-school student, 9 kindergarten students, and 10 first grade students, my study did not have a large number of participants in each grade level. Also, all students that attended class signed up to participate in dance. Therefore, these students may have been more inclined to enjoy moving and singing compared to a regular classroom in a normal school setting.

Conclusion

Ladson-Billings said, “Regardless of whatever else schools do, students are supposed to learn something. That learning can be manifested in student competency in a variety of subject areas and skills” (Delpit & Dowdy, 2002, p. 111). In this statement, Ladson-Billings is referring to the academic commitment schools need to make to their students to help them succeed. Above all else, a school’s primary goal should be for students to learn. All means should be utilized to help students learn a variety of subjects and a variety of skills that

could be used in real life. This includes using movement and music in a general education classroom.

The songs and movements that my study utilized can be used with any curriculum to help students who are struggling or further students' capabilities in mathematics. The songs allow teachers to break away from molded curriculum to teach students. Although the songs and movements may not help every student in every subject, this study suggested that they are a valuable tool to combine with other forms of instruction.

NEXT STEPS

By completing the thesis process, I have enhanced the way I teach. Due to my change in teaching, my students are now given a stronger learning environment. I no longer think of myself as just a teacher, but rather a co-worker in a learning experience. I am the children's partner in their learning, in their discussions, and in their explorations. I have learned that my learning must never stop. I must continue to challenge myself to become the best teacher possible for my students. In order to continue on my path of inquiry, I have created additional questions that I would like to find answers to in order to provide the best education possible for my students.

What are the observed and reported experiences when songs and movements are used to instruct various academic subjects? Since I saw an increase in test scores and more positive attitudes in my class while instructing math, I would like to find if the benefits of using music and movement carry over into other subject areas. I am wondering if music and movement help instruct certain subjects more than others. In addition, I am curious if students would not like music and movement as much if it became a staple in their curriculum.

What are the observed and reported experiences when review activities are completed in different cooperative groupings? In referring to profound thinkers' assumptions from the past, Vygotsky (1978) states, "They never entertained the notion that what children can do with the assistance of others

might be in some sense more indicative of their mental development than what they can do alone" (p. 85). Vygotsky was referring to the notion that students may be further mentally developed than we give them credit for. My students reacted positively to different grouping strategies during my lessons. They also responded well to the choice of being able to choose the type of group they would work in. When delving into this question, I would like to compare student-choice groups as opposed to teacher-choice groups.

When musical and bodily-kinesthetic instructional strategies are used over a prolonged amount of time, do children retain more information? I am curious if students would retain more information from year to year if teachers used the same songs and movements to instruct students. If the students heard the same songs, perhaps they would be more likely to sing the songs and remember the information. Catchy tunes have always stayed with me, and I wonder if the songs will stay with my students for a long time as well.

Does student affect for learning and test scores continue to increase if the musical intelligence and bodily-kinesthetic intelligence are not used in conjunction with one another? Were the songs the leading force behind the academic and positive attitude improvement in my students, or was it the movements? Should they be instructed together? I am interested in finding out whether it is more beneficial to teaching these intelligences separately or together. I do not want students to feel that music and movements are intertwined to the

point that they cannot be separated. Yet, I do want students to realize that these two intelligences lend themselves to being combined and aiding in a learning experience.

If parents feel a connection to material their child is learning, will they assist more at home with academic learning? The positive responses from parents gave me hope that they would be interested in their child's learning. Some parents mentioned their child singing the math songs at home. Parents and siblings reported to me that they now knew the math songs because they heard them sung so often. Sometimes parents feel as if they are not capable of helping their child complete math problems because the method in which to solve the problems is unfamiliar to the parents. However, all parents can sing a math song to help their child. I am wondering what the effects would be on student achievement if parents believed they were capable of helping their child. Would the families sing the songs together? Would the parents be more excited to help their child if the parents themselves find the material more understandable?

As a teacher, I plan on continuing to reflect upon my work and my students. I want my students to understand that teachers have the desire to further their education and instill the love for learning in each of my students. I will also design more lessons that involve the musical and bodily-kinesthetic intelligences into my classroom. I believe incorporating these intelligences will help motivate my students and keep their body and brains active throughout the day.

As a teacher-researcher, I would like to continue on my journey of researching topics to better instruct my students. I also hope to inspire my fellow co-workers to find topics that excite them, and research those topics to help the school grow with knowledge of effective teaching methods. With the pressure of state testing taking the wind out of many teachers' sails, I believe finding new and stimulating topics to research may begin to put a little more excitement into the world of teaching. I would also like to share my songs and movements with fellow co-workers. I believe sharing my songs with co-workers would be an exciting way to start creating more songs and movements as a team.

I do not feel that this is the end of my journey. The road ahead of me is long with speed bumps. At the end of that road is the most rewarding gift of all; the ability to provide a productive and meaningful education to the youth of today. My journey and research will not end until my teaching career is complete. At that time, I hope to have inspired children's learning and given all of my students the best teacher they could have asked for.

REFERENCES

- Adams, T.L. (2000/2001, Winter). Helping children learn mathematics through multiple intelligences and standards for school mathematics. *Childhood Education, 77(2)*, 86-92.
- Anderson, L. W., & Krathwohl, D.R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of educational objectives*. New York: Addison Wesley Longman, Inc.
- Autry, S. (2002, November). *Attitude and achievement using two approaches for first-grade mathematics instruction*. Paper presented at the meeting of the Mid-South Education Research Association, Chattanooga, TN. (ERIC Document Reproduction Service No. ED474448)
- Bednar, J., Coughlin, J., Evans, E., & Sievers, T. (2002, May). *Improving student motivation and achievement in mathematics through teaching to the multiple intelligences*. Chicago: Illinois: Saint Xavier University & SkyLight Professional Development. (ERIC Document Reproduction Service No. ED466408)
- Beliavsky, N. (2006, January 1). Revisiting Vygotsky and Gardner: Realizing human potential. *Journal of Aesthetic Education, 40(2)*, 1. (ERIC Document Reproduction Service No. EJ750795)

- Bielsker, S., Napoli, L., Sandino, M., & Waishwell, L. (2001, December). *Effects of direct teaching using creative memorization strategies to improve math achievement*. Chicago: Illinois: Saint Xavier University & SkyLight Professional Development (ERIC Document Reproduction Service No. ED460855)
- Brown, J. (2008, May). Student-centered instruction: Involving students in their own education. *Music Educators Journal*, 94(5), 30-35. Retrieved July 3, 2008, from Academic Search Elite Database.
- Bryant-Jones, M., Shimmins, K., & Vega, J. (2003, May). *Increasing math achievement through use of music*. Chicago: Illinois: Saint Xavier University & SkyLight Professional Development. (ERIC Document Reproduction Service No. ED478919)
- Caldwell, T. (1993, January 1). A Dalcroze perspective on skills for learning. *Music Educators Journal*, 79(7), 27. (ERIC Document Reproduction Service No. EJ478505)
- Campabello, N., De Carlo, M. J., O'Neil, J., & Vacek, M. J. (2002, May). *Music enhances learning*. Chicago: Illinois: Saint Xavier University & SkyLight Professional Development. (ERIC Document Reproduction Service No. ED471580)

- Campbell, L., & Campbell, B. (1999). *Multiple intelligences and student achievement: Success stories from six schools*. Alexandria: Association for Supervision and Curriculum Development.
- DeFrancesco, C., & Casas, B. (2004, January 1). Elementary physical education and math skill development. *Strategies: A Journal for Physical and Sport Educators*, 18(Nov-Dec), 21. (ERIC Document Reproduction Service No. EJ740779)
- Delpit, L., & Dowdy, J. K. (Eds.) (2002). *The skin that we speak: Thoughts on language and culture in the classroom*. New York: The New Press.
- Dewey, J. (1997). *Experience and education*. New York: Touchstone. (Original work published 1938)
- Eisner, E. (2001, January). Music education six months after the turn of the century. *Arts Education Policy Review*, 102(3), 20. Retrieved June 10, 2008, from Academic Search Elite database.
- Elliot, I. (1998, March). Music, dance, drama and learning. (Cover story). *Teaching Pre K-8*, 28(6) 36. Retrieved June 10, 2008, from Academic Search Elite database.
- Ely, M., Anzul, M., Friedman, T., Garner, D., & Steinmetz, A. M. (1991). *Doing qualitative research: Circles within circles*. London: Falmer Press.
- Ely, M., Vinz, R., Anzul, M., & Downing, M. (1997). *On writing qualitative research: Living by words*. London: Falmer Press.

- Freire, P. (1984). *Pedagogy of the oppressed* (M. B. Ramos, Trans.). New York: Continuum. (Original work published 1970)
- Gardner, H. (1991). *The unschooled mind: How children think and how schools should teach*. New York: BasicBooks.
- Gardner, H. (1993). *Multiple intelligences: The theory in practice*. New York: BasicBooks.
- Goral, M.B. & Wiest, L.R. (2007, September). An arts-based approach to teaching fractions. *Teaching Children Mathematics*, 14(2), 74-80.
- Hampden-Thompson, G., Herring, W.L., Kienzl, G. (2008). *Attrition of public school mathematics and science teachers* (NCES 2008-077). National Center for Education Statistics. (ERIC Document Reproduction Service No. ED501286)
- Hendricks, C. (2006). *Improving schools through action research: A comprehension guide for educators*. Boston: Pearson Education, Inc.
- Holly, M. L., Arhar, J. M., & Kasten, W. C. (2005). *Action research for teachers: Traveling the yellow brick road*. (2nd ed.) Upper Saddle River, NJ: Prentice-Hall.
- Jehlen, A. (2008, May). Dance of the trapezoid. *NEA Today*, 26(8), 25-27. Retrieved June 10, 2008, from Academic Search Elite Database.
- Jensen, E. (1997). *Brain compatible strategies*. San Diego: The Brain Store, Inc.

- Jordan, S.E. (1996, November). Multiple intelligences: seven keys to opening closed minds. *National Association of Secondary School Principals, 80(583)*, 29-35.
- Klein, C., Pfleiderer, B., & Truckenmiller, M. (1998, May). *Increasing student motivation through cooperative learning, writing in mathematics, and multiple intelligences*. Chicago: Illinois: Saint Xavier University & SkyLight Training & Publishing. (ERIC Document Reproduction Service No. ED436351)
- Lopez, D., & Schroeder, L. (2008, May 1). Designing strategies that meet the variety of learning styles of students. Chicago: Illinois: Saint Xavier University, School of Education. (ERIC Document Reproduction Service No. ED500848)
- MacLean, M., & Mohr, M. (1999). *Teacher-Researchers at Work*. Berkeley, CA: The National Writing Project.
- Mead, V. (1996, January 1). More than mere movement: Dalcroze eurythmics. *Music Educators Journal, 82(4)*, 38. (ERIC Document Reproduction Service No. EJ525323)
- Munro, J. (1994, January). *Multiple intelligences and mathematics teaching*. Paper presented at the meeting of the Annual Conference of the Australian Remedial Mathematical Education Association, Melbourne. (Eric Document Reproduction Service No. ED372927)

- National Center for Education Statistics. (n.d.). *Trends in international mathematics and science study (TIMSS)*. Retrieved July 3, 2008, from http://nces.ed.gov/timss/results03_fourth95.asp.
- Paini, M.F. (2006). *Using music to enhance learning in a seventh grade English classroom* [Data file]. Retrieved March 17, 2008, from Moravian College Web site: <http://home.moravian.edu/public/educ/eddept/mEd/thesis.htm>
- Pennsylvania Department of Education. (2008, June 11). *The framework for pre-k through grade 4 program guidelines*. Retrieved July 2, 2008, from www.teaching.state.pa.us/teaching/lib/teaching/Pre-KthruGr4Guide2008_6_10.pdf.
- Pica, R. (2006, May 1). Learning in leaps and bounds. *Teaching Elementary Physical Education*, 17(3), 31. (ERIC Document Reproduction Service No. EJ749071)
- Ruhf, A. (2004). *Kinesthetic and hands on activities in second grade general music* [Data file]. Retrieved March 17, 2008, from Moravian College Web site: <http://home.moravian.edu/public/educ/eddept/mEd/thesis.htm>
- Sanchez, W.B., & Ice, N.F. (2004, December). Standards-based teaching and test preparation are not mutually exclusive. Retrieved July 3, 2008, from www.nctm.org/news/content.aspx?id=632.
- Sarasin, L.C. (1999). *Learning style perspectives: Impact in the classroom*. Madison: Atwood Publishing.

- Slavin, R. E. (1994). *Educational psychology: Theory and practice* (4th ed.). Needham Heights: Paramount Publishing.
- Smith, M.W. & Wilhelm, J.D. (2006). *Going with the flow: How to engage boys (and girls) in their literacy learning*. Portsmouth: Heinemann.
- Snowman, J. & Biehler, R. (2003). *Psychology applied to teaching* (10th ed.). Boston: Houghton Mifflin Company.
- Swann-Hudkins, B. (2002, May 1). *The effect of an elementary fine arts program on students' attitudes and development*. Salem International University. (ERIC Document Reproduction Service No. ED475611)
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Werner, L. (2001, October 1). *Arts for academic achievement. Changing student attitudes toward math: Using dance to teach math*. University of Minnesota, College of Education and Human Development. (ERIC Document Reproduction Service No. ED482650)

APPENDIXES

APPENDIX A



1742

MORAVIAN COLLEGE

A SMALL NATIONAL TREASURE

1200 Main Street
Bethlehem, Pennsylvania 18018-6650
TEL 610 861-1300
WEB www.moravian.edu

August 12, 2008

Christine Nicole Grady

Dear Christine Nicole Grady:

The Moravian College Human Subjects Internal Review Board has accepted your proposal: "The Forgotten Intelligences: Incorporating Movement and Music to Enhance Mathematics Instruction." Given the materials submitted, your proposal received an expedited review. A copy of your proposal will remain with the HSIRB Chair.

Please note that if you intend on venturing into other topics than the ones indicated in your proposal, you must inform the HSIRB about what those topics will be.

Should any other aspect of your research change or extend past one year of the date of this letter, you must file those changes or extensions with the HSIRB before implementation.

This letter has been sent to you through U.S. Mail and e-mail. Please do not hesitate to contact me by telephone (610-861-1415) or through e-mail (medwh02@moravian.edu) should you have any questions about the committee's requests.

Debra Wetcher-Hendricks
Chair, Human Subjects Internal Review Board
Moravian College
610-861-1415

APPENDIX B

CONSENT FORM

August 28, 2008

Dear Miss [REDACTED]

I am completing a Master of Education degree at Moravian College. My courses have enabled me to learn about the most effective teaching methods. One of the requirements of the program is that I complete a thesis study of my own teaching practices. This semester I am focusing my research on singing and movement when teaching mathematics. The title of my research is "The Forgotten Intelligences: Incorporating Movement and Music to Enhance Mathematics Instruction." The children at the studio will benefit from participating in the study because they will learn a different way to remember and utilize basic mathematical facts while also learning how to use their bodies productively.

As part of this study, students and parents will be asked to complete a short interest survey on their current feelings about math, singing and movement. These surveys will be given before and after the intervention time period. A pre and post test will also be given to students. The study will take place from September 9, 2008 – December 23, 2008.

The data will be collected and coded using pseudonyms. No personal identities will be used in the report. At the conclusion of the research, all data will be destroyed.

A student or parent may choose at any time not to participate in this study. However, the student must partake in the regular classroom activities. Data for non-participant students and parents will not be collected or analyzed. There will be no penalty for refusal to participate in the study.

My faculty sponsor is Dr. Charlotte Zales. She may be contacted by phone at (610) 861-1300 ex: 7958 or by email at mcrz01@moravian.edu.

I welcome any questions about the research at any time. Please direct any questions about the study to me, Christine Grady, at [REDACTED] or by email at [REDACTED].

Sincerely,

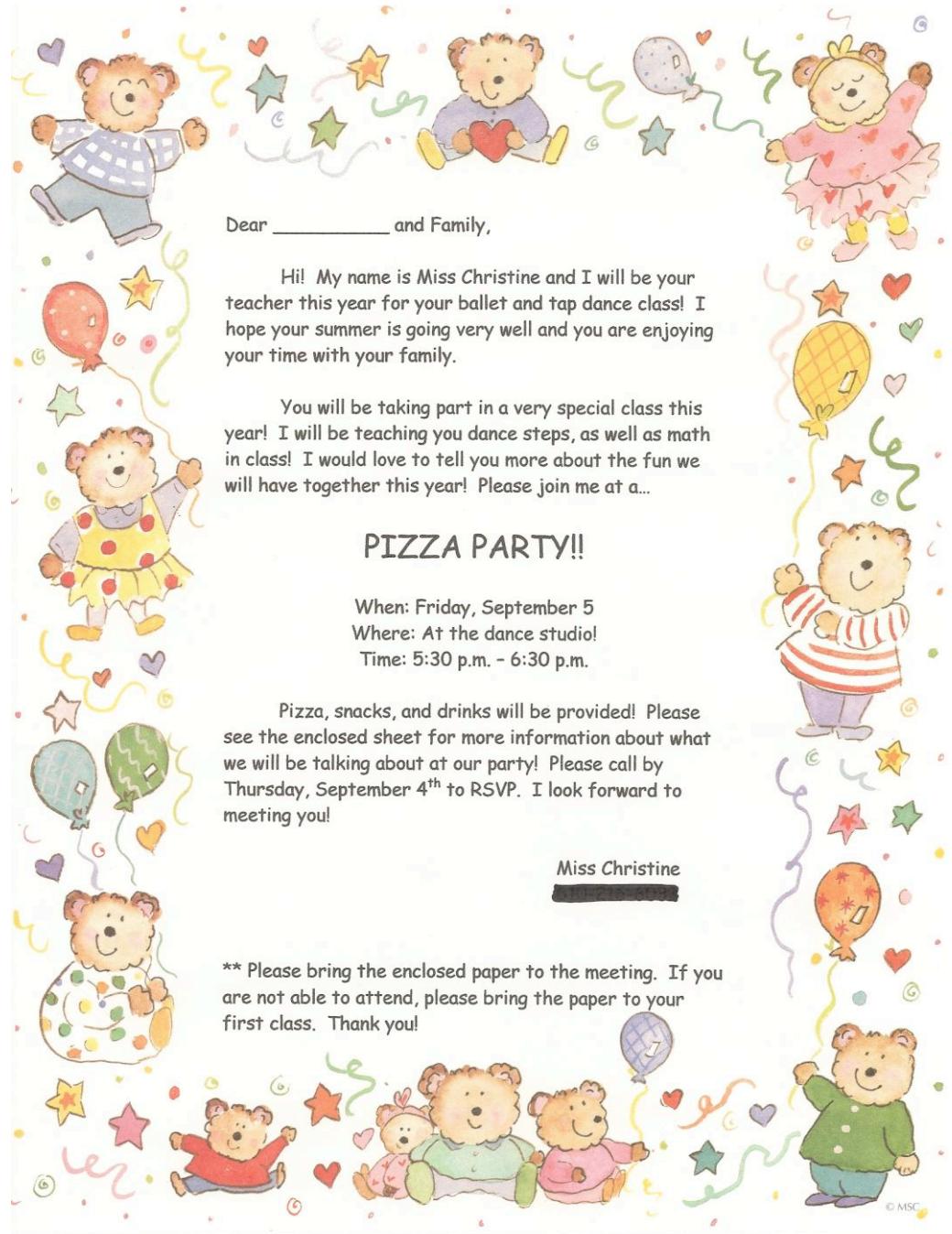

Christine Grady

I attest that I am the owner of [REDACTED] and the boss of the teacher conducting this research study, that I have read and understand this consent form, and that I have received a copy. Christine Grady has my permission to complete this research project at the [REDACTED].

Boss's Signature: _____

Date: _____

APPENDIX C



APPENDIX D

CONSENT FORM

August 28, 2008

Dear Parent(s) or Guardian(s),

I am completing a Master of Education degree at Moravian College. One of the requirements of the program is that I complete a thesis study of my own teaching practices. This semester I am focusing my research on singing and movement when teaching mathematics. The title of my research is "The Forgotten Intelligences: Incorporating Movement and Music to Enhance Mathematics Instruction." Your child will benefit from participating in this study, as she will learn a different way to remember and utilize basic mathematical facts.

As part of this study, students will be asked to complete a short interest survey on their current feelings about math, singing and movement. This survey will be given before and after the intervention time period. A pre and post test will also be given to students to measure mathematical knowledge. The study will occur from September 9, 2008 – December 23, 2008.

The data will be collected and coded using pseudonyms. No personal identities will be used in the report. At the conclusion of the research, all data will be destroyed.

A student may choose at any time not to participate in this study by telling me or Miss [REDACTED] directly or by phone at [REDACTED]. However, the student must partake in the regular classroom activities. Data for non-participant students will not be collected or analyzed. There will be no penalty for refusal to participate in the study.

My faculty sponsor at Moravian College is Dr. Charlotte Zales. She may be contacted by phone at (610) 861-1300 ex: 7958 or by email at mcrz01@moravian.edu.

I welcome any questions about the research at any time. Please direct any questions about the study to me, Christine Grady, at [REDACTED] or by email at [REDACTED].

Sincerely,

Christine Grady
Christine Grady

I attest that I am the student's legally authorized representative and that I have read and understand this consent form. I agree to allow my daughter to take part in this project. I understand that my daughter can choose not to participate at any time.

I do not give permission for my child's data to be included in this study.

Parent/Guardian Signature/Date: _____

Child's Signature: _____

Medications that my child is taking that may affect the overall outcome of the study:

APPENDIX E

CONSENT FORM

August 28, 2008

Dear Parent(s) or Guardian(s),

I am completing a Master of Education degree at Moravian College. My courses have enabled me to utilize the most effective teaching methods in a classroom. One of the requirements of the program is that I complete a thesis study of my own teaching practices. This semester I am focusing my research on singing and movement when teaching mathematics. The title of my research is "The Forgotten Intelligences: Incorporating Movement and Music to Enhance Mathematics Instruction."

As part of this study, parents will be asked to complete a short survey on their child's current feelings about math, singing and movement. These surveys will be given before and after the intervention time period. The study will take place from September 9, 2008 – December 23, 2008.

The data will be collected and coded using numbers. No personal identities will be used in the report. Graphs will be compiled using the data collected. At the conclusion of the research, all data will be destroyed.

As a parent, you may choose at any time not to participate in this study by telling me or Miss [REDACTED] directly or by phone at [REDACTED]. Data for non-participant parents will not be collected or analyzed. There will be no penalty for refusal to participate in the study.

My faculty sponsor at Moravian College is Dr. Charlotte Zales. She may be contacted by phone at (610) 861-1300 ex: 7958 or by email at mcrz01@moravian.edu.

I welcome any questions about the research at any time. Please direct any questions about the study to me, Christine Grady, at [REDACTED] or by email at [REDACTED]

Sincerely,

Christine Grady
Christine Grady

I attest that I am a student's legally authorized representative and that I have read and understand this consent form. I agree to allow my survey results to be utilized in this study. I understand that I can choose not to participate at any time.

I do not wish to participate in this study.

Parent/Guardian Signature/Date: _____

Child's Name: _____

APPENDIX F

Pre-test

Number: _____

1. Write in the missing numbers.

a.) 4, 6, 8, _____

b.) 6, 9, 12, _____

c.) 30, 40, 50, _____

d.) 20, 25, 30, _____

2. How much is the coin worth?



_____¢



_____¢



_____¢



_____¢

3. How much money is here?



_____¢



_____¢

4. Measure the line in inches.

_____ in.

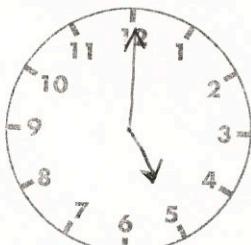
_____ in.

5. Measure the line in centimeters.

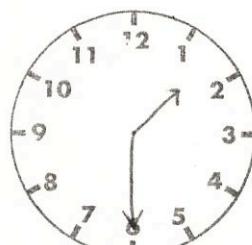
_____ cm.

Pre-test

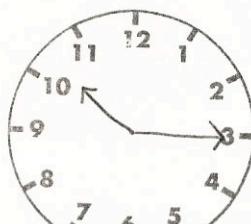
6. What time is it?



_____ o'clock

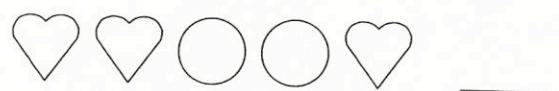


half-past _____ o'clock



Quarter after _____ o'clock.

7. Complete the pattern.



APPENDIX G

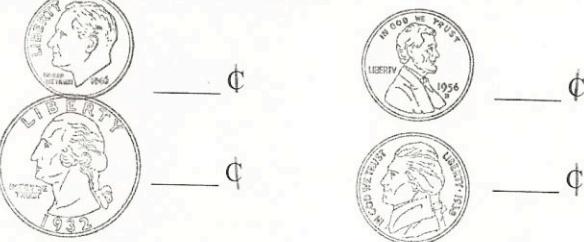
Post Test

Number: _____

1. Write in the missing numbers.

- a.) 6, 8, 10, _____ b.) 15, 20, 25, _____
 c.) 50, 60, 70, _____ d.) 3, 6, 9, _____

2. How much is the coin worth?



3. How much money is here?



4. Measure the line in inches.

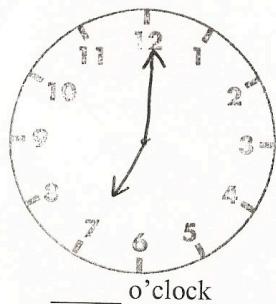
_____ in.

5. Measure the line in centimeters.

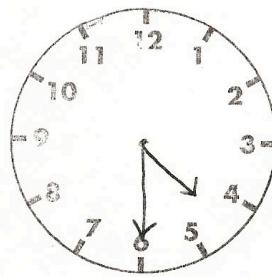
_____ cm.

Post Test

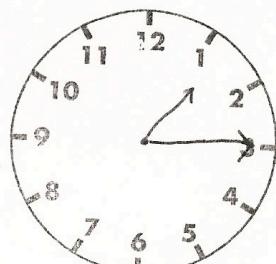
6. What time is it?



____ o'clock

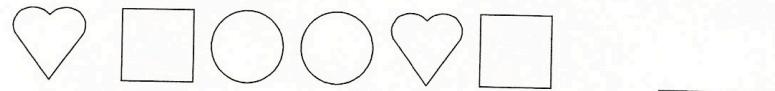
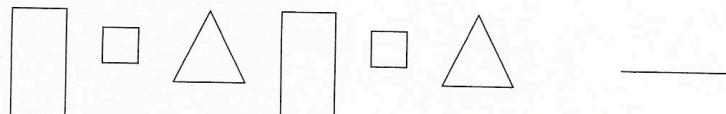


half-past ____ o'clock



Quarter after ____ o'clock.

7. Complete the pattern.



APPENDIX H

Song and Movement Guide

The following is an outline of the study, including the songs and movements used to instruct students. This weekly schedule also includes activities completed with each song and corresponding R&R worksheets.

Week 1

Class: We discussed rules, talked about what makes a happy classroom, learned more about one another, and reviewed the material that would be instructed during the study.

Week 2

Class: We reviewed rules and discussed what math meant to each student. Students took the pre-test.

Activity: Students took the pre-test (see Appendix F) and then we reviewed it as a class when everyone was finished.

Week 3

Class: Students learned the *Counting by 10's* song (see Figure 1). The movements included bending all the way to the floor and standing up while holding their hands out to show 10. On “100”, the students jumped in the air.

Activities: Count total amount of fingers in a small group, fill in missing number, R&R worksheet: Counting by 10's (see Appendix J).

Week 4

Class: Students reviewed the previously learned song and learned the *Counting by 5's* song (see Figure 2). Movements included tapping one foot as they sang due to having 5 toes on 1 foot.

Activities: The class compared the *Counting by 10's* and *Counting by 5's* song, completed a connect-the-dot activity as a class, and worked on the R&R worksheet: Counting by 10's and 5's (see Appendix J).

Week 5

Class: Students reviewed the previously learned songs and learned about patterns. The class defined patterns.

Activities: The class completed patterns on the board, made up their own patterns for their peers to complete with sounds and movements, and worked on the R&R worksheet: Counting by 10's, 5's, and Patterns (see Appendix J). Following the worksheet, the students found patterns in the room.

Week 6 and 7

Class: Students reviewed the previously learned songs and learned the *Money* song (see Figure 10). Movements included holding up one finger for a penny while bending legs, holding up a hand for a nickel while rising up on their toes, holding both hands up for the dime while jumping straight in the air, and jumping with legs and arms in the front and landing with an additional hand out to show a quarter.

Activities: The class shared patterns they had found outside of the studio, completed patterns on the board, described and compared coins, discussed the importance of money, completed fill-in-the-blank questions about counting by 5's and 10's, and worked on the R&R worksheets: Counting by 10's, 5's, Patterns, Money and Counting by 10's, 5's, Patterns, Money Review (see Appendix J).

Week 8 and 9

Class: Students reviewed the previously learned songs and learned the *Time* song (see Figure 14). Movements included drawing an imaginary dotted line and holding up one hand in the air and moving it around the clock as we sung to quarter-after, half-past, quarter-to, and o'clock.

Activities: The class shared patterns they had found outside of the studio, drew dotted lines from the hour hands on paper clocks to find the hour, learned how to start at the 12 and go around the clock to tell which hour it was, held up the coins they were singing about, made 10 cents as many ways as possible as a group, completed fill-in-the-blank questions about counting by 5's and 10's, and worked on the R&R worksheets: Counting by 10's, 5's, Patterns, Time and Money Review(1) and Counting by 10's, 5's, Patterns, Time, and Money Review(2) (see Appendix J).

Week 10 and 11

Class: Students reviewed the previously learned songs and learned the *Measuring* song (see Figure 7). Movements included taking small steps for a centimeter and big steps for an inch.

Activities: The class discussed what a ruler was and what they noticed on the ruler, measured objects in inches and centimeters as a class and in small groups, compared inches to centimeters, went on a measurement hunt, ran to different times around the room (quarter-after, half-past, quarter-to, o'clock) to help with the understanding of the motion of clocks, made 30 cents as many ways as possible as a group, counted by 5's to see how many toes there were in a group, and worked on the R&R worksheets: Counting by 10's, 5's, Patterns, Time, Money, Measuring (1) and Counting by 10's, 5's, Patterns, Time, Money, Measuring (2) (see Appendix J).

Week 12 and 13

Class: Students reviewed the previously learned songs and learned the *Counting by 2's* song (see Figure 3). Movements included jumping in the air every time they counted by 2's. Some students whispered the odd numbers as they landed in the beginning of the study.

Activities: The class discussed what they noticed about counting by 2's, touched on even and odd numbers, filled in missing numbers when counting by 2's, discussed patterns found in counting songs, compared inches to centimeters when

measuring objects, went on a measurement hunt, put times in order by organizing four clocks in a small group, and worked on the R&R worksheets: Counting by 10's, 5's, 2's, Time, Money, Measuring and Counting by 10's, 5's, 2's, Time, Pattern, Money, Measuring (see Appendix J).

Week 14

Class: Students reviewed the previously learned songs.

Activities: Students took the post-test (see Appendix G) and then we reviewed the test as a class when everyone was finished.

Week 15

Class: Students reviewed the previously learned songs.

Activities: Students worked in small groups to create their own songs (see Figures 18-23) and movements. Students shared their songs with the class.

APPENDIX I

Interview Questions

1. Tell me what you think about using songs and movements in our lessons.
2. Some people make up their own songs and movements to help them learn.

What do you think about that?

- Interviews were continued based off of the student's response to each of the questions.

APPENDIX J

Name: _____

R & R Math

Counting by 10's

1. Write the next number. 0, 10, 20, _____	2. Connect the dots.  A grid of numbered dots for connecting the dots activity. The numbers are arranged as follows: Row 1: 90, 100, 10 Row 2: 80, 0, 30 Row 3: 70, 50, 60
3. Circle the next number. 40, 50, _____	4. Draw a picture of 20 objects in groups of 10. Ex: + 60 100 20

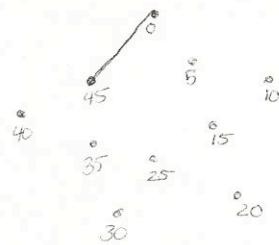
Name: _____

R & R Math
Counting by 10's and 5's

1. Write the next number.

0, 5, 10, _____

2. Connect the dots.



3. Circle the next number.

10, 20, _____

4. Write the missing number.

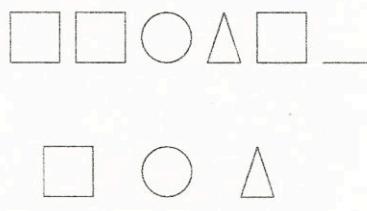
30 5 60

60, _____, 80

Name: _____

R & R Math

Counting by 10's, 5's and patterns

1. Write the next number. 15, 20, 25, _____	2. Write the next number. 40, 50, _____
3. Circle the next shape.  	4. Write the next letters in the pattern. D S C C D S _____

Name: _____

R & R Math
Counting by 10's, 5's, Patterns, Money

<p>1. Write the missing number.</p> <p>0, 10, _____, 30</p> <p>25, 30, _____, 40</p>	<p>2. What comes next?</p> <p>XX O O X X _____</p>
<p>3. How much are the coins worth?</p> <p> _____ ¢</p> <p> _____ ¢</p>	<p>4. Write or draw two places you use money.</p>

** BONUS **

Make your own pattern on the back.

Name: _____

R & R Math

Counting by 10's, 5's, Patterns, Money Review

1. Write the missing number. 20, 30, ___, 50	2. What comes next? ☺ ♡ □ ☺ ♡ ___
20, 25, ___, 35	
3. How much is each coin worth?  ____ c  ____ c	4. How much are the coins worth together?  ____ c

** BONUS **

What coin is the smallest in size?

Name: _____

R & R Math

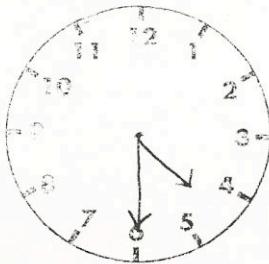
Counting by 10's, 5's, Time, Money Review

1. Write the missing number.

40, 50, ____, 70

35, 40, ____, 50

2. What time is it?



half-past ____ o'clock

3. How much is each coin worth?



_____¢



_____¢

4. How much are the coins worth together?



_____¢

** BONUS **

What coin is the biggest in size?

Name: _____

R & R Math

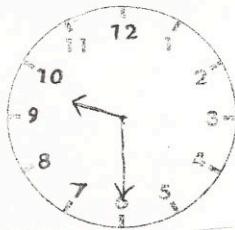
Counting by 10's, 5's, Time, Money Review

1. Write the missing number.

15, 20, _____

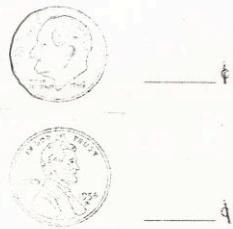
80, 90, _____

2. What time is it?

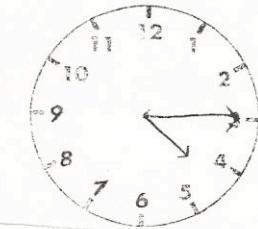


Half-past _____ o'clock

3. How much is each coin worth?



4. What time is it?



Quarter-after _____ o'clock

** BONUS **

How much are 3 dimes worth all together?

Name: _____

R & R Math

Counting by 10's, 5's, Time, Money, Measuring

1. Write the missing number.

30, 35, _____

50, 60, _____

2. Measure each line.

★ _____

_____ in.

★ _____

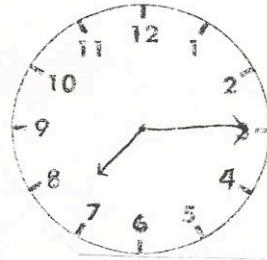
_____ cm

3. How much are the coins worth together?



_____ c

4. What time is it?



Quarter-after _____ o'clock

** BONUS **

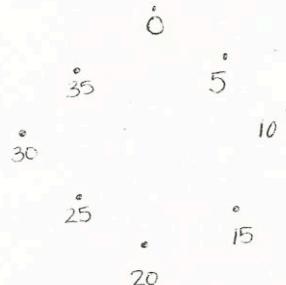
Make your own pattern on the back. Have a friend solve the pattern.

Name: _____

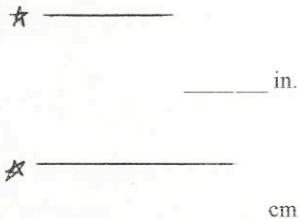
R & R Math

Counting by 10's, 5's, Time, Money, Measuring

1. Connect the dots. Count by 5's.

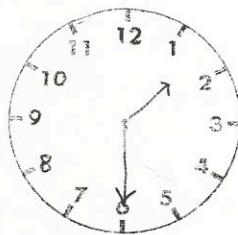


2. Measure each line.



3. Make 10 cents as many ways as you can. Use P, N, D, or Q when drawing the coins.

4. What time is it?



Half-past _____ o'clock

** BONUS **

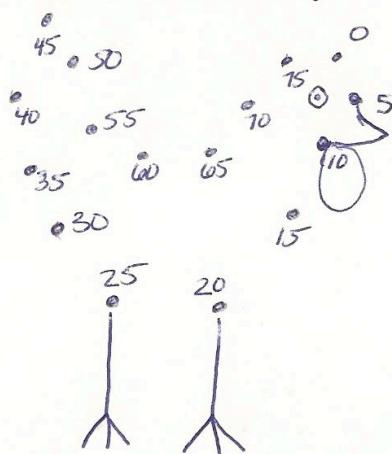
Find two objects in the room that are 6 inches. Draw a picture or write the name of each object you find on the back of this paper.

Name: _____

R & R Math

Counting by 10's, 5's, 2's, Time, Money, Measuring

1. Connect the dots. Count by 5's.



2. Find 2 objects that are 3 inches long. Draw them below.

3. Count by 2's. Write the missing number.

2, 4, 6, _____

4. What time is it?

10, 12, 14, _____

_____ o'clock

**** BONUS ****

Make 20 cents as many ways as you can. Use D, N, or P when drawing the coins.

Name: _____

Math R & R

Counting by 10's, 5's, 2's, Time, Pattern, Money, Measuring

1. Connect the dots. Count by 2's.



2 4 6 8 10 12 14 16 18 20 22 24 26 28

6 8 10 12 14 16 18 20 22 24

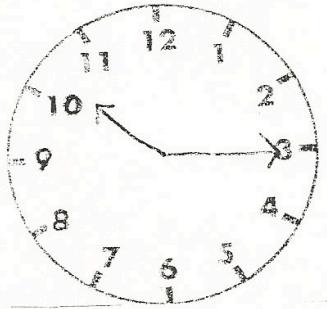
10 12 14 16 18 20

14 16 18

2. Find 2 objects that are 10 centimeters long. Draw them below.

3. Make 25 cents as many ways as you can. Use Q, D, N, P to draw the coins.

What time is it?



Quarter-after _____ o'clock

** Bonus **

Make a pattern using 3 different shapes. Have a friend finish your pattern.

APPENDIX K

Parent Survey

Please take the time to complete and return the following survey. For the top portion, circle the number you feel best represents your child based on the scale below.

1 Do Not Agree	2 Somewhat Agree	3 Mostly Agree	4 Strongly Agree
-------------------	---------------------	-------------------	---------------------

- | | |
|---|------------------|
| 1. My child enjoys learning math. | 1 2 3 4 |
| 2. My child learns information by singing. | 1 2 3 4 |
| 3. My child learns information by using movements. | 1 2 3 4 |
| 4. I believe songs and movements help my child learn. | 1 2 3 4 |
| 5. My child is a high achiever in math. | 1 2 3 4 |

Please complete the bottom portion with as much detail as possible.

1. Please tell me what you think about using music and dance to teach your child mathematics.

2. Please tell me any behavioral or academic changes you have seen in your child since the beginning of the study.
