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Math Via Movement: Using Emotional Intelligence in the Math Classroom

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MATH VIA MOVEMENT: USING EMOTIONAL INTELLIGENCE IN THE MATH
CLASSROOM

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Dance can be approached as a direct and natural way to move without any personalized aesthetics imposed from an outside authority. Dance is not necessarily graceful, pretty, or spectacular. Dance can be grotesque, ugly, clumsy, funny, frightening, and conflicted... We can move together or alone... Movement is happening everywhere all the time.

-- Anna Halprin, (2002), p. 23.

Abstract

The purpose of this curriculum development project was the conception of lesson plans incorporating dance/movement therapy principles in order to augment the instruction of mathematics at a third grade level in a public school while addressing emotional intelligence through social emotional learning. This endeavor was guided by the questions: How does movement affect third grade math students' abilities to take in and retain information at a public school setting? How can social-emotional interventions change the experience of a third grade student learning mathematics? How can academic counseling informed by body movement and awareness benefit the facilitation of learning mathematics? In order to ensure the functionality of the curriculum, this thesis was mostly a collaboration between the writer and three third grade teachers at a Chicago Public School. Not all of the lesson ideas were actually executed. This process was guided by the Logic Model for program development as presented by the University of Wisconsin. This finished product includes twelve lesson plans which were developed during the school year 2014-2015 and were designed to complement the classroom's curriculum. These lesson plans were an attempt to incorporate social emotional learning standards from a dance/movement therapy perspective.

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Chapter One: Introduction

American education has been recognizably losing its edge over other countries since at least the early 1980's (McFarlane & McFarlane, 2013; Wolk, 2011). Different authors present different postulations over why this is the case. From the No Child Left Behind practices, to greater multiculturalism and poverty levels, to higher dropout rates – the only generalization that can be made from the literature is that there is no clear one answer to this situation (Archer, 2008; Bennet, 2013; McFarlane & McFarlane 2013; and Wolk 2011). One of the most striking facts is that the United States is underperforming in mathematics, science, and technology as compared to several developing Third World countries (McFarlane & McFarlane 2013).

Math is generally known to be a subject dominated by linear thinking processes, which are thought to predominantly come from the left side of the brain (Hannaford, 1995). Because this subject is based in logic, and has traditionally been taught in a cognitively oriented visual and auditory learning style, its potential for being best understood is limited to left-brain dominant students who are not kinesthetic or tactile learners (Gardner, 1993). This thesis came about in revelation of the mind body connection, specifically its relationship to learning. Because of my background in dance, I began to think of ideas of how I could foster learning experiences using movement and used this curiosity to fuel my thesis project.

This curriculum development project will seek to bridge the divide between a logic-based subject and creatively oriented students. Potentially by engaging all of the students in a full-body learning approach, everyone will achieve more hemisphere integration as well a mind and body connection to the academic material (Hannaford, 1995). The latter concept comes from dance/movement therapy theories, and while the work will not be technically considered therapy, the holistic application of it will be used to achieve a practical purpose.

Definitions of key terms.

Academic Counseling. Movement which supports social emotional learning and emotional intelligence in the classroom (Levy, 2005).

Dance. Any movement which is expressive and used in the service of connecting with others... a “consciously organized energy that gives form to feeling”(Dale, Hyatt & Hollerman, 2007, p. 90).

Emotional Intelligence. This concept may be conceived as the kind of social reciprocity which leads to abilities such as self-motivation and persistence, control of frustration and impulses, being able to delay gratification, regulation of moods, empathy and hope (Goleman, 1995).

Multiple Intelligences. A theory of intelligences that distinguishes them as being separated into distinct sensory-related domains, rather than being constricted into one singular generalized ability (Gardner, 1993).

Social-Emotional Learning. The ability to understand, manage, and express the social and emotional aspects of a person’s life experience in such a way to enable the successful navigation of tasks such as: forming relationships, problem solving, and adapting to the demands of development which include self-awareness, impulse control, working cooperatively, and caring about self and others (Elias, 1997).

The purpose of this curriculum development project was to explore the facilitation of academic counseling within a third grade classroom from the perspective of dance/movement therapy. This project will incorporate embodied learning exercises to address the support of social emotional learning and emotional intelligence in a classroom setting. I pursued this

endeavor from the perspective of multiple intelligences as proposed by Gardner (1993), and incorporating dance/movement therapy principles to enhance a social-emotional learning experience. This thesis incorporated the dance/movement therapy principles of: the body-mind connection, creating new neuropathways through movement, creation of mastery through movement, congruency between verbal and non-verbal integration, and the development of a meaningful relationship to the learning process.

This thesis project aspires to be valuable to anyone involved in the education system as well as adding to the current literature in the field of dance/movement therapy. This was a fortuitous opportunity to combine both realms for the benefit of each and create a new and progressive experience of the subject of mathematics for one elementary level classroom. In the area of primary education, this project emphasized the importance of continuing to impel students to learning from an experiential framework beyond the early years of pre-k through second grade. The topics covered in third grade mathematics classes serve as the basis for later, more complex, operations in high school and beyond.

According to Erickson's psychosocial stages of development, this critical time period of industry versus inferiority is when children must experience a sense of mastery over their social and academic demands before moving onto the next stage of development. A lack of achievement here will result in feelings of inferiority which will prevail into the later adolescent phase. Additionally, Piaget would argue that this would be the prime time to instill strong mathematical influences during the concrete operational stage, before abstract thinking emerges (Zimbardo et al., 2006). During third and fourth grade is the time when children learn concepts such as multiplication, division, and fractions which lay the groundwork for later more advanced mathematical concepts.

Research has supported utilizing both sides of the brain to maximize learning potential (Hannaford, 1995; Jensen, 2000). Other authors have written extensively about different ways of processing information unique to individuals known as learning styles (Gardner, 1983; and Kolb, 1984). My thesis project was an integration of all these concepts as well as bringing specialized dance/movement therapy concepts to the classroom.

The field of dance/movement therapy currently exists as an integrated field which pulls theories from both psychology and dance. Marian Chace, the mother of dance/movement therapy in this country, was primarily a dancer before she ever set foot into a psychiatric unit or a psychology course (Sandel, Chaiklin, & Lohn, 1993). I believe it was only after her innovative work at St. Elizabeth's hospital that the connection between the mind and the body began to truly be known.

My thesis strives to bridge the gap between dance/movement therapy, education, and psychology by incorporating an academic counseling component. DMT was used to help foster a positive emotional experience in the learning process, creating social-emotional learning and emotional intelligence. This thesis attempted to take the rich wealth of knowledge we have gleaned over the years and apply it in a practical way that is desperately needed in our diverse and faltering primary education system.

Chapter Two: Literature Review

This literature review chapter will dive into what is happening psychologically for students in early elementary years, and review developmental education practices which take into account the unfolding development of each student. The next section will look more specifically into social emotional learning strategies, emotional intelligence, and learning styles which pertain to the movement patterns of children and relate to the mind body connection. In the fourth section, I discuss how neuroscience both informs and explains what happens during movement integrated learning, as well as touching on how the neurobiology of early attachment to caregivers can either set a student up for emotional success or failure in a classroom setting. This section also contains information about math anxiety, which can severely impair learning outcomes and cause some of the brightest students to have the worst test scores. Finally, the whole chapter is tied together with a section about dance/movement therapy as a unique modality well suited for the classroom setting, in order to promote movement integrated learning, and incorporate kinesthetic learning style.

Psychology and Developmental Education

For many years, schools of thought in the arena of developmental psychology have proposed various developmental stages for the psyche of the young child. It is inferred that individuals must pass through each developmental stage successfully in order to reach the subsequent one and continue on through a healthy productive lifespan. Even Freud, who is considered the father of modern psychology, proposed developmental milestones and correlated them with psychological relational constructs such as trust and control (Ivey, D'Andrea, & Ivey, 2012).

Developmental psychology is important to early education, however, because the early

development of the child is so crucial to later success, and many curriculums are based on studies of human development (Katz, 1988). Relevant to this literature review are Erikson's psychosocial stage of industry versus inferiority and Piaget's concrete operational stage. Both of these occur starting around first or second grade and progress to the beginning of adolescence (Zimbardo, Johnson, & McCann, 2006). Erikson claimed that this critical time period comprises a need for children to experience mastery over social and academic demands including a sense of self acceptance before moving on to the next stage. Whereas Piaget (2001) emphasized a solid immersion in concrete mental operations such as basic mathematics, before developing into more abstract thought processes. Third and fourth grade are the years when students learn mathematical concepts such as multiplication, division, and fractions which lay the groundwork for more complicated operations later in adolescence. According to these psychological theorists, there is both a mental and emotional component to this developmental time period.

Glasser (1986) who formulated Control Theory proposed that all actions in an individual's life are an attempt to satisfy one of five basic biological drives. Accordingly, students would need to be motivated to want to learn in order to be productive in the classroom. Glasser asserted that all motivation must come from inside the student, and when students are striving in school they are really gratifying their biological need for power, i.e., attaining control over their learning experience. Piaget (2001) on the other hand, would counter that not motivation, but the need itself determines the will to act. If students do not feel they have a need to learn anything then there will be no effort made. According to Piaget, the impetus to learn comes from both outside and inside the student. Piaget also contended that feelings about the educational experience determine the goal for behavior while intelligence provides the means of attaining that goal. Therefore the affective life of the student and the cognitive life of the student

cannot be separated. Glasser would reply that what is happening within the student is more important than the behavior he or she is displaying. He contended that:

Our needs push us for fulfillment; whether in our attempt to satisfy them we do right or wrong is up to each of us to decide.... if students do not feel that they have any power in their academic classes, they will not work in school. (Glasser, 1986, p. 27)

One of the main concerns in early educations lies in which curriculum to choose for optimal learning. Should a school choose to approach its young students from a developmental perspective? Some authors (Elkind, 1988; and Hannaford, 1995) would claim that the existing model for education is more academic than developmental, with emphasis on pen and paper activities, quiet classrooms, and skills testing to measure achievement. According to this paradigm, the only information that is relevant is that which can be quantified. However, there is a bigger picture emerging with the whole child being taken into consideration in the educational context. Several sources discuss how the current education system views students as vessels to be filled with information, rather than seeing them as individuals with unique developmental needs (D’Innocenzo, 2014; Elkind, 1988; and Katz, 1988). These same sources would stress that learning is unique to each individual student, and it is more of an unfolding process rather than a filling process. If education were to appeal to the student and be child-directed rather than teacher-oriented, then students would not be forced into academics before they are ready, potentially causing them harm and perhaps endowing them with learned inadequacy at a young age (Foyle, 1991; Katz, 1988; and Waugh, 2007).

However, the developmental view of education itself is not a new one. One of the current developmentally oriented school programs in practice was started by Rudolf Steiner in the early 1900’s. Now known as Waldorf education, this vision was based on a theoretical practice called

Anthroposophy with flavors of Aristotle and other classic philosophers (Steiner, 1919). Steiner saw education as being a gradual unfolding enterprise, according to the development of the students, and appealing to the entire gestalt of each individual. This would be attained through activities such as singing and dancing, and not just through abstract thought processes and memory. Waldorf education still incorporates these practices today utilizing singing, dancing, and knitting as part of the general curriculum. Not only do these activities incorporate the body, and engage students creatively but they stimulate brain growth and integration (D’Innocenzo, 2014; Rosenbloom, 2013).

According to D’Innocenzo (2014) and Johnson (2005) fine motor skill activities involving both hands such as knitting or playing a musical instrument, actually myelinate the corpus callosum and prepare students for the easy acquisition of later academic skills. In addition, Waldorf educators argue that teaching a student to read before the age of seven is actually harmful to development as the biological focus at this time is mainly on learning gross motor skills and developing the right side of the brain. Because the left side of the brain does not fully mature until between the ages of seven and nine, teaching a student to read before this time period forces them to use the right side of the brain, causing later potential problems in balance, eye contact, learning, and general behavior (Johnson, 2005). Other authors would agree that reading before the age of eight is not developmentally appropriate (Katz, 1988; Glasser, 1986).

Finally, this section would not be complete without touching on the importance of movement and emotions to this developmental phase of learning. Movement itself can be extensively seen in the symbolic play of young children (Whitebread, Coltman, Jameson, & Lander, 2009). However, many educators do not capitalize on the fact that what children are actually doing during play are developing motor skills, learning social skills, and developing self

regulation via their immediate environment (Hannaford, 1995; Whitebread et al., 2009).

Hannaford attested that the body itself is an important tool for learning “from our earliest moments in utero right through to old age” (Hannaford, 1995, p. 15). According to this author, movement can be thought of as simply as picking up a pen to write letters and numbers as well as talking aloud to anchor thoughts. Johnson advocated for larger gross motor movements such as “skipping, hopping, rolling down a hill, playing catch with a ball, jumping rope, walking, playing clapping and circle games...” to build strength and neural pathways before settling into rigorous academia (Johnson, 2005, p. 23).

Of course there is an emotional component to all of this developmental play and movement. Proponents of Waldorf education for instance, claimed that using movement to enhance learning helps give children a sense of mastery over their academic experience (D’Innocenzo 2014; Johnson, 2005). It also augments neural pathways in the brain while learning, to help the students remember concepts and builds a bridge to the limbic system to create a sense of well-being in the moment (D’Innocenzo, 2014; Hannaford, 1995). According to Hannaford, “(i)f we consider that consciousness is actually experience in the present moment, then movement and being conscious to learning are synonymous” (Hannaford, 1995, p.110). It has been indicated by the literature that following a developmental progression and giving students a sense of control and mastery over their learning experience is key to later academic success (Glasser, 1986; Katz, 1988; Linnenbrink, 2007; and Pekrun, Frenzel, Goetz, & Perry, 2007).

Social Emotional Learning, Emotional Intelligence, and Learning styles

One of the underlying principles guiding the process of this thesis was the Social Emotional learning mandate in Illinois for which the teachers involved in this thesis received no formal training (school staff, personal communication, 10/02/2014). Social emotional learning can be defined as “the process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions” Collaborative for Academic, Social, and Emotional Learning. (2015). What Is Social and Emotional Learning? [webpage] retrieved from <http://www.casel.org/social-and-emotional-learning/>. Illinois was the first state to enact social emotional learning standards stemming from the Children’s Mental Health report in 2003 (Gordon, Ji, Mulhall, Shaw, & Weissberg, 2011). This was based on much research (Elias et al., 1997 and Greenberg et al., 2003) which prompted Illinois educators and violence prevention supporters to come together and advocate for new learning standards in Illinois in order to promote developmentally appropriate teaching methods in collaboration with teachers, peers, and family to advance social and emotional well-being within the classroom (Gordon et al., 2011).

One of the key findings in the report indicated that “social and emotional development is an essential underpinning to school readiness and school success” (Gordon et al., 2011, p.71). This ties into the developmental psychology perspective that emotions and learning cannot be separated. Alas, Illinois was able pass the Illinois Children’s Mental Health Act in 2003 as a result of the aforementioned report, which led to the development of a Children’s Mental Health Plan for Illinois, established the Illinois Children’s Mental Health Partnership, and was supported by the Collaborative for Academic, Social, and Emotional Learning or CASEL (Gordon et al.,

2011, pp. 71-72).

According to Elias, Zins, Weissberg, Frey, Greenberg, Haynes, and Shriver (1997), Social Emotional Learning or SEL education has a more expansive focus than academic education. With an emphasis on active rather than passive learning techniques, and development of socialized decision making and problem solving skills, the SEL classroom presents an adaptive edge over its counterparts in mainstream education. Other authors from previous discussion would accede that students benefit from learning in situations which involve active rather than passive activities (Foyle, Lyman, & Thies, 1991; Glasser, 1986; and Katz, 1988) especially at a young age (Johnson, 2005 and Piaget, 2001). Pasi contended that “(b)y explicitly including instruction in emotional learning within academic instruction, we increase students’ capacity to grasp the connection between what they are learning in the classroom and life itself” (Pasi, 2001, p. 34). This author asserted that by implementing SEL instruction within the classroom, eventually students will display a greater sense of self worth, feel safer within the classroom environment, develop mutual trust and positive interactions with others, and display intelligent decision-making behavior in the face of peer pressure. Furthermore, SEL education provides students with meaningful experiences which demonstrate the connection between thinking, feeling and acting. Thinking positive versus negative thoughts has an affect on mood and confidence and subsequently affects the way students choose to behave in a classroom environment.

Conversely, Boekaerts (2007) argued that it is the emotions arising from a particular experience that impact the quality of a student’s cognition and motivation to perform in the classroom. This author proposed that students have two main tasks within the classroom: to improve academic proficiency and maintain their emotional equilibrium. Therefore students

who perceive school favorably will seek mastery and growth within the curriculum, whereas those who assess the activities negatively will switch into focusing on their emotional equilibrium instead. Students may choose to cope with their negative emotions by ignoring or avoiding academics, as well as displaying behavioral difficulties. As mentioned previously, students tend to perform better in classrooms where they have greater sense of control over their academic outcomes (Glasser, 1986; Boekaerts, 2007). Finally, in a non-SEL classroom, students may find that when they try to align their social with their academic goals it is difficult if not improbable (Boekaerts, 2007).

Because emotions play such a key role in everyday functioning, they contribute to the quality of information processing within the student. This includes activities such as written and social communication, memory, critical thinking, and even such aspects as attention and concentration (Kusché & Greenberg, 2006). Early childhood is a time of rapid emotional development due to the changes that occur in the brain as a result of interacting and responding to stimuli in the environment. For example the frontal lobe, which is not completely developed in early childhood, plays an important role in concentration and incorporation of new knowledge into mental schemata. All of these processes within the mind are highly influenced by the emotional state of the student. (Boekaerts, 2007; Kusché & Greenberg, 2006).

Due to the way the brain is forming in early childhood, and the connections it has not developed yet, children can only focus inward or outward but not both at the same time. Thus, a child who is experiencing negative emotions such as anxiety or depression will become more focused on those emotions than on learning new information (Kusché & Greenberg, 2006).

“Students who have a positive mindset at the time of learning will observe mainly favorable cues in the learning environment, whereas students who have established a negative mindset will pay

attention to unfavorable cues in the environment” (Boekaerts, 2007, p. 46). Over time, if a student is unable to concentrate and take in new information, this pattern becomes ingrained in his or her self-perception and the student will believe that he or she is unable to learn (Waugh, 2007).

What is notable during this developmental phase of neurobiology is that not only are the emotional responses to the environment clearly present during early childhood, but the limbic to brainstem connections are developed earlier, which is why children are more prone to movement than logical thought processes (Kusché & Greenberg, 2006). In the past few decades children have been having difficulty shifting from motor to cognitive responses from the ages of five to seven years old, and this is most likely due to the fact that they are forced to sit in desks for longer periods of time than ever before (Johnson, 2005 and Wolk, 2011).

Social emotional learning within the classroom is tied to a bigger concept which is more prevalent in the corporate world called Emotional Intelligence. Emotional Intelligence, or EI, may be conceived as the capability of understanding emotions on all levels such as what causes them and how they are used to affect thinking, as well as being able to regulate the emotions of oneself and others (Mayer and Salovey, 1997). In layman’s terms, this means having the capacity of realizing that emotions sometimes drive behavior and affect other people. Being aware of these emotional circumstances and being able to modulate and control them, especially in stressful situations, gives individuals an advantage in the professional world (Clarke, 2010).

The concept of Emotional Intelligence was popularized by Goleman (1995) and now recognized in both educational settings and in the workplace (Clarke, 2010; Seema, 2012). Goleman (1995) argued that students should learn to recognize and accurately label their emotions at an early age, as well as begin to understand how emotions may affect their behavior.

As previously mentioned, being aware of emotions may help shape neural circuitry in the pre-frontal cortex and improve impulse control (Kusché & Greenberg, 2006).

According to Goleman (1995), all emotions are actually an impulse to act based on evolution and human ancestors being faced with situations that defied rational thought, such as danger, loss, and bonding with a mate in order to perpetuate the species. The current education system is based in the rational mind and logical thought processes (Gardner, 1999; Goleman, 1995; and Hannaford, 1995). However, the emotional mind has a completely different intelligence all its own – impulsive and powerful, it helps to make snap decisions when rational thought and reflection would fail. According to Goleman (1995), psychology’s inability to predict success later in life based on SAT scores and IQ tests, means there is something missing from quantitative assessments and it could have to do with the intelligence of emotions. Clarke (2010) proposed that activities utilizing cognitive behavioral techniques, combined with feedback and possibly relaxation breaks, would help to support habits of recognizing emotions and managing them within the self and others in the classroom.

Meekums (2008) executed a pilot study involving the use of dance/movement therapy (DMT) for the improvement of emotional literacy in children aged four to seven years old. Emotional Literacy was defined as having the ability to acknowledge and express feelings appropriately while being able to understand the feelings of others thus making this concept interchangeable with emotional intelligence. This study occurred as part of a crime prevention program in a North England school and some of the goals were to improve self-esteem of the students, augment verbalizations pertaining to emotions, and increase social functionality much like the SEL standards occurring in Illinois currently. The method used to conduct the research was individual DMT sessions with each of the students involved, and an emphasis on process

rather than outcome. This means that the researcher generated material from the spontaneous symbolization of themes which occurred through a movement metaphor – the students were given the opportunity to express feelings through movement for which they were not developmentally capable of articulating with words (Meekums, 2008).

Some of the techniques utilized to facilitate this study were empathic mirroring and embodied empathy, i.e. the therapist/researcher would mirror back to the student what he or she was doing and also embody what he or she felt in the moment. This approach was obviously child-centered, and some of the themes which came up were very appropriate to the developmental level of the students as well as concepts related to success in school such as: mastery, feeling special, having power, ritual, and learning to cooperate (Meekums, 2008). Preliminary findings suggested that the movement helped students to externalize emotions in the dynamic of a relationship rather than through damaging and misguided behavior. Also it was discovered that moving through emotions aided in naming them and discussing them, which in turn helped the students to develop self-soothing strategies (Meekums, 2008).

Another study regarding emotional intelligence was executed via MBA students, to assess the benefits of incorporating EI in the workplace (Clarke, 2010). This study investigated how team learning could be used to amplify positive EI outcomes within groups of people in a corporate setting. It focused on a model of EI that integrates how people process emotion into four different categories: perception of emotions in self and others, utilizing emotion to expand on thinking processes, understanding emotions, and managing emotions in self and others. All of these categories tie into work efficiency outcomes such as negotiation, teamwork and decision making. On an individual level, having emotional intelligence in a work setting allows people to form social relationships with co-workers and have a sense of well-being while at work (Clarke,

2010). Interventions for developing EI are becoming much more prevalent, but are occurring once people are already hired as adult employees.

Complete data sets were collected from sixty-four students who participated in a one day training session about emotional intelligence, then completed a team-based learning project in small groups over a fourteen week period. An additional thirteen students only participated in the one day training to serve as a control group. After the small groups completed their team projects, they were re-assessed using the ability based model of EI as mentioned above, and it was found that using emotions to facilitate thinking processes was improved in the treatment groups who participated more intensely in the group projects (Clarke, 2010). Thus it may be concluded that “after being initially exposed to self-awareness of emotional intelligence concepts, participation in team-based forms of learning can offer a means through which EI abilities might then develop” (Clarke, 2010, p.130). Also, by giving the MBA students an opportunity to work together in small groups, it enabled them to understand each other more on an emotional level and create a group culture. By having more knowledge about the emotional content of the people within the group, the students were able to take emotions into account when moving forward with project plans (Clarke, 2010).

Social emotional learning and emotional intelligence are both connected to another topic which has been around longer – the concept of learning styles. Gardner (1983) first proposed his theory of multiple intelligences which was closely followed if not happening concurrently with Kolb’s (1984) theory of experiential learning. Gardner chose to study psychology instead of going to law school, and discovered that some children appeared to be good at many things, while others had a more narrow capacity for academic aptitude (Gardner, 1999). The established parameters for intelligence at that time were too limited to explain the complexities of the human

mind which, according to Gardner, was better conceived as “a series of relatively separate faculties, with only loose and non-predictable relations with one another, than as a single, all-purpose machine that performs steadily at a certain horsepower, independent of content and context” (Gardner, 1999, p. 32). Gardner then defined intelligence loosely as a biopsychological potential for synthesizing information, which is culturally derived for the purpose of creating products that are necessary for society. This author noted that, much like today, students are often seen as either being intelligent or unintelligent without taking into account all of the nuances that play into those descriptions.

Hence, Gardner developed what he perceived to be seven different ability strengths which he entitled multiple intelligences (MI). They were as follows: linguistic, or the ability to use spoken and written language effectively; logical mathematical, the ability to reason logically and use linear thinking processes; musical, which is not to be referred to as a talent but rather parallel to linguistic intelligence utilizing musical ability; bodily-kinesthetic, also known as the ability to use one’s body to solve problems or create products; spatial, the ability to recognize and operate within patterns of wide and small space, which is culturally derived; interpersonal, the ability to effectively negotiate social relationships with others; and intrapersonal, the ability to have a deep understanding of oneself and to use that understanding to function effectively in life circumstances (Gardner, 1999).

Similarly to Gardner, Kolb (1984) claimed that learning is a process of adaptation to the environment resulting in individual evolutionary growth, and with the increased use of technology this process has become more pervasive throughout the life-cycle. Yet because learning encompasses not only cognitive but social and physical mechanisms, it must be a result of the integrated functions of the whole person he implied. Kolb argued that this includes

“thinking, feeling, perceiving and behaving” (Kolb, 1984, p. 31). Gardner (1973) actually came to a similar conclusion as this prior to his development of multiple intelligences. While writing about the arts and human development, he contended that individuals have three discrete systems within them called the “making, perceiving, and feeling” systems which operate at first independently of each other and then gradually integrate throughout the life process to create holistic functioning (Gardner, 1973, p. 37). Gardner asserted, “The immature organism seems to be equipped with discrete structured wholes or systems, which are programmed at specific rates, which go off independently or even interfere with each other, and which only gradually come to interact smoothly with on another” (Gardner, 1973, p. 39).

Kolb (1984), on the other hand, believed that all choices occurring in reality anticipation programming boil down to apprehension or comprehension of an event. Once the individual subconsciously decides whether to apprehend or comprehend something they then act on this impulse in a way that can be described as extension or intention according to Kolb. His theory then broke down into four modes of learning orientation. The first, concrete experience, deals with living in the here and now of the learning incident, which correlates to being driven by feelings and intuition. The second mode, reflective observation, causes the learner to take a step back from the event and synthesize it by observing and describing it. A learner who utilizes this mentality is more concerned with what is true, rather than how to change it. Abstract conceptualization is the third orientation to learning; which is the learning style most appealed to by the current education system. It focuses on logic and concepts with an emphasis on thinking instead of feelings. The last learning style orientation refers to active experimentation. People with this style of understanding aspire to have an impact on other people and situations – they learn better by doing rather than seeing (Kolb, 1984).

The concept of learning styles today could be plainly defined as “the characteristics of a learner that influence the way in which that person learns,” (Rolfe & Cheek, 2012 p.176) and are more generally known in common language such as auditory, visual, tactile, and kinesthetic (Rolfe & Cheek, 2012). There are indeed schools that currently implement programs to foster both emotional intelligence and multiple intelligences within the classroom, each camp coming out with similar outcomes (Hatch & Kornhaber, 2006). The literature has indicated that supporting social and emotional learning at school contributes to academic success, overall mental health, and productive integration within society (Elias et al., 1997; Goleman, 1995; Pasi, 2001; and Seema, 2012). Hatch and Kornhaber (2006) argued that emotional intelligence is really just an extension to the multiple intelligences theory, or perhaps just a combination of the interpersonal and intrapersonal intelligences. These authors support the use of multiple intelligences within the classroom rather than focusing on strictly emotional intelligence because they believe that developing students’ abilities to process and manage emotions can be incorporated into the cultivation of all the intelligences. In addition, they maintain that in the MI school, students are recognized as unique individuals with “worthwhile and intellectual strengths” (Hatch and Kornhaber, 2006, p.40).

Wilson (2012) performed a study which attempted to match teachers’ instructional strategies with the learning styles of their students and search for correlations. This study was executed using information from 187 fourth grade students in South Carolina with approximately fifty percent male and female participants. The researcher collected standardized test results for each student and compared them with individual learning inventories as well as the instructional style of their teachers. The results indicated that the students’ learning styles and preferences were not all equally matched with their teachers’ instructional strategies. Most of the teachers

had high accommodation for visual and auditory learners with little to no activities involving bodily-kinesthetic learning style or oral expression. The researcher did not find statistically significant correlations, but it was discovered that ninety-seven percent of the students indicated a moderate to high preference for bodily-kinesthetic learning activities and eight out of the thirteen teachers involved did not hardly accommodate for them at all. None of the teachers provided high accommodation for bodily-kinesthetic learning style. Students within the same classrooms experienced vastly different degrees of success – some students performed with high proficiency while others were barely capable of understanding the basic concepts (Wilson 2012). It leads one to wonder how the students would have performed had their education been more tailored to their needs.

Neuroscience and Brain Integrated Learning

Neuroscience is now being used to lend credence to many practices used in dance/movement therapy and psychology for decades. Specifically in DMT, techniques such as mirroring and embodied empathy are being shown to have a neural basis for effectiveness (Berrol, 2006). One could also postulate that the emotional underpinnings of mental processing that impact learning originate in early attachment and emotional regulation by caregivers (Schoore, 1994 and Siegel, 1999). Psychoneurobiological patterns are indeed encoded in the brain as a result of early relationships, causing a child to develop “neural networks” within the brain which are more likely to fire in the future in response to environmental stimuli (Schoore, 2003). According to Siegel (1999), these groups of neurons within the brain which fire simultaneously with each other create neural network profiles that are more likely to fire together over time in response to common experiences. The firing of these patterns of neurons are dependent on the environment in which a person lives. They develop in response to relationships as well as

learning experiences, and are strengthened due to repetition. Some authors would contend that adding movement to life experiences would strengthen the neural pathways even more (Gentilucci and Volta, 2008; Hannaford, 1995).

The most pertinent way in which neuroscience has supported dance/movement therapy practices was the discovery of mirror neurons during the 1990's. These neurons were discovered by Italian scientists Gallese, Fadiga, Fogassi, and Rizzolati (1996) who conducted experiments using macaque monkeys. They knew that certain areas of the monkeys' brains were activated during goal oriented behaviors, but then curiously found that the same areas of the brain activated while watching other monkeys perform the same behaviors. This was found to be strongest when observing hand to mouth movements such as eating, thus providing an evolutionary explanation. Psychologists have known for decades that powerful learning occurs as a result of observing modeled behaviors. Bandura studied this concept long before the discovery of mirror neurons in the early 1950's (Ivey, D'Andrea, & Ivey, 2012). Because both mirror neurons and observational learning involve movement, they both add support for the efficacy of dance/movement therapy in creating change within an individual.

After the initial discovery of mirror neurons, Gentilucci and Volta (2008) went on to study how movement specifically relates to arm gestures. They found that there is a particular part of Broca's area that is responsible for creating mental schema of speech patterns and linking them to hand gestures and mouth articulation. Perhaps this is why many people gesture with their hands while speaking, using the movement to help formulate their thoughts. Broca's area is located just behind the frontal lobe and correlates exactly with the mirror neuron location of the original macaque monkeys. Furthermore, Broca's area has been implicated in the evolution of human speech and gives humans the capability of inner speech (Lieberman, 2007) thus

connecting movement, observational learning, and internal human self talk all in one part of the brain. Lieberman (2007) asserted that it is Broca's connection to the basal ganglia in the middle of the brain that gives speech its planned out and reiterative qualities, however, the basal ganglia was traditionally associated with motor planning and the ability to change one's direction while moving in space. What do these intimate motor and learning connections within the brain infer for the current education system as well as dance/movement therapy?

Schore (2003) wrote extensively about the neurobiological processes which underlie attachment between infant and caregiver. Attachment pertains to this thesis in regard to where it occurs in the brain. According to Schore (2003) the entire development of attachment consists of attuned emotional regulation by caregiver to infant, in the way of engraining positive affective states into the neural network profiles of the child and strengthening the pathways between the limbic system and the orbitofrontal cortex. This ever important orbitofrontal region is located in the frontal lobe of the brain and responsible for higher thinking processes such as cognition, judgment, planning, problem solving, initiative, and also empathy, self-awareness, and emotional regulation (Berrol, 2006; Siegel, 1999). Many if not all of these functions are necessary for success in academics as well as everyday life. Also, the orbitofrontal cortex contains the Broca's area previously discussed which is so important for mirror functions and observational learning.

The brain is indeed a plastic organ which develops and adapts in response to life experiences and environmental stimuli. Young infants are born with the innate capacities and genetic predispositions granted to them by their parents, but much of the way they grow and develop into a social context is completely experience dependent (Schore, 2003). According to Schore (1994) the emotional availability of the primary caregiver is the most growth promoting feature of the child-parent dyad, because the parent serves as the innate regulator of the infant's

immature nervous system during the first two years (Schore, 2003). As it turns out, this intensely relational experience first occurs through affective mirroring and mutual gaze between parent and child. This deep connection between the primary caregiver and infant is ingrained implicitly on a non-verbal level to the child's subconscious and may be accessed later on in early childhood in a non-verbal way.

Most of this interaction occurs initially in the right hemisphere of the prefrontal cortex which is known to be the more holistic gestalt side of the brain (Hannaford, 1995). This side of the brain matures earlier and more quickly than the left side of the brain where Broca's area is located (Schore, 2003). During the first two years, visual stimulation from the mother's face serves to release endorphins and opiates in the right side of the brain which will be responsible for social-emotional development later in life. Conversely, if the caregiver is misattuned to the child or does not serve to regulate his or her emotions, especially in the second year, it has been demonstrated that prolonged exposure to toxic states of unregulated stress lead to apoptosis or cell death in the right prefrontal cortex of the child (Schore, 2003). This would effectively block the pathways between the limbic system and the orbitofrontal cortex for social-emotional self-regulation later in childhood and in life. Thus, the child may be somewhat emotionally handicapped before even entering the classroom and might not reach out for help because he or she has learned, due to insecure attachment, that their emotions are shameful and they are not worthy of being helped or comforted (Schore, 1994).

The opportunity which presents itself in this scenario lies within the non-verbal context in which the emotional trauma first occurred. Because the child's emotional state was implicitly ingrained and can be accessed non-verbally, this provides the perfect chance for a highly attuned teacher or a dance/movement therapist in an educational setting to make a big difference in the

child's life. Berrol (2006) proposed that the mirror neuron system is activated by environmental stimuli that occur in the context of a relationship. Dance/movement therapists frequently utilize the technique of mirroring another person's body movement or posture in order to build a therapeutic relationship with clients and embody the way a person feels to deepen empathy. Berrol (2006) indicated that both emotion and cognition are central to the formation of empathy with others, much like they both inform the learning process.

Kornblum (2002) created a violence prevention program which was implemented in schools utilizing movement techniques informed by dance/movement therapy. Her program could be considered primary prevention in that it helps children to create self-awareness within the classroom environment to help prevent violence before it even starts. According to Kornblum's training manual, in-school programs of this nature should occur in early elementary years to promote personal and social competency while utilizing interactive techniques such as role playing to enhance social awareness, and focusing on culturally sensitive perspectives while promoting a positive classroom environment (Kornblum, 2002).

Similarly, Jensen asserted that, "Movement is about living and living is about learning" (Jensen, 2000, p. 2). He went on to argue that movement constitutes much of what makes up implicit learning, or knowledge that takes place outside of conscious awareness, then discussed how this overlaps and can even strengthen the kind of learning that takes place in the classroom. Jensen (2000) contended that implicit learning is more reliable than textbook learning because it affects the brain in a different way and serves as a bridge between the body and the mind. Movement affects the brain by activating the pleasure and reward systems, via the basal ganglia and thalamus; the sympathetic arousal system, via the thalamus, pituitary, and adrenals; the vestibulocochlear balance system, via the cochlea vestibular auditory nerve; the attentional

system, via the amygdala and prefrontal cortex; the sensory motor system, via the parietal lobe and cerebellar/prefrontal cortex; cognitive skills, via the prefrontal cortex connections to the cingulate gyrus; emotional-social attunement, coming from the occipital lobe, amygdala, and orbitofrontal cortex; and finally the memory systems, such as the cerebellum, parietal lobes, amygdala and temporal lobe. All of these systems are activated and triggered by the emotions of the individual, and the environment where the body/mind is located has an impact on all of the biological systems (Jensen, 2000). This argument makes it apparent why emotional regulation is so important for an effective learning environment as well as demonstrating the potential for utilizing the body for a potent brain-activating and memory tool in the classroom context.

Siegel (1999) discussed this process of implicit encoding as implicit memory which is stored in the hippocampus. Like Schore (2003) Siegel (1999) contended that this originally occurs in the dyadic interactions of attachment, which profoundly affect the way individuals will function throughout their lives. On the flip side of implicit memory is explicit memory, which is experienced more on a conscious level with the awareness of “I am remembering something” (Siegel, 1999, p. 63). Explicit memory would characterize what is expected of students in American classrooms in the form of rote memorization of facts and generalized principles such as grammar and multiplication tables etc. However, every explicit learning episode is informed by an underlying current of emotional state of being, as well as ingrained implicit relational interactive learning patterns (Jensen, 2000; Schore, 2003; Siegel, 1999). Luckily, the minds of young children still remain plastic enough to be redirected onto a positive learning course if they have access to sensitive, attuned, and educated personnel in their educational environments.

Some children who grow up in settings with less than optimal care, and end up internalizing insecure attachment patterns as a result, are more susceptible to academic stress and

more likely to develop pathology later in life (Schoore, 2003 and Siegel 1999). These individuals may experience classrooms as anxiety-ridden places full of social misunderstanding and personal cues for withdrawal. A child who perceives the learning context as threatening, or is unable to experience a sense of control or mastery during learning activities may become mentally “hijacked” and miss out on explicit learning opportunities because of having a misattuned internal emotional state (Goleman, 1995).

Hijacking is something everyone experiences from time to time when they sense danger to be present in their surroundings and go into “fight or flight” mode. When this happens, the central limbic area of the brain completely takes over functioning, with this response originating in the amygdala (Goleman, 1995). Thus a person loses access to their frontal cortex and rational thought processes. Historically, the fight or flight response was very adaptive to humans in actual danger, but in the classroom setting it hinders effective learning and may even lead to behavioral difficulties (Goleman, 1995). Also, the release of cortisol that occurs during these episodes of mental hijacking has been shown to block out encoding of explicit memory, leaving a primarily negative implicit effect on the individual (Siegel, 1999). It is apparent how children with insecure attachment styles and less than optimal home environments would be more susceptible to these occurrences of toxic stress, as their brain structures would be less inclined to utilize regulated neural connections to the orbitofrontal cortex before even entering the classroom (Schoore, 2003).

Children who experience school as being a stressful place switch from feeling control and mastery as well as being open to new learning experiences, to being internally focused on their negative emotional state (Boekaerts, 2007; Elias et. al., 1997; Foyle, 1991; Glasser, 1986; Katz 1988) and eventually may take on avoidance behaviors which characterize many anxiety

disorders (Morrison, 1995). Anxiety may be related to the general context of school itself or be tied to a specific subject such as mathematics. Math anxiety can be compared to test anxiety, and has become a rather recent phenomenon to be studied in the literature (Ashcraft and Ridley, 2005). It can be defined as “a negative reaction to math and to mathematical situations” (Ashcraft and Ridley, 2005, p. 315) but can elevate to the extent of complete dread, leading math anxious individuals to avoid taking higher level math classes or entering any math-related career path (Ashcraft & Krause, 2007; Ramirez, Gunderson, Levine, & Beilock, 2012).

Math anxiety is tied to math reasoning skills, but it has more of an effect on complex mathematical operations rather than simple numerical problems in a vertical format (Wu, Barth, Amin, Malceme, & Menon, 2012). This correlates to both verbal and spatial cognitive abilities, but seems to have a more profound effect in the horizontal or verbal domain (Beilock, 2008). So at a third grade level, math anxiety would pertain more to verbally presented word problems rather than simple subtraction or multiplication exercises presented in numbers. Furthermore, math anxiety specifically targets the working memory system of individual students (Ashcraft & Krause, 2007; Beilock, 2008, and Ramirez et. al., 2012). It has been discovered that students who actually have a higher aptitude for working memory are the ones who are most severely affected by math anxiety, causing these very intelligent students to perform at the same level or worse than their peers who have a lower capacity for working memory (Ramirez et. al., 2012). This is because math anxiety acts as a dually functioning circuit in the brain. Once a student’s amygdala perceives a math activity as threatening, he or she then becomes mentally hijacked and automatically allocates high functioning working memory resources over to ruminating on anxious thoughts while other students would resort to simpler problem-solving methods or shortcuts (Legg & Locker, 2009; Ramirez et. al., 2012). If the math anxious student were to be

in more of a regulated state when this happens, then he or she would be more likely to use all working memory and cognitive resources toward effectively completing the math activity.

Conversely, it has been shown that there are mental coping skills which can be implemented to help combat the effects of math anxiety. Legg and Locker (2009) executed a study which investigated the relationship between metacognition and math anxiety.

Metacognition was loosely defined as “thinking about thinking” (Legg and Locker, 2009, p. 472). They found that students who ranked higher in metacognitive abilities were actually able to moderate their math anxiety by knowing when and how to use better problem-solving strategies, as well as having more overall confidence about their math abilities. Thus, it was concluded that having a positive attitude about mathematics enabled participants to consciously shift their focus from anxiety containing thoughts to problem-solving thoughts (Legg and Locker, 2009). This process then reversed the feedback loop of debilitating anxiety to create a new feedback loop which reinforced confidence and mastery.

Ashcraft and Krause (2007) proclaimed that math anxiety presents an interesting opportunity for cognitive psychology to study mathematics. Because abstract thinking is a developmental construct and anxiety is potentially a learned emotional response in the classroom, mathematical reasoning may be closer to psychological processes than originally suspected. Mathematical thinking can even be seen in the patterns of how children play and interact with their environments (Van Oers, 2010). What makes this pertinent to dance/movement therapy is the way numbers can be expressed and felt in the body through patterns and repetition, as well as considering the emotional component of math anxiety. Students who develop extreme math anxiety are disempowered by it, and subsequently avoid all situations containing math including higher math courses and career options (Ashcraft & Krause,

2007; Legg & Locker, 2009; Ramirez et. al., 2012; Wu et.al., 2012). It also bears repeating that math anxiety has the strongest detrimental effect on students who otherwise would be considered to have the greatest capacity for academic success (Beilock, 2008).

One undergraduate math professor recognized the trauma that students were bringing into his classroom regarding the subject of mathematics. Upon learning that students were actually avoiding the class because of this, he decided to implement a “math therapy” exercise to help them be more open to his class (Stogsdill, 2013). He had the students journal about their experiences with mathematics and discuss them openly – it was discovered that every single one of them had something negative to say (Stogsdill, 2013). However, it was apparent that even just talking about it and bringing awareness into the classroom had a positive effect. Over time, Stogsdill modified the activity to include these parameters: earliest memories of mathematics, when and why math became difficult (if it did), worst memories of math class, best memories of math class, feelings about mathematics and taking this course. This activity is similar to an initial therapy visit, as it serves to be a beginning assessment of where the students are at, and gives the teacher an idea of what he or she needs to address for this particular group of students.

Stogsdill (2013) ultimately found that over half the students he encountered in the past twenty-three years had some degree of math anxiety; more specifically of 132 students enrolled in his course in the past two years, only four of them did not exhibit a negative experience with mathematics. In response to a post-course evaluation, one student commented on the math therapy exercise, “I was surprised to learn that many people shared traumatic experiences in their early math education. Simply knowing that others struggled as I did helped me feel supported, understood, and less intimidated as I went through the course. By expressing my fears and blocks about math, it released them and allowed me to recognize them but not be controlled by them”

(Stogsdill, 2013, p.126).

Math anxiety is closely intertwined and related to test anxiety, as previously mentioned (Ashcraft and Ridley, 2005). Dance/Movement therapy may present an effective solution for cognitively and emotionally alleviating negative outcomes from both test anxiety and math anxiety. In a pilot study executed by Erwin-Grabner, Goodill, Hill, and Von Neida, (1999) twenty-one graduate and undergraduate students completed a pre and post-test assessment pertaining to test anxiety. The dependent variable in this study was four dance/movement therapy sessions targeted at ameliorating test anxiety, and each session lasted for thirty-five minutes. What made this experiment so poignant was that it occurred in the two weeks prior to final exams when test anxiety would be at its highest (Erwin-Grabner, Goodill, Hill, and Von Neida, 1999).

The dance/movement therapy interventions in this study specifically addressed the topics of control and mastery within the classroom, self-efficacy and groundedness, positive self-concept, and relaxation/tension release. The group format of the sessions also augmented positive social interactions and group support (Erwin-Grabner, Goodill, Hill, and Von Neida, 1999). Goals of the sessions included: establishing a group culture, improving body awareness and tension release, present moment awareness, increasing expressive movement, association of thoughts and movements to body sensations, increased self-awareness, and symbolic mastery of a topic using movement. Interventions used to achieve these goals were: breath work, progressive relaxation techniques, exploring use of weight in relation to a topic, abstract symbolization of a theme, role-play, mirroring, use of props including scarves and a stretch band, as well as use of body sculpting to represent emotions in relation to test anxiety (Erwin-Grabner, Goodill, Hill, and Von Neida, 1999).

Ultimately the researchers found that dance/movement therapy would be a valid modality for coping with test anxiety as the experimental group indicated in their post-test measures. In addition, they discovered that not only was test anxiety alleviated, but the group dynamic in itself had healing aspects. Because of feelings of support and understanding by the group, members felt increasingly free to express themselves during the sessions. Several of the participants commented on the group aspect after the study was over. Some such comments were, "I have learned that despite age, race and gender, each of us had a common thread that brought us together," as well as, "Once I observed the group, I noticed everyone had similar feelings," and, "I think the group worked well together and that we were able to come up with interesting and creative ideas" (Erwin-Grabner, Goodill, Hill, and Von Neida, 1999, p.31). It is evident that dance/movement therapy was able to achieve not only the functional purpose of alleviating anxiety, but as a by-product of the group modality participants in the study were able to come away with an experience rich in social support and unity with their peers.

Dance/Movement Therapy

Dance/movement therapy (DMT) began in the United States in the 1940's in response to rehabilitating traumatized soldiers. Marian Chace pioneered DMT in the wards of St. Elizabeth's hospital in Washington D.C. and one of the beginning techniques involved partner dancing such as waltz, which served to increase interpersonal connection and ground the patients in reality. Chace noticed that movement was foremost a form of communication and that unity and connection occurred between people as a result of rhythmic group activity. Also movement served as a powerful vehicle for symbolism which could be non-verbally shared and understood among group members on a body-based level. Mastery of movement in body action helped to expand movement repertoires which enabled group members to learn and internalize new ways

of being (Sandel, Chaiklin, & Lohn, 1993).

When people engage in movement in a unified group, it activates the mirror neuron system within the brain. Even just watching movement occur can create cognitive growth for everyone in the room. "Rhythmic action when watched is felt by the onlookers in their own musculatures," (Chace, 1993, p. 218) benefitting them in integrating information and including them as part of the group while not physically performing the actions. Movement that is rhythmic and performed within a nucleus of people, including traditional dance forms, may inherently contain numbers and patterns much like mathematics. Also, rhythms and patterns may be observed in the movements of young children's play. Clements and Sarama (2004) indicated that algebraic instruction can bring coherence and understanding to the patterns and rhythms which occur in children's play, while helping them to generalize and set up expectations for the future. Similarly, elementary instruction in geometrical reasoning can help with how children navigate and move through space with their bodies (Clements and Sarama, 2004). Thus, mathematical logic can be seen as already being intrinsic to children's thinking processes, and can be observed in how they move their bodies and navigate relationships through play. If young students were allowed to explore materials and activities in their own way utilizing their own information gathering processes first, it would merely be the task of an observant teacher to guide them and "mathematize" their experiences in a way that would make sense to them developmentally while still incorporating valid social skills (Baratta-Lorton, 1976).

Laban, who is best known for his movement notation system, is responsible for ritualized movement patterns known as "movement scales" which are based on geometric shapes (Moore, 2009). These are performed in ordered sequences, simple enough for most people to grasp, and develop movement patterns within the brain and throughout space that theoretically create such

shapes as hexagons and icosahedrons. These movement scales are now commonly used in dance/movement therapy to help create mental stability and clarity in various clinical populations. Piaget (1952) claimed that understanding the sensory-motor representations of how children organize thought, would serve as the basis for understanding how they originally conceive of numbers and then develop into eventual logical thought processes.

Tortora (2006) conducted dance/movement therapy with young children using the Ways of Seeing approach she created. This technique involves encountering the child utilizing all of the senses and perceiving the experience of the child without judgment. In particular, Tortora emphasized the intuitive practice of noting her own body feelings and sensations while moving with the child. She noted that many children who have behavioral difficulties are merely in the state of trying to control their own environments, and perhaps are not having their needs met or being pushed beyond what they are developmentally capable of. Tortora asserted that engaging with children on a non-verbal level helps to augment social-emotional inter-relatedness within groups because of entering the child's world and speaking the child's language of non-verbal communication via movement. According to Tortora, not only does dance and movement improve cognitive functioning and physical coordination, but tuning into a child's movement style helps to create an understanding of how that child processes information pertinent to his or her learning style.

Similar to Tortora, Cathcart developed a dance/movement therapy program for working with preschoolers with learning disabilities in the 1980's. Her work was based on attachment theory, and therapeutic goals included: enabling children to become aware of their own resources, identify themselves as worthy, and express ideas and emotions while fully utilizing all five senses (Levy, 2005). Beardall created a cohesive dance/movement therapy program in

public schools in Massachusetts. This program focused more on social-emotional and relational learning throughout the student body where emotional intelligence was fostered using movement. Regarding Beardall's work in the public schools Levy (2005) commented, "Dance (movement) therapists have much to offer educators where education and therapy meet in the integration of social and emotional learning for each student" (Levy, 2005, p. 188). Indeed, on the developmental spectrum where children move from motor movement to affective expression and finally cognitive processing (Dyrud, 1993) engaging children in movement "helps to achieve a more relaxed open child, more aware of self and therefore more able to interact with others" (Chace, 1993, p. 324).

Before this gets much further, it is important to define what is meant by the word dance. As the name of the therapeutic modality implies, dance/movement therapy encompasses more than what is thought of classical concert performance, or even street styles of dancing. Dance/movement therapists are trained in observing the nuances of all movement qualities and understand how the mind can be connected to bodily expression. Hanna (1995) asserted that a lot of what dance/movement therapy explores involves bodily sensations or movements. She used the word dance to describe "purposeful, intentionally rhythmical, and culturally patterned sequences of nonverbal body movements other than ordinary motor activities" (Hanna, 1995, p. 323). This thesis will look more literally at the movement side of dance, in observance that any movement which is expressive and used in the service of connecting with others could be construed as dance, and benefit cognitive functioning. A more befitting description of dance in this case would be that of Dale, Hyatt & Hollerman, who defined dance as "consciously organized energy that gives form to feeling" (Dale, Hyatt & Hollerman, 2007, p. 90). This definition takes into account that movement is indeed a conscious reflection of inner mental

state, and also appeals to a social-emotional context.

In a more recent publication, Hanna (2015) wrote that dance/movement is a nonverbal language and that more of the human brain is devoted to movement than any other function. She also contended that some of these same movement areas in the brain are associated with cognitive functions. Hanna argued that “dance may improve thinking more than thinking does” (Hanna, 2015, p. 16) because human consciousness is anchored within the surroundings with which it interacts, and communicative movement sparks the connection of neural pathways within the brain. Berrol (1992) wrote that movement acts as an intermediary between cognitive, affective, and behavioral responses to the environment – and that it is a reflection of constant neuronal organizing and reorganizing of these facets of functionality. Hannaford (1995) avowed that movement not only expresses knowledge and augments mental operations, but increases the complexity of the brain as a gestalt. She wrote that, “(M)ovement is essential to learning and to the manifestation of life itself. Even in seeming stillness, our whole body teems with movement... Movement awakens and activates many of our mental capacities (and) integrates and anchors new information and experience into our neural networks” (Hannaford, 1995, p.107).

The field of dance/movement therapy recognizes and uses the mind/body connection to effect therapeutic change within individuals and groups. As this thesis would argue, the connection between the mind and body can be used to improve cognitive functions as well. Hackney (1998) wrote about developmental movement patterns which occur throughout the first several years of life, as a person grows from infant to child. She has studied the ways in which re-visiting these movement patterns later in life can vitalize cognition, thus using the body to affect the mind. This is the opposite approach to many mainstream education and psychology

practices. Hackney wrote about the ways that a person's body and mind act as a filter through which knowledge is processed, much like learning styles. She maintained that human bodies contain knowledge and wisdom of their own which is separate from intellectual knowing, and that the most fundamental aspect of moving and relating in the world is change itself. Hackney's work promoted mental flexibility through body re-patterning, and she concluded:

Learning is a creative process – and as such there can be no one 'right' way to teach or learn... There are times in learning where it is important to be merged kinesthetically with the moving experience... There are times when feelings and emotional dynamics are the primary teachers. (Hackney, 1998, p. 31).

One of the developmental body patterns Hackney studied was named "body half" (Hackney, 1998, pp.165-175). This pattern consists of using movement on one side of the body versus the other side, and examines the relationship between the two halves of the body along an invisible meridian down the center. Body half is just one example of the mind/body connection, as it correlates with the dance/movement therapy principle of stability versus mobility. This may seem implausible at first, but when observed in movement it is easy to see how one side of the body can be used to stabilize and ground the movement or mobility of the other side of the body. It is very rare that both sides of the body are equally mobilized simultaneously. Thus, investigating body half movement patterns leads to insight about an individual's access to stability and mobility in his or her life, and can even be indicative of mental flexibility and problem-solving skills. Both mental flexibility and problem-solving skills are necessary when executing mathematical operations. Conversely, if someone is cognitively struggling with an issue feeling unstable or not being able to make a decision, it can be helpful to move through all the body patterns especially focusing on body half.

To lend even more credence to the discussion of body half are the learning exercises proposed by Hannaford (1995). This author uses Brain Gym activities involving movement to help regulate and prepare students of all ages for optimal learning. One of the more poignant of the activities is called “Hook-ups” and occurs in stillness while utilizing both sides of the body (Hannaford, 1995, p.133). This technique involves having the student stand vertical with one foot crossed over the other, while also crossing the hands at the wrist and clasping the fingers. Then, the student bends the elbows inverting the crossed hands up to the heart center, and the final step occurs when the tongue is rested on the roof of the mouth. Unlike body half patterning, hook-ups utilizes both sides of the body for stability in order improve mental clarity. However, it is arguable that both of these techniques have similar effects from a neurobiological perspective. According to Hannaford, standing in this position for at least two minutes integrates and activates both sides of the brain, while arousing the frontal lobe and deactivating the fight or flight response brought on by overstimulation. This activity is great to use after recess, in order to prime the higher thinking brains of students for focused learning.

Perhaps one of the most pertinent aspects of dance/movement therapy, which makes it so relevant and unlike other modalities, is its innate capability of accessing and influencing the emotional core of an individual. Because DMT promotes integration within the self via strengthening of the mind/body connection, it can lead to the discovery and release of hidden emotions that are tied to body-based memories. Hanna (2015) wrote about the ways in which these implicit memories become encoded during emotional experiences. Unfortunately, many memories become encoded during negative experiences such as fear or shame, which can then be triggered and brought out by reactions to classroom settings. Dance/movement therapy can be used as an intervention to help teach students how to connect to their bodies during times of

stress in order to self regulate. A good example of this can be found in the aforementioned curriculum created by Kornblum (2002) where there are activities and techniques for the purpose of teaching students how to calm down and tune into their bodies. One of the techniques is called the four C's, and involves showing the students how to "connect to the ground, collect your thoughts and calm down, concentrate on one thing, (and) create stillness" (Kornblum, 2002, p.56). Kornblum's curriculum also promotes impulse control and increases empathy which arguably augments emotional intelligence in the long run.

Halprin (2002) contended that emotions actually run deeper than surface feelings, and can authentically be accessed via artistic expression. She maintained that connection to the body is essential for true healing to occur and attested that "our personal and cultural abandonment of our bodies can create illness and a void in understanding how to regain our health" (Halprin, 2002, p. 21). Much of Halprin's work was done with cancer patients where she was humbled to realize that a cure was not the same thing as healing, but that it was more important for patients to rediscover their connection to themselves and the natural world than to actually survive the disease. In her work, Halprin observed that there was an intimate feedback loop between the movements and the feelings of cancer patients. This became a delight to her and others, as she noted that because there were so many possibilities of ways to move, there must also be a vast amount of ways to experience emotions.

Hanna (2015) also tied together the link between movement and emotions. From this author's perspective movement is primarily for communication purposes, but that means the way a person moves must mold his or her thought processes. Also because cognition cannot be separated from emotion in the mind, these feelings must be apparent in the physical expression of dancing as well. According to Hanna, emotions are really just cognitive evaluations of the

bodily sensations of feelings which occur prior to thought. Thus, the existence of emotions at all depends on a healthy relationship between the body and the mind by nature of this argument. Furthermore, dance/movement helps to generate and strengthen neuropathways within the brain unlocking creativity which increases divergent and convergent thinking processes and problem solving (Hanna, 2015). Promoting a positive, emotionally empowered environment in the classroom increases students' motivation to learn and improves social relationships (Hanna, 2015).

Schmais (1985) wrote about many aspects of the mind/body connection in her discussion of healing processes in group dance/movement therapy. This author would also agree that movement fosters integration within individuals and in groups, creating a sense of unity and increasing harmony between external and internal consciousness. Schmais commented on how integration within the mind/body perspective leads to an increased sense of commitment in everyday life. She noted how physical expression enables people to access their inner emotional worlds through symbolic gestures which share the same neuropathways in the brain, and how symbolism itself may be the most powerful yet most elusive aspect of the movement arena. Schmais claimed that, "Symbolic expressions in dance therapy form the bridge between the (person's) internal and external worlds as they transfer energy from one realm to the other in a social context" (Schmais, 1985, p. 33).

Education is naturally incorporated into the process of dance/movement therapy. In group DMT, clients continuously learn a lot about themselves and others by observing and experiencing the process of movement in the unfolding moment. Much of this is brought to explicit fruition via verbal processing from the therapist and others. According to Stark and Lohn (1993) "Verbalization can be used to foster emotional connection and response to

behavior... Thus, the physical action becomes connected to a cognitive symbol and to a full affective response” (Stark and Lohn, 1993, pp. 125-126). This is not unlike what a teacher does in order to help guide students to effective problem solving. In a dance/movement therapy context, the therapist will use techniques such as clarifying and confronting to increase learning assimilation, all while modifying the tone of voice to match the energy level in the room. Conceivably, the most effective learning factor in dance/movement therapy with the most potential for healing and positive outcome is the fact that engaging in movement cohesively with others teaches individuals that they are important, accepted, and that their contributions to the group make a difference (Schmais, 1985).

Dance/movement, in a non-therapeutic sense, has been used previously to enhance mathematical learning experiences. Wood (2008) utilized traditional square dance and activities using stretch bands to foster understanding of shapes and multiplication in a primary school in Western Australia. Inherent in the rhythmic patterns of the square dance was the concept of multiplying by two, and the researcher discovered that by having the students traverse the shape of the square she could easily transition into the topic of fractions. Ultimately, Wood noted that many of the students were kinesthetic learners, and by engaging them in movement they were more motivated to learn concepts and have rich discussions afterwards which cultivated deeper understanding.

In another third grade class in South Carolina, dance was incorporated into the math curriculum as part of an arts integration project where students were broken into teams and created “geometry dances” to be performed for their peers (Moore and Linder, 2012). For this project, students learned traditional tenets of dance performance such as counts and phrasing, which were then incorporated into geometry lessons like lines, segments, shapes, and angles

(Moore and Linder, 2012). This was helpful for including the kinesthetic learning style into the classroom setting and improved collaboration and risk-taking among the students while also benefitting those who were struggling by giving them the opportunity to experience repetition of concepts.

Another study conducted by Kercood, Grskovic, Lee and Emmert (2007) involved movement but not necessarily dance, but investigated how fine motor movement can affect the math problem solving skills of students with learning disabilities. This study involved four fourth grade students who all met the criteria for attention deficit hyperactivity disorder (ADHD), and utilized an alternating treatment design. One of the students was also diagnosed with spinal bifida which prevented her from using her lower limbs. In the original condition, students were asked to solve as many mathematical word problems as they could in a twenty minute time frame. Then, during a subsequent session, students were given a puzzle toy to hold and manipulate in their hands while solving a similar series of mathematical word problems. It was found that when being allowed to move in fine motor condition, two of the students performed with 55% and 45% more accuracy (Kercood, Grskovic, Lee and Emmert, 2007) and all of the students engaged in less off-task behavior during the experimental session. The puzzle toy was used as a stimulation tool for thinking, where students either held it in their non-dominant hand or manipulated the toy while thinking about the answer to a question (Kercood, Grskovic, Lee and Emmert, 2007).

Finally, this section will conclude with a dance/movement therapy pilot study conducted by Grönlund, Renck, and Weibull (2005) for the purpose of presenting DMT as a treatment modality for students with ADHD. This study examined the usefulness of short-term dance/movement therapy in working with two young boys who exhibited symptoms related to

ADHD. There were ten forty minute sessions which occurred once a week during a time span of three months. Goals for treatment were to improve gross motor function and reduce the emotional behavioral symptom related to hyperactivity such as poor inhibition and self-regulation (Grönlund, Renck, and Weibull, 2005). Dance/movement therapy was proposed to be the therapy of choice because of all the body-related symptoms tied to ADHD such as elevated body tension and fragmented movement patterns. The therapists focused on creating a safe space for the boys to express their emotions, and emphasized the healthy aspects of both individuals while building on their strengths. The students were each able to learn social skills such as cooperation, and moderate the balance between their internal and external realities. After the short duration of this study, one of the students was able to sleep at night while the other student was able to go off his medication and sit still for an entire hour. Both of the boys were able to subsequently play more cooperatively with other children. Perhaps the most interesting finding of this study was that the therapists involved discovered that once they addressed the “fundamental movement skills” in the beginning such as balance, coordination, and personal space – the behavioral and emotional symptoms became much easier to alleviate (Grönlund, Renck, and Weibull, 2005).

Questions informing this curriculum development.

This thesis came about in revelation of the mind body connection, specifically its relationship to learning. While attending Columbia College Chicago and moving through the sequential curriculum of the program, I became increasingly reliant on my body to really learn, understand, and incorporate the concepts. Many of the learning activities were so deliciously kinesthetically incorporated, that I began to wonder how bringing movement into a typical classroom setting could have changed my academic experience at a younger age. My thoughts

traveled to my third grade teacher who had her students sing during mathematics class. She had made such an impression on me then, and quite honestly, that was the last time I enjoyed math. Naturally, as a dancer, I began to think of ideas of how I could foster those learning experiences using movement and my first research question was formed. How does movement affect third grade math students' abilities to take in and retain information at a public school setting?

As a blossoming therapist I wondered what was really going on psychologically during those third grade math exercises, and why the songs had brought everyone together. I decided that there must be a definite emotional component to singing as a group which would cultivate unity among students much like a dance/movement therapy session does. This shared emotional experience where the students can help each other remember the song, equalized everyone in that one cohesive moment. All of the students became a part of an integrated whole, where each student had a voice in the song, yet no one student was more important than another. This integrated team activity may have contributed to emotional intelligence in the long run, but what it was really doing was contributing to positive affect and creating a positive relationship to the learned group experience. Upon studying the literature, I discovered that the term for this in an educational setting is called social emotional learning (SEL), and that there are mandates for these components already in place. Therefore I included SEL from the perspective of a therapist into my second question. How can social-emotional interventions change the experience of a third grade student learning mathematics?

When it came time to write my thesis I was posed with the conundrum of how to make it a dance/movement therapy thesis. Clearly I was unable to enter a public school classroom and execute therapy sessions for ethical and time constraint reasons. I saw this as more of a therapeutic enterprise without explicitly involving therapy – more like primary prevention. If

students are allowed to use their bodies as a tool for learning, while benefitting their emotional experience and connecting them to their peers and others, then perhaps learning outcomes will be more positive and individuals will be more successful throughout their academic careers and lifetimes. I saw the magical neurobiological potential of dance/movement therapy for effecting change and positive outcomes. This is looking at DMT from a prevention standpoint rather than an explicitly therapeutic one. Thus, my endeavor became an academic counseling one, using the body as the medium for deepening mathematics concepts and improving emotional intelligence. My final research question was born: How can academic counseling informed by body movement and awareness benefit the facilitation of learning mathematics?

The purpose of this program/curriculum development project was to explore the mechanism of the mind body connection in an academic classroom context. The literature has indicated that following a developmental progression in the curriculum informed by psychology has positive outcomes as well as incorporating emotional intelligence and learning styles. Several studies reviewed in this chapter also pointed to the importance of movement for cognitive development in early elementary years, as well as the ways that movement can benefit emotional and learning outcomes. All of this information has a solid basis in neuroscience which is continually expanding knowledge about the human brain and the mind's connection to the body. What makes this thesis unique is its attempt to bring all of these concepts together from the perspective of a dance/movement therapist, showing the distinct ways the field of DMT can benefit the field of education in order to promote more fully integrated, empowered, and emotionally intelligent students for the better future of America.

Chapter Three: Model and Process

The Logic Model was used for this program development project because it depicts the relationship between resources, activities, outputs and evaluation. This model is commonly used to evaluate the effectiveness of a program. Due to its user friendly format, I used the University of Wisconsin's version of the Logic Model. University of Wisconsin. (2016). Program Development and Evaluation [webpage] retrieved from <http://www.uwex.edu/ces/pdande/progdev/>. It was not feasible to enter a CPS school and attempt to study this topic from a research perspective, without having any ideas formulated or even completely understanding the unique needs of an individual school. Therefore, it was best to enter the classroom as an observer and collaborator with the teachers of an entire third grade class. What ensued was much learning about myself as a dance/movement therapist, and the possible opportunities for incorporating movement into the classroom environment to improve learning and social emotional outcomes.

According to the Logic Model, the first step is to immerse oneself in the situation of the agency where the program is to be developed for the purpose of understanding the collective mission already in place, as well as assessing any problematic areas to be targeted for improvement. As such I was able to find a progressive, culturally diverse, and arts friendly CPS school to welcome me into their third grade classrooms. I traveled to the school twice a week for a little over half the school year, and I was in the classroom for math period, but arrived thirty minutes early in order to check in with the teachers each time. There were two third grade classrooms respectively, so I spent one hour in each classroom a week.

It was perhaps not a coincidence that the mission statement of the school aligned with the purpose of my thesis, mentioning goals such as creating lifelong collaborators while still

focusing on the unique needs of each student. However, it became apparent after one of my initial interviews with the teachers that even though they were aware of SEL mandates, there was really no training or implementation of them beyond using their own intuition and experience as educators when problems arose in the classroom (school staff, personal communication, 10/02/2014). Nevertheless, I was still enthusiastic about observing their teaching styles and conflict resolution techniques while formulating my own ideas during mathematics class.

I began creating lesson plans immediately, as I did not enter the school until the end of September. My lesson plans were designed to complement the mathematics curriculum the teachers were following, which at the time was Everyday Mathematics (Bell, Bell, & University of Chicago, 2007). More importantly than developing ideas though, I began attuning myself to the classroom culture as well as the needs of individual students. Every math class was broken into three twenty minute sections where groups of students rotated between having a learning activity with the teacher, doing a worksheet on their own, and completing math exercises on the iPad. Upon further inquiry I learned that the students were broken into groups based on their perceived math abilities. This distribution of the students felt like it was contradictory to my approach at first because I had wanted to find a way to facilitate an integrative learning environment where groups of students work together and build each other up in understanding.

The second stage of the Logic Model is called “inputs” and entails defining goals for the program to address as well as creating plan for the eventual implementation of the program. I kept a handwritten journal throughout the entire process, as well as continually checking in with the teachers via e-mail and direct meetings. Both of the teachers involved received hard copies of the drafts of my lessons as well as one of the intervention specialists. At this stage in the development of my curriculum one of the teachers went on maternity leave for the rest of the

school year, so I turned to the other original teacher as my primary contact while still visiting the classroom with a new substitute teacher. Over time, I developed a relationship with the substitute teacher as well. Within the first month of being in both classes I was allowed to try little five minute activities with the students, and one of the teachers even asked me to collaborate with her for a lesson involving role play she had come up with. The activities I tried at this point were so short – they were for the sake of learning and deepening concepts in brief amounts of time. I noticed that even though I was not doing therapy per se, the way I related and engaged with the students was different than their teachers, and some of the students began coming to me to ask questions when they were struggling with a concept.

The final stage of my endeavor, which was the “outputs” stage, was when most of the activities happened. By the end of November I had established enough trust and credibility with the teachers to try out a few of my lesson plans in brief fifteen minute sessions. The outputs stage is characterized by actual implementation of the program, which is not exactly what occurred, but ideas were tried out as microcosms. These activities happened in various spaces, such as during class time with the lowest performing students, or in the hallway or empty classrooms. I generally worked with small groups of students at a time during one of the rotation periods of math class. The sessions were executed either spontaneously or in planned increments, much like a practicing dance/movement therapist would be doing in the field of therapy. Even though the amount of time was brief, I still managed to turn the learning activity into a social emotional one involving connection among the students as well as some time for mind/body work in the beginning and reflection afterwards. Ideally these would have occurred in thirty minute time frames.

Unfortunately, after the beginning of 2015, the teachers were forced to devise an entirely

new math curriculum due to test results which will be further discussed in the last chapter. Therefore, I was not allowed to come to the classrooms anymore or really even do much follow-up with the teachers or students. If I would have been able to continue on to the outcomes and impact stage, or the last stage, I would have liked to maybe more fully implement a lesson collaboratively with the teachers, or perhaps been able to modify what I had already established to better meet the needs of the class as a whole. I would have enjoyed having more in depth discussions with them as to what worked or did not work, as the outcomes and impact stage calls for evaluation of the program. For instance, some of the feedback I received from one of the teachers indicated that she wished my lessons were not so time-consuming, but rather more like a ten minute warm-up to prime the students for focus and learning. Finally, it would have been wonderful to get more feedback from the students themselves such as an exit slip before I left. I spoke to a few of them individually about the activities, and other students came to me frequently asking when they would be able to learn a new “math game” with me after experiencing a few of my lessons.

Chapter Four: Program and Program Evaluation Plan

This Chapter contains the lesson plans I created in complementary order to the curriculum of Everyday Mathematics (Bell, Bell, & University of Chicago, 2007). I did not create a lesson for every single lesson plan found in the curriculum, but rather conceived of ideas as they emerged naturally in tandem with what the students were already learning. To support and clarify the ideas I proposed, I incorporated DMT principles as stated in an original document from Columbia College (Appendix B). In the Appendices I included the original document as well as a numbered document for the purposes of this thesis. In addition to the DMT principles, I correlated each lesson plan with the SEL standards as mandated by the state of Illinois after the Children's Mental Health Act in 2003 (Gordon, Ji, Mulhall, Shaw, & Weissberg, 2011). These are located in Appendix D. Though I attempted to make the lessons plain and easy to follow, I was striving to bring together all the information discussed in the Literature review for the best possible learning outcomes.

In my discussion of each lesson plan I used pseudonyms for the teachers. Ms. A refers to the teacher I first made contact with when looking for a location. She remained my primary guide and contact until she went on maternity leave a few months after I started coming to the school. Ms. D refers to the other teacher who was there for the entire year and became my primary contact after Ms. A left. The substitute teacher who came in to take over for Ms. A's class was called Ms. Q. None of the letters are indicative of the actual names of the teachers.

Math via Movement: Lesson Plan 1

Complement Everyday Math 1.5

Concept: Minimum, Maximum, Range, Median and Mode

Goal: Students will use their bodies either individually or in groups to demonstrate the concepts of Minimum, Maximum, Range, Median and Mode.

Activity: Students are given a list of number of various values with some of them listed more than once. They are asked to find the numbers with the least and most value, thus the minimum and the maximum. Students are asked how these numbers appear in relation to each other i.e. “how would the 7 look standing next to the 23 in this list of numbers?” Two students could volunteer, one showing how small the minimum looks by crouching down, and the other showing how big the maximum looks by standing tall (these demonstrations will vary depending on the student)

- Another option would be each student sitting at their desk and showing how small the minimum is with their hands ie. holding the index and thumb finger close together, and the maximum spreading all the fingers far apart.

Range, Median, and Mode – a group of students could hold a piece of paper with the number written on it and arrange themselves in a line in front of the room from order of least to greatest. They could further demonstrate the value of their numbers by adjusting the size of their bodies and postures. This would give an easy visual representation to the rest of class of the range of numbers, which the teacher could ask of the sitting students. They would also be able to easily see the median and the mode as represented by their

fellow students. For the students participating this will be an easy way to engage creativity and understanding as well as teamwork.

- Sitting students can also feel the range in their own bodies by keeping the hand signs of the minimum and maximum and spreading their arms in front of them to depict the size of the range from a body perspective. The standing activity can be done seated in this by using partners and working together to demonstrate the visual value line
- This activity can also be used to depict difference between two numbers, as in solving a subtraction problem, with minimum, maximum, range, and median implicit in the learning process.

Outcome: Students will work together to collaboratively come up with an understanding of these concepts while physically embodying them.

DMT Outcome: Students get to work on interpersonal skills while working as a team. They negotiate compromise while using their bodies to physically demonstrate the exercise.

DMT Principles: 4) Dance/movement is functional, expressive, and communicative. 10) Dance/movement is relational. 12) internal and external consciousness are both elicited through dance/movement. 14) Dance/movement is both the means of assessment and intervention tool.

SEL: 2A.1a. Recognize that others may experience situations differently from oneself; 2 C. 1 a. Identify ways to work and play well with others; 3A.2b. Demonstrate knowledge of how social norms affect decision making and behavior; C.1a. Identify and perform roles that contribute to one's classroom.

Reflections: 10/27. Even though this was the first lesson I wrote, it was not tried in class until several weeks after the students had initially learned the concept. When the circular curriculum came back around to minimum, maximum, median, mode and range, it became apparent that several of the students had not learned it the first time. Thus, the entire math period of this day was devoted to reviewing it for the sake of the upcoming test. This was one of the very few days when I observed the teacher addressing the entire class as a whole, rather than breaking into segmented groups. There was something interesting about the learning that occurred when all the students were addressed as a unit. Also this particular teacher had them get up and give each other high fives every time an answer was correct – increasing social support.

At some point during the class, I indicated to her that I had some ideas regarding this topic and using the body to support it. She was skeptical but open to me, and graciously gave me about five minutes toward the end of the period. My goal was to give the students a more meaningful sense of the concept by engaging them in a playful way that they could understand. For instance, the teacher was explaining the meaning of “range” by using a subtraction problem, but in my mind that was not really a complete depiction of the concept. I saw it as a spectrum of all the numbers that lie between two endpoints and felt that this could be demonstrated in the body. After it is known what a range of numbers means, then the subtraction problem becomes the easy way to find the answer.

When I was given my time with the students I felt extremely nervous because the teacher was closely observing me, and I only had about five minutes to tackle a concept which I knew would take more time. Nonetheless, I had several volunteer students stand up in a line across the front of the room to embody the list of numbers on the board. Instead of having them explicitly “act out” the numbers as dictated by my lesson, I had the students in the audience tell me who

was which number and what that meant. At one point I asked the median to jump up and down, then the modes to jump up and down. Once this was finished I briefly demonstrated for the students how they could feel the range in their bodies by spreading out their arms and legs. This was far too abstract as evidenced by the students' confused expressions and probably could have been left out altogether due to the time constraint. Perhaps if I had more time it would have been more effective to register with each student on an individual level. I noticed during this activity how beneficial it would have been to have a warm-up to get them into their bodies before diving in. Also I would have loved to discuss with them why the concepts of maximum, minimum, range, median, and mode are important in real life.

Math via Movement: Lesson Plan 2

Complement Everyday Math 2.5

Concept: Borrowing 10 in subtraction

Goal: Students will demonstrate their understanding of borrowing 10 in subtraction using creative role play with numbers

Activity: Break students into groups of three to five and give each group a subtraction problem such as twenty-seven minus nine, where the number of digits corresponds to the number of students in the group. Each student will receive a popsicle stick with a number attached to it from the mathematics problem. The groups will be asked to work together to devise a way to role play and explain to the class how to solve the problem using the concept of borrowing. They will be given extra paper to demonstrate their method as well as disclose the solution at the conclusion of the activity.

Example: In the mathematics problem twenty-seven minus nine, the student holding the number seven popsicle stick says, “Oh no! Nine is bigger than me so I cannot subtract it. I need to get help from my friend in the tens place.” Then he or she borrows ten from the person holding the two which represents twenty. Then the seven becomes seventeen and can subtract the nine. The person who was twenty now becomes ten and the answer is eighteen.

Alternatives: The student who gets tens borrowed from them can have a different number written on the other side of the popsicle stick, or hand out a notecard that says ten on it.

Outcome: Each group of students will perform their role play for the rest of the class in the front of the room. This can involve “acting it out” or using the board to demonstrate how they got the answer to the subtraction problem. After the group performs, another volunteer from the audience works the problem out on the board to verify the answer.

*Disclaimer – the original idea for this lesson was proposed by the third grade teacher of a CPS school. I then collaborated with her in facilitating the activity and writing up this lesson plan.

DMT Outcome: Students get to work on interpersonal skills while working as a team. They negotiate compromise and listening skills while using their bodies to embody a number with place value. Students have the option to use their bodies in relationship to others spatially, as well as taking on a “character” to demonstrate their personal impression of how a number would act towards others. This activity serves as a wonderful assessment for the teacher to observe each student’s inner world and perceptions regarding mathematics.

DMT Principles: 3) Neuropathways are triggered altered and created through movement fostering new behaviors and affective states. 5) Creativity is fostered and enhanced. 10) Dance/movement is relational. 12) Internal and external consciousness are both elicited through dance/movement.

SEL: 1C.2a. Describe the steps in setting and working toward goal achievement; 2A.1 b. Use listening skills to identify the feelings and perspectives of others; 2C.2b. Analyze ways to work effectively in groups; 2D.1 b. Identify approaches to resolving conflicts constructively;

Reflections: 10/02/14. This role play actually took place during the entire math period, and was the original idea of the teacher's. However, she was unsure as to how it would be facilitated and sought out my help and collaboration. I observed that this might have been slightly out of her comfort zone. What we did was break the students in groups of four giving them each a popsicle stick with a number on it. Each group had a different subtraction problem that needed to be solved and they were told to work together to "act out" the problem to find the answer.

The teacher and I had discussed this extensively before class and it seemed we had a good plan in place. However, we did not anticipate how the students' developmental level would affect the outcome of the activity. Many of the groups were confused about what they were supposed to do, as well as unable to work together. I walked around the room trying to support and facilitate as much as possible, but within twenty minutes several of the students were fighting and crying. We finally found a group who had figured it out and stopped the entire class in order to watch them demonstrate how they found a solution. This was very helpful in that now the students knew what they were "supposed to do." For the rest of the activity I continued to move throughout the room and facilitate the rest of the groups. I used imagery in order to make the solution more concrete. I asked therapeutic questions in order to help foster social emotional learning and collaboration. I would use open ended questions such as "what can (student) do next to help find the answer?" This got the students thinking about how they could work together more efficiently as a team. When one of the students would not cooperate or get frustrated, I would redirect him or her into team-oriented thinking processes.

Once the students figured out how to solve the problems they became much more creative and playful in their role-plays. At the end of the class when the problems were demonstrated, many of the groups actually acted them out completely differently while still

finding out the correct answer. The students showed their eager enthusiasm using rising advancing open postures as opposed to enclosing and retreating like many of them had been doing when they were unsure of the activity. The teacher was pleased with the outcome, though it was clear that she was unsure whether it had been an efficient use of time. She was upset that the students could not initially figure it out which, in her mind, made the activity seem like more of a failure rather than a working process. I saw the whole class as being a great learning experience both for us as facilitators and for the students as well. The initial struggle actually contributed to a richer outcome in my mind. After this day, however, this particular teacher pulled back from the creative ideas and did not try to incorporate any more of them herself.

Math via Movement: Lesson Plan 3

Complement Everyday Math 3.4

Concept: Perimeter

Goal: In tandem with the straw activity shown on pages 189-190, students will embody the concept of making polygons while using their bodies to create the shapes.

Optional Supplies: rubber disks and/or string

Activity: After the students have mastered the concept of what it means to create polygons with straws, break the class into two or three teams depending on the number of students.

Give them specific problems such as: make a trapezoid using x amount of units on each side. Designate one or two of the students on each team to be a leader. The rest of them will all start out by standing in a circle holding hands. It will be the leaders' jobs to create the shape out of the students in the circle without breaking the lines (each student represents one "unit" of space). Afterwards, the students can check their work by placing rubber disks where each one is standing, and outlining the shape with string

- This can be made into a game by setting a timer for the activity
- The "rule" of the activity is that all the members in the group can help with solving the problem. It is merely the leaders' jobs to create the shape without breaking the line.
- A good way to incorporate more movement into this activity is once the students have mastered a series of shapes, they can make a dance out of them flowing from one shape to the next while listening to music.

Outcome: Students will work together to solve the perimeter problems in a potentially time sensitive manner. There is the opportunity for experiencing mastery of this concept while feeling it in their own bodies, as well as taking pride in the outcome of the work.

DMT Outcome: Students get to work on interpersonal skills while working as a team. Each student is recognized as a unique entity who is important in creating the gestalt of the shape. Students will have to negotiate in making the perimeter while using listening skills and compromise. They will also be using their kinesthetic intelligence to embody an abstract representation of a concept.

DMT Principles: 3) Neuropathways are triggered altered and created through movement fostering new behaviors and affective states. 8) Dance/movement allows for a ritualization of experience. 9) Movement is the mediator between our internal perception and external reality. 14) Dance/movement is both the means of assessment and intervention tool.

SEL: 1C.2a. Describe the steps in setting and working toward goal achievement; 2A. 1b. Use listening skills to identify the feelings and perspectives of others; 3B.1b. Make positive choices when interacting with classmates; 3B.2a. Identify and apply the steps of systematic decision making;

Reflections: 10/06. This exact lesson was not done in class. However, early on in the school year, one of the teachers allowed me to work with the students for a few minutes while having them create polygons with their bodies while lying on the floor. The activity was completely her idea, but she had asked me to facilitate it in order to become better acquainted with the students. I was glad that she had given me this opportunity because it actually forced me to think of the concept in a different way. All of my lessons up to this point were conceived in upright standing

positions and more about spatial relationships to others. The act of putting their bodies on the floor in order to make the shapes, allowed the students to feel their bodies in connection to the ground while still maintaining a connection with others to create the polygon.

Ms. A was fond of using proprioception and tactile stimulation with her class. She felt that it was very important for the students to feel sensations in their bodies in relationship to the environment. In previous years she would take students outside to run laps so they could feel the ground beneath their feet. When I did this brief activity with her class, I was pleasantly drawn to their energy and enthusiasm. The students were eager to volunteer and then work together to figure out the shapes. They enjoyed the feeling of pleasing the teacher and accomplishing the task. I sensed the disappointment of the students who did not get picked, and wished I could have done this activity in a structured way so that everyone would get a turn. Although I am certain the onlookers benefited from the activity as well.

I was very aware of my body language during this activity; I wanted to make the most out of my time and build as much rapport with the students as I possibly could. I focused on making strong eye contact with the students as I gave them positive feedback while using open rising body posture. Subconsciously the teacher must have picked up on what I was doing because she had the students each make eye contact with me before they were allowed to go back to their desks. Her directive felt a little more forced and less organic, and it made me feel more nervous to look at the students even though I was smiling. I always felt Ms. A was intelligent when it came to body awareness and body language. She used her knowledge from a different perspective because her training as a teacher was very different from mine as a therapist.

Math via Movement: Lesson Plan 4

Complement Everyday Math 3.2

Concept: Measuring in inches, half inches, quarter inches

Goal: Students will demonstrate understanding of measuring in inches, half inches and quarter inches while using their bodies.

Activity: As the classroom discusses measuring in inches the teacher will lead the students in doing punches while calling out “one inch, two inch, three inch!” This can coincide with the measurement of an actual object. Then when the discussion moves to half inches the teacher will show the class how to do elbow hooks to represent the measurement. So if an inch represents a full punch, a half inch represents an elbow hook as the length of the arm is cut in half. The gesture will correlate to the actual measurement. The students can use these gestures when counting and measuring. If the teacher only wants them to think in half inches, they only use hooks while counting. Finally the quarter inches can be demonstrated by uppercuts as it is the smallest of the punching gestures. The teacher will be sure to show them the proper way to perform the moves, and not to direct them toward others.

- Students can work collaboratively in pairs or in groups to measure items and then punch it out. They can demonstrate the work for the teacher and their peers.
- Students can send the punches toward each other across the room using eye contact.

- This activity can also be performed in a circle with the students punching one at a time while counting out loud.

Outcome: Moving while learning increases the understanding of the concept in a different way.

It integrates the brain hemispheres while activating pathways of “math knowledge” inside the brain. Counting while punching becomes more memorable than counting alone.

*Disclaimer – This lesson plan is a variation of an actual activity used in the third grade class of a CPS school. Teacher invited students to explore what it would be like to go to a boxing match while counting and punching. Writer changed the activity to make the movements represent the actual measurements while encouraging students to work together to solve problems.

DMT Outcome: This activity augments self awareness and impulse control. Students have the opportunity to become more aware of their bodies and aware of their personal space while still working together with others. They also become more aware of other students while tracking the movement as it goes around the room. Concentration is necessary in order for the activity to be successful within the context of learning while moving. Teamwork is utilized in collaboratively presenting the solution of mathematics problems to the teacher and peers.

DMT Principles: 2) Body and mind are inseparable hence you can move the body to move the mind and vice versa. 6) Dance/movement is contagious and increases one's motivation for action. 8) Dance/movement allows for a ritualization of experience. 10) Dance/movement is relational.

SEL: 1A.1b. Demonstrate control of impulsive behavior; 2C.1b. Demonstrate appropriate social and classroom behavior; 3A.2a. Demonstrate the ability to respect the rights of self and others; 3A. 1b. identify social norms and safety considerations that guide behavior.

Reflections: 10/20 A version of this activity was done in class, pertaining to the measurement of inches, though was facilitated by the actual teacher of that class. (Ms. A) She used the punching activity while counting to get the students out of their seats and move their bodies while counting in inches. I observed that she was approaching the lesson from a fun standpoint, but the movement was only loosely related to what they were learning. Movement was also approached in this way during the movement breaks I observed throughout the day – furthering the mind/body split.

I began to wonder: How could we as facilitators make the movements themselves more meaningful and actually tie them into the lesson? I contemplated how it would be possible to make the movements themselves symbolize the actual measurements the students were learning about, thereby embodying the concept. I know from taking kickboxing classes that there are different kinds of punches that make different shapes in space and are of varying lengths. The longest length being a traditional punching motion could represent the longest measurement, the inch, and a half an inch could be represented using an elbow hook, effectively cutting the arm and space used in half. Finally I envisioned a quarter inch being symbolized by using an uppercut punching motion which uses the smallest amount of space and occurs closest to the body. To incorporate the SEL objectives I envisioned the lesson being much more collaborative and team oriented instead of having the class passively imitate the teacher. They could interact with each other using eye contact and increasing spatial awareness while using their bodies to

symbolize the concepts they were learning. This exact lesson was not tried in class but is an expansion of what I observed, and a visualization of what could be possible.

Math via Movement: Lesson Plan 5

Complement Everyday Math 3.7

Concept: Area

Goal: Students demonstrate the concept area by using their bodies to represent units in space.

Optional Supplies: rubber disks and/or string

Activity: Similar to the previous embodied lesson involving perimeter, students will make shapes while using their bodies in space. Instead of focusing on the outside of the shapes, they will focus on filling up the inside, with each body representing a “unit.” They can use the rubber disks as place-markers to check their work, or each stand inside the shape while another student traces the outline of the shape with string. Students can move around the inside area of a shape while counting in order to explore and feel the area for themselves. Also the teacher may give a directive such as, “Everyone make a connection with someone else while standing in the area.” This turns the activity into more of a game and brings in a teamwork component.

- if there are not enough students in the group to represent one unit, they may choose to expand their body stance to represent two. Also, instead of being used to check the work, the rubber disks may be used as placeholders for units
- The teacher will give each group a problem or set of problems with stipulations for what they need to create
- It will be beneficial for the groups to see other groups’ work and even assist in checking or correcting the answers collaboratively.

- As with the perimeter exercise, once the students become acquainted with the concept it might be interesting to see how quickly they can move from one shape to the next, or having them move to music with a fast or slow tempo.

Outcome: Students understand the concept of area on a different level because they are asked to embody the concept of area, rather than just discussing and thinking of it outside of the self. Also it will be potentially useful to embody and discuss understanding of the concept rather than just answering questions.

DMT Outcome: Students get to work on interpersonal skills while working as a team. For those students who have a difficult time explaining math concepts, this activity will be empowering to demonstrate them physically rather than verbally explaining. Enactment may also help to augment verbal processing. Students also engage in negotiating and listening to others in order to have a successful outcome while using spatial awareness skills.

DMT Principles: 4) Dance/movement is functional, expressive, and communicative. 8) Dance/movement allows for a ritualization of experience. 9) Movement is the mediator between our internal perception and external reality. 10) Dance/movement is both the means of assessment and intervention tool.

SEL: 1C.1b. Identify goals for academic success and classroom behavior; 2A.1b. Use listening skills to identify the feelings and perspectives of others; 2C.1b. Demonstrate appropriate social and classroom behavior; 2C.2b. Analyze ways to work effectively in groups.

Reflections: 10/25 Ms. D graciously allowed me to try lesson five briefly with one of her three rotations on the carpet during math class. This means that only a third of the class got to do it for approximately twenty minutes. The activity which was already being done on the carpet this day involved using plastic grids and putting little blocks of wood in them to learn about area, so at least the students were already working on a visual level. The group of students I got to work with were the lower performing group, and they were excited to be up and moving in their bodies for this activity. As in the popsicle role play from lesson two, at first we just gave directives and hoped the group could figure it out on their own. An example of this would be, “Standing in a group, make me a rectangle that is two by three people.” Again the students struggled to figure it out and could not do so without actually being shown what to do. However, once they had been told how to do it a few times, then they succeeded in working together to solve one on their own. It was fun to see how their creativity played out, as they did things I did not expect such as lying on the floor to build a perimeter and then filling the inner space to find the area. The students insisted on using every person in the group to solve the problem even if there were extra people.

I was again intrigued at how much the students relied on the teacher and I to help them solve the problems initially. I assumed that this was based on their developmental level, but part of me wondered if they struggled to work collaboratively because they were hardly engaged in this way. Perhaps using their bodies, while working together, and solving a problem in an abstract way was too much for them at first; but based on how quickly they figured it out and how enthusiastically they solved the later problems, I felt that the third graders could succeed with less direction if they were approached with this method regularly. It was unfortunate to see the other groups of students watching us work out of the corners of the room, and then be told

that they did not get to try the activity. I suspect that each consecutive group would have gotten better and better after observing their peers.

Math via Movement: Lesson Plan 6

Complement Everyday Math 3.9

Concept: Diameter and Circumference

Goal: Students will demonstrate their understanding of the circumference and diameter of a circle by embodying these concepts.

Optional Supplies: string to make an outline of a circle, and/or rubber disks for counting units.

Activity: Students will learn a math song and dance for creating circles on the floor. The song is spoken aloud as follows: “We are making circles (pause four beats for children to say whatever they like such as “oh yeah, oh yeah”) We are making circles (oh yeah, oh yeah).” Then they hold their hands up saying “How big is the circumference? How big is the circumference?” Students point to where they are in space and begin counting, “One two three etc” until they reach the starting point, jump and say “done.” The next part, the students jump with their feet apart and arms spread saying, “We cut it in half,” then they march in place twice while saying “diameter.” Repeat. Then they say “Jump!” and go to one side to start counting the length of diameter. Again when finished saying “done.”

- This activity can be done solo, using one foot as the center point and tracing the circumference with their other foot. The counting should be done while making little chugs with the outside foot, and the diameter should be counted on tip-toe.
- A partner can be used to trace the circle with string, and also to check the work. Not everyone’s circle will be the same size because of different body sizes.

Teacher can clarify by establishing the circle ahead of time with string, or giving set parameters

- This activity can also be completed as a class while the kids walk in a circle and take turns jumping up during the counts. One specific student will be nominated to jump across the circle. In this case the song can be repeated multiple times.

Other Activity Options: Doing something similar to lesson 3.4, have the students hold hands and each represent a unit in space while making circles and diameters. This could be done in teams, and students can check the other team's answers.

- Also the rubber disks could be arranged in a circle and students could jump on them while counting to understand the concept of circumference and diameter.
- Other students can stomp and clap while counting and watching those perform the activity. This will augment classroom support and deepen understanding.

Outcome: Students will increase their understanding of diameter and circumference while feeling the meaning of each concept in their bodies. Students will also need to rely on their peers to check work and be part of a team, thereby working on interpersonal skills and social/emotional intelligence simultaneously.

*Disclaimer – the original inspiration for the song and dance came from YouTube video:

<http://www.youtube.com/watch?v=YAjp5noDVE0>

DMT Outcome: Students improve on self awareness and impulse control while using their bodies to create a circle and then measure it. Students also work effectively while engaging in rhythmic group activity with the entire class.

DMT Principles: 4) Dance/movement is functional, expressive, and communicative. 9)

Movement is the mediator between our internal perception and external reality. 15)

Dance/movement may enhance one's sense of autonomy, self-control, mastery and self-esteem.

16) Dance/movement defines congruency between verbal/non-verbal integration.

SEL: 1A.1b. Demonstrate control of impulsive behavior; 1C.1b. Identify goals for academic success and classroom behavior; 3A.1b. Identify social norms and safety considerations that guide behavior; 3B.1b. Make positive choices when interacting with classmates.

Reflections: This is one of my favorite lessons. I demonstrated it to one of the intervention specialists, but it was not tried in class. My inspiration for this lesson came from a youtube video I had found prior to the research poster session at Columbia College. I wanted to find a way to make a dance and a song for the students to perform together while either making a circle as a class or individually. This lesson feels like more of what is typically considered to be dance, while still incorporating a math component.

Math via Movement: Lesson Plan 7

Complement Everyday Math 4.1

Concept: Layers of Multiplication

Goal: Students will use their bodies to understand the concept of multiplication.

Suggestion: Create a number grid on the floor from zero to nine, large enough that at least a few students can stand inside each designated number at a time.

Activity: Section 4.1 talks about solving problems of equal groups. Teacher breaks gives the entire class a set of problems and works collaboratively with them to find the answers. They should start simple such as: How many times does two go into ten? The goal is for ten students to get up and problem solve with guidance from the teacher and the rest of the class. Eventually they will break up into five sets of two in the front of the room. Then they can jump up in pairs saying, “two, four, six, eight, ten!”

- The number grid can be used to augment understanding; each pair of students can stand in a number to plainly demonstrate the five sets of two. The teacher could then ask them what would happen if they were in groups of five instead of two, and the students would have to rearrange to put five students in the “one” and “two” gridmarks on the floor.
- As the students continue to solve problems, their understanding of how to use the number grid will improve as they further understand the concept of multiplication. The teacher can break the class into teams and keeps score of how many problems they answered correctly, or keep score of the time used to answer the questions.

- For the larger multiplication problems, students can jump multiple times for instance: 8×7 , one student can stand in the one on the grid and jump eight times holding a piece of paper that says eight. Then they pass it to the next student in the two who jumps eight times, until they get to the answer: 56

Outcome: Doing multiplication in this way will encourage students to work as a team to creatively solve problems. When they are broken into teams they will enjoy the competitive aspect of being more efficient in their problem solving, while expending energy in movement.

DMT Outcome: Students get to work on interpersonal skills while working as a team. They utilize listening skills and compromise while using their bodies to solve multiplication problems. Each student experiences embodying a number within the solution of the problem, making them each accountable for the collaborative learning of a new concept. Students must compromise with others in order to make the solution successful.

DMT Principles: 4) Dance/movement is functional, expressive, and communicative. 9)

Movement is the mediator between our internal perception and external reality. 15)

Dance/movement may enhance one's sense of autonomy, self-control, mastery and self-esteem.

16) Dance/movement defines congruency between verbal/non-verbal integration.

SEL: 1C.1b. Identify goals for academic success and classroom behavior; 2B.2b. Demonstrate how to work effectively with those who are different from oneself; 3A.1b. Identify social norms and safety considerations that guide behavior; 3B.1b. Make positive choices when interacting with classmates.

Reflections: 11/20 I did not get to actually try this lesson in class but on November 20th I was asked to go sit in on the “intervention specialist” group, a group of about eight of the lower performing kids. At least two of them were Hispanic girls, one of the students was a girl with a learning disability, and the rest of them were boys who were either hyperactive or withdrawn. At first I decided to merely observe the teacher struggle to keep them on task. Her tactic was to describe multiplication as repeated addition, i.e. if you count to six and then add it to six that would be the same thing as six times two. To me, this way of looking at multiplication was more confusing than actually trying to grasp the concept of multiplication as I understood it.

Prior to having this class, I had come in early and met with one of the teachers to discuss ways in which to tackle multiplication. Her idea was to talk about “skip counting” while jumping up and down the stairs – this had gotten me thinking about moving in intervals as such. I noticed that they were presenting with hyperactive unfocused energy while being silly and noisy, and two of them were completely quiet. Then I checked in with myself and noticed how the hyperactive silliness was affecting me, and also how I felt in response to the students who were withdrawn. I pondered, how could I engage them in a way which would include everyone and also make use of the energy they are already displaying?

I indicated to the flustered teacher that I had an idea of how to facilitate what she was teaching them. She graciously allowed me to have them all stand up in a line across the room. Before we started the activity I had the students take three deep focus breaths, because I did not really have time to do a warm-up. Since they were working on multiplying by sixes I told each of the students that they represented the number six. I walked down the line and said “You are six times one, you are six times two, etc.” Then I created a game on the spot where they would all

have to work together. Each of the students had to do jumping jacks while counting (my version of skip counting) then when he or she got to the given interval of six, that person had to strike any pose they wanted and hold it while the next person did jumping jacks while counting. Thus, the first student posed at six, the second student posed at twelve and so on. I asked them to hold the poses until the entire group was finished, and while each student was jumping, I held up my fingers so that person would know when they had reached six.

When they were finished, I said “Now what did we learn?” I went down the line and said, “Six times one is ____, six times two is ____” I let the corresponding student answer because they remembered which number they had stopped on. What I liked about this impromptu activity was that all the students had to rely on each other to complete the set, and everyone was able to do it, even the student with the learning disability. The silly poses gave each child a chance to express their individuality and they were able to feel what focused stillness was like in their bodies as they held the pose until everyone was finished.

Math via Movement: Lesson Plan 8

Complement Everyday Math 4.2 – 4.3

Concept: Layers of Multiplication

Goal: Students will use their bodies to understand the concept of multiplication.

Suggestion: Create a number grid on the floor from zero to nine, large enough that at least a few students can stand inside each designated number at a time.

Activity: As students become more familiar with the concept of multiplication and their knowledge of math “facts” increases, the movement activities can become even more creative. Students can hold hands in multiples and jump together along the number grid. For example, three students can hold hands and jump along the grid while saying out loud, “three times one is three, three times two is six” or even just saying the simple words of “three, six, nine, twelve etc.” In this way, students who are having a more difficult time with multiplication will increase their understanding as they move together with their peers. Those children who struggle more with conceptualizing while not moving will have the benefit of moving while learning and speaking out loud.

- Allow children to come up with movements to symbolize numbers, such as stomp right “one” stomp left “two” slap thighs “three” clap hands “four” snap fingers “five” etc. The dance can go all the way up to nine or ten, as far as the teacher wants to take them. They can dance to music while saying the numbers or thinking them. Eventually the goal will be to only say the answer. For

example $4 \times 4 =$ stomp right, stomp left, slap thighs, clap hands four times at the end, the students say “sixteen!”

For Brain Integration and Memory: Students stand in a circle and have a ball that they can easily bounce to one another. It might be useful to give them time to bounce the ball around the circle making eye contact before the activity begins. This activity should be used once the math facts are fairly familiar to them. Once the game begins, students bounce the ball across the circle while multiplying. For example the first student bounces the ball to classmate saying, 2×2 and the person who catches it says 4. If the person who catches it says the wrong answer they must bounce it back to the first student while the whole class says the correct answer. Then they start over.

- The goal is to get the ball moving smoothly around the circle and go as long as possible without having to start over.
- This activity inherently improves SEL as the students must make eye contact before bouncing the ball
- While the arm gestures will not be symbolic of the numbers, using motion while learning will help to neurologically ingrain the information and make it more explicitly available to awareness.

Outcome: Students must learn how to communicate verbally as well as non-verbally. All of these activities are designed for the students to help each other as a group, thus creating cohesion and interpersonal support.

DMT Outcome: Students learn how to experience mastery of a concept while using their bodies and working together with others. Interpersonal skills are inherently fostered within the

team-oriented activities, and students augment spatial awareness in relationship to their peers. These activities also involve engagement of impulse control because students will need to focus in order to complete the task.

DMT Principles: 3) Neuropathways are triggered altered and created through movement fostering new behaviors and affective states. 9) Movement is the mediator between our internal perception and external reality. 15) Dance/movement may enhance one's sense of autonomy, self-control, mastery and self-esteem.

SEL: 1C.2a. Describe the steps in setting and working toward goal achievement; 2C.1b. Demonstrate appropriate social and classroom behavior; 2C.2b. Analyze ways to work effectively in groups; 3A.1b. Identify social norms and safety considerations that guide behavior;

Reflections: 12/15 and 12/18 The brain integration and memory segment of Lesson 8 was tried extensively with the entire third grade class. I worked with small groups between six to eight students for approximately fifteen minutes each in both classrooms. The activity took place in the hallway outside the classrooms, so there was a slight noise issue and the space was not as enclosed as I would have liked it to be. My goal was to start with a brief warm-up and then move into the ball circle toss activity. However, I did not use an actual ball, I used a silk scarf tied into a ball which was easy to throw but would not cause noise or have the potential to break things. (I frequently used silk scarves in my clinical work for internship). Every single group of students was completely different, based on selection of gender and how the students related to each other and myself.

I tried to start each group by going around and saying names while giving me a pose. Then I had the students take focus breaths. For a warm-up we did the dimensional scale, which

is a movement scale according to Laban that increases mental stability (Moore, 2009) and I explained to them that this was going to help them focus on the activity. I had them shake all their limbs and then said, “pick a hand and put it out in front of you.” Each student chose a hand and put it in the middle of the circle. I then had them use whichever hand they chose to go “up and down, across and away, backward and forwards.” After I led them through the scale once I would ask three different students to lead us in each of the three different components. This was similar to what I had observed with the teachers asking them to “stand and teach” during classes. They did not execute the scale perfectly, but I did not take the time to correct anyone, as long as they were focused and participating that was all I cared about.

After the warm-up I quickly taught them the multiplication game using the scarf, and I let them pick a number to multiply by. Some groups did the number five and some groups were up for a challenge, even going as high as doing the number eight. Inevitably I ran out of time with each group, only briefly being able to do the game for about five to seven minutes. I tried so hard to keep the warm-up brief, but I knew how important it was and there was no clock in the hallway to help me gauge my time.

As I progressed through all the groups in both classes the process became easier and went more smoothly. I began to start each group with the students standing in a circle and pressing hands together. This helped to both create the shape of a circle and give them a proprioceptive focus point as the unstructured hallway space led them to be more hyperactive at first. After about the third group or so, I re-designed the game on the spot to configure to the space of the long hallway. Instead of having the students remain in a circle for the duration, I had them stand in two staggered lines facing each other. I then started with the first student on the far end, having him or her say for example, “six times one,” then throwing the scarf diagonally across the

hallway to the next student who said, “six.” After the second student answered correctly, the first student would begin walking towards him or her to take the place, and the second student would say “six times two,” and throw the scarf diagonally across the hall again. The goal was for the second student to move before the first student arrived, and the scarf would move diagonally down the hall. When it got to the last student, he or she was to run back to the beginning and either start over or keep going with the same progression.

I found that the more direct and nonverbal I was with the students, the better the activity went. Modifying the activity to fit the space was also very helpful; it felt more like the activity was supposed to occur in the hallway, rather than trying to make the students behave while standing in a circle in the hallway. I would have liked to have at least twenty to thirty minutes with each group, in order to calm them down after learning the game, and do a little debriefing afterwards. The dimensional scale was used for stability and focus. I tried to do the jumping jack game from the previous week with a group of students who were particularly hyperactive, but it did not work as it was a different space and an entirely different group of students.

Math via Movement: Lesson Plan 9

Complement Everyday Math 4.4

Concept: Beginning Division

Goal: Students will use their bodies in space to begin to develop an understanding of the concept of division.

Activity: Teacher maps out a large area of the room that is the designated “space” for the activity. He or She gives the students an image to guide them such as, “This is the tank for the fishes to swim in,” or “This is the field for the horses to play in.” Whatever metaphor or image for the class is appropriate will work. Then, the teacher invites the students to enter the space as horses or fishes, whatever story they are going with. The students begin to move around the space being mindful of each other and careful not to run into each other. Then the teacher says something like, “quick! Divide yourselves in half, the fisher (or farmer) is coming!” Then the students have to rapidly decide how get themselves into two groups.

- There might be a student left over if the class is not an even amount of kids, then that student gets to join the teacher in the front and help count the students to make sure they are equally divided.
- The teacher does more rounds of this activity, having them divide into various numbers: two, three, four, five etc. Every time there is a student left out they come to the front and help count, or even take on the role of the “fisher” or the “farmer.” Eventually the teacher can put them back in with the other students.

Subsequent Activity: This original activity can become more complex, with the teacher dividing the class into teams. When there are less students in each group, the teacher provides them with number cards so each student can be accountable for being a different number instead of just being considered as one fish or one horse.

- The story can also change, so now they are logs rolling down a hill. Students get down on the ground and roll for numbers. For example, the teacher gives a group of five students the problem: 15 divided by 5. The students roll around on the floor figuring out how to solve the problem. For instance, three students could roll five times to get fifteen, or each of the five could roll three times to get fifteen.
- After they get the answer, the group can demonstrate for the others, using movements. The movements represent the numbers.

Outcome: By engaging students in a playful way, the teacher enters their worlds while fostering an understanding of division. Students must be accountable for themselves in space, and once they have to be accountable for more than one number, they must creatively problem solve as teams to find ways of representing numbers for division purposes.

DMT Outcome: Completing this activity successfully will involve significant impulse control at this developmental level. Students collaborate with peers using teamwork skills to divide themselves into equal groups. This involves a team effort and focused spatial awareness to be divided into equal numbers of people. Most notable to DMT is the creativity that gets expressed while students are allowed to move throughout the space becoming fish or horses, or any number of metaphors the teacher chooses to implement.

DMT Principles: 3) Neuropathways are triggered altered and created through movement fostering new behaviors and affective states. 4) Dance/movement is functional, expressive, and communicative. 5) Creativity is fostered and enhanced. 14) Dance/movement is both the means of assessment and intervention tool.

SEL: 1A.1b. Demonstrate control of impulsive behavior; 2A.1a. Recognize that others may experience situations differently from oneself; 2C.1b. Demonstrate appropriate social and classroom behavior; 2D.1b. Identify approaches to resolving conflicts constructively; 3B.1b. Make positive choices when interacting with classmates.

Reflections: This lesson is a creative spin-off of the iPad game the class was playing to learn the beginning concept of division. The difference was that on the game, the students were asked to divide groups of bricks or bundles of flowers into equal groups using their fine motor skills. On the day that I was observing this class and sitting with the students on the iPad, one of the Hispanic female students very politely described to me what the game was and what she was supposed to do. It was very clear to me that she already understood the concept of division as well as what the game entailed. I then watched as she struggled and failed to complete the game repeatedly; she lacked the fine motor skills and spatial awareness to be able to manipulate the instrument to her advantage. Her frustration and defeat were evident. My activity would have given her an option to demonstrate her understanding of division using her whole body, while increasing her spatial awareness skills and self-esteem, as well as connection with her peers.

Math via Movement: Lesson Plan 10

Complement Everyday Math 5.1

Concept: Place Value to Ten-Thousands (and up)

Goal: To learn a game embodying the concept of place value in mathematics.

Activity: Students will break into teams and be given lists of numbers going up to the ten thousands and beyond. The lists can be the same or different. Each team of students will stand in a line shoulder to shoulder and will embody a place value such as tens, hundreds, thousands etc. Each student will understand his/her responsibility for their number. The smallest “place value” person will be given a two to five pound medicine ball. Either the teacher or one of the team members holds a card with one of the large numbers; then the person in the lowest place value says their number and swings the medicine ball in front of the body like a pendulum from one side to the other and hands it off to the next person who says their number and so on. The object of the game is to get the ball to the highest place value and have everyone say the total number together before the other team does. The highest place value then runs to the end of the line and it starts over. This can be used as a competition with a list of several large numbers to see which team will finish their list of numbers first.

Outcome: Students will augment their understanding of place value while working together as a team, and taking individual responsibility for a unit of an entire number. The game aspect will add competition and fun while increasing concentration because time will be at stake. On a movement level, each student will improve gross motor skills while

feeling the “weight” of the medicine ball and their importance to the team on a psychosocial level.

DMT Outcome: Students get to work on interpersonal skills while working as a team. They negotiate compromise while using their bodies to physically demonstrate the exercise. On a movement level, each student will improve gross motor skills while feeling the “weight” of the medicine ball and their importance to the team on a psychosocial level. This activity will also help to improve gross motor coordination skills while augmenting learning pathways in the brain because of using arm movements.

DMT Principles: 1) Dance/movement is communication. 6) Dance/movement is contagious and increases one's motivation for action. 10) Dance/movement is relational. 11) Dance/movement is stabilizing and mobilizing.

SEL: 1A.1b. Demonstrate control of impulsive behavior; 1C.1b. Identify goals for academic success and classroom behavior; 2C.2b. Analyze ways to work effectively in groups; 3A.1b. Identify social norms and safety considerations that guide behavior.

Reflections: 1/22 and 1/26 I got to try this idea extensively with two groups of students from the two classes. Unfortunately not all of the students had the opportunity of learning the activity, only two groups of approximately eight students learned it for about fifteen minutes on different days. The first time this lesson was executed in the hallway, but because of the open space and time constraint it was not very effective. The students were loud and silly but they were also very kinesthetic and excited about using the medicine ball as well as working together as a team. They were a mix of both boys and girls, and at least three of them had been in my earlier lesson

with the jumping jacks. Because there was such a small amount of them, I chose not to break the group in teams, but rather have them stand in a line down the hallway, telling each student which place value he or she represented ie tens, hundreds, thousands, etc. I held up note cards with various numbers written on them such as, 25,117 and the team of students had to pass the ball while swinging in downward motion to the next student while saying their place value. For instance, the third student would say “100,” then when the medicine ball got to the last student, they all said the entire number together.

Since time had been such an issue for the multiplication lesson, I brought my phone with me for this lesson and set a timer on it. The first group was actually able to execute a few numbers after I quickly taught them the concept of the “game.” I expected them to struggle with the movement aspect while verbally saying the numbers, but they were surprisingly coordinated using the medicine ball.

As I demonstrated the movement to the students they were all concentrating and focusing, then quickly mimed back to me what I had done without even thinking about it. It struck me at how easy it was for the students to execute a movement in comparison to how much I had watched them struggle while sitting at their desks to understand certain concepts. They also remained focused throughout the duration of the activity once they understood the lesson because they had to depend on each other to complete the activity as a team. I designed this lesson using the medicine ball and the swinging motion in order to get the students to feel their weight. I saw the swinging as bringing them into the horizontal plane to relate to the other students while still feeling their significance of being a weighted integral aspect of the whole, in this case, large number. This is relevant on a psychosocial as well as social emotional level, using the body and movement as a medium for the learning.

The second group of students I tried this lesson with consisted of all boys. This time I was able to take them into an empty classroom which was normally reserved for special learning groups. Naturally the activity went a lot more smoothly this time as I was more prepared, and the space was more enclosed. For the second time around I decided to make another set of note cards to place on floor saying ones, tens, hundreds, etc. to signify to the students where they should stand and what they represented. As in the first group I brought my phone to set a timer, but did not spend much time checking in or warming up. We collectively took three big focus breaths while standing in a circle and pressing hands together. The group of boys presented new challenges from the first group because they tended to be aggressive with the medicine ball and more hyperactive in general. However, they learned the concept of the game even more quickly than the first group and eagerly tried to execute it as quickly as possible. I decided to cope with their energy by modulating them in time. I would present them a new number to try but say things like, “show me how slowly you can move the ball, as if you are moving through water.” This kept the game interesting and challenging for the students, but also toned down their energy and helped them focus. The second group particularly enjoyed getting the ball to the end of the line, where they would all yell the number simultaneously as loud as they could. Had I more time to work with them, I would have modulated their noise level, like I had modulated their use of time previously.

Math via Movement: Lesson Plan 11

Complement Everyday Math 5.6

Concept: Exploring Polygons

Goal: Students will demonstrate their knowledge of various polygons using teamwork and their bodies to create the shapes.

Supplies: String or yard tied together at the ends, big enough to stretch and manipulate – or a large circular stretch band that can be twisted and manipulated any way.

Activity: Break students into four teams and give each team a string or a stretch band to work with. Give each team a shape to start with such as a square and tell them that the rules are once they make the shape, they can't let go of the string. The teacher goes around to each group and approves the shape then tells them the next one to shift into such as a rhombus. The team then has to negotiate how to make the rhombus without letting go of the string. If they let go, they must start over. The teacher may have them make as many shapes as time will allow and the team that finishes first gets a prize. If necessary the teacher may appoint people to monitor the groups – helping them and making sure they follow the rules.

Outcome: Students will work together and focus on their bodies while controlling their impulses to make various polygons utilizing the string or stretch band. They will improve fine motor skills and social emotional skills.

DMT Outcome: Students get to work on interpersonal skills while working as a team. They negotiate compromise and impulse control in order to not let go of the string. This

activity entails activation of creative problem solving, as well as improvement of fine motor skills.

DMT Principles: 2) Body and mind are inseparable hence you can move the body to move the mind and vice versa. 9) Movement is the mediator between our internal perception and external reality. 11) Dance/movement is stabilizing and mobilizing. 14) Dance/movement is both the means of assessment and intervention tool.

SEL: 1A.1b. Demonstrate control of impulsive behavior; 2B.2b. Demonstrate how to work effectively with those who are different from oneself; 2C.1b. Demonstrate appropriate social and classroom behavior; 2D.1b. Identify approaches to resolving conflicts constructively.

Reflections: This lesson was not tried in class. My conception of this was to activate the proprioceptive as well as fine motor capacities within the students because my last lesson had been so much about teamwork and gross motor control. Theoretically, if the students had been allowed to go through each lesson of my curriculum, by this time in the school year team work may have been an easy concept for them to grasp. Thus, this lesson might have been a beautiful exercise of students really deepening their understanding of polygons while relying on their peers to complete the activity. Ideally I visualized this lesson being performed with a giant stretch band, in order for the students to really feel how their bodies contributed to the essence of the shape. The challenge would be then how to shift from one shape into the next one while still retaining the integrity of the polygon. Opportunities presented in this lesson include: impulse control, teamwork, focus, and of course fine motor skills.

Math via Movement: Lesson Plan 12

Complement Everyday Math 5.7 – 5.8

Concept: Exploring Decimals to Tenths and Hundredths

Goal: Students will demonstrate their understanding of decimals using the money analogy as well as their bodies to embody the numbers.

Supplies: Large container of change as well as place markers to put on the floor signifying dollars, tenths and hundredths.

Activity: Break students into teams of three or four people each. Every student will represent either a dollar, a tenth or a hundredth. The fourth student will either rotate in, or be responsible for facilitating the group. Either the fourth student or the teacher will throw a bunch of change on the floor and the group will gather it to count it up. When they decipher how much change there is the students will go to their designated spots and the “dollar” student will jump for as many times as there are dollars for example saying. “two dollars” and jumping twice. If there are no dollars, he or she will bend his or her knees saying “zero dollars” and come back to standing. Next the student who represents the tenths will tap his or her foot on the floor saying “three tenths” and tapping three times. The last student will also tap his or her foot but instead of straight down it will be shoulder width apart, similar to second position in ballet. After they go through this progression once, the students will push their hands together and repeat the whole thing in unison three times. Once this all is finished, either the fourth student or the three of them joined together must say “two dollars and thirty-six cents,” or whatever their total was. Then they can begin again.

Outcome: Students will practice counting money as well as demonstrating their understanding of decimals. Working in teams, they will reap the gratification of creating little “decimal dances” based on the money they counted. Each student plays a role on the team and as they master this activity, the roles can be rotated.

DMT Outcome: Students get to work on interpersonal skills while working as a team. They must use impulse control in order to complete the activity successfully. Because they are working together to create a dance that has rhythm, students must attune to others nonverbally and use spatial awareness to achieve this goal.

DMT Principles: 4) Dance/movement is functional, expressive, and communicative. 5) Creativity is fostered and enhanced. 8) Dance/movement allows for a ritualization of experience. 9) Movement is the mediator between our internal perception and external reality.

SEL: 1A.1b. Demonstrate control of impulsive behavior; 1C.1b. Identify goals for academic success and classroom behavior; 2C.2b. Analyze ways to work effectively in groups; 2D.1b. Identify approaches to resolving conflicts constructively;

Reflections: 2/12 This lesson was not tried in class. It was presented to the teachers on the day my project was terminated. I loved this and was looking forward to trying it – this lesson seemed functional, and from my observations of previous classes the students understood place value, but were struggling with decimals. I thought the money metaphor would be helpful in making this connection as well as allowing students to demonstrate their grasp of the concept. The tapping on the floor aspect came from my background as a tap dancer, however, it also reminded me of a conversation with Ms. A at the beginning of the school year where she

disclosed that she felt it was important for students to run and feel the sensation of their feet on the pavement.

Chapter Five: Discussion

This thesis process was such a fortunate occurrence, as I was so lucky to be able to find a school that was willing to give me even the smallest amount of their precious time. As such, I feel that I was only able to begin exploring my first question: How does movement affect third/fourth grade math students' abilities to take in and retain information at a public school setting? My approach to the facilitation of learning was new for both the teachers and the students. Once I was able to meet the students on more of a purely kinesthetic level, they were able to pick up the activities quickly as indicative of their developmental level (D'Innocenzo, 2014; Johnson, 2005; Zimbardo, Johnson, & McCann, 2006). The teachers were always open and kind throughout the process, but generally skeptical about the activities and how they could be proven to be effective.

One epiphany occurred via e-mail when I was discussing with Ms. D about how my lessons were meant to address the "whole child" psychosocially, as well as developmentally. She agreed that considering the whole child is important for learning (school staff, personal communication, Jan 15-22nd, 2015). In this way, I was discovering more about who I was as a therapist and what my goals for the curriculum actually were – perhaps this brought up new things for the teachers as well. The students did show enthusiasm for the activities I was able to attempt, and in some instances such as November 20th when I sat in on the lower performing class and improvised an activity, they did seem to benefit from the movement as well as team-oriented thinking.

Right around the same time as the e-mail communication I discussed, the students took a national test which indicated that most of them were actually over-performing beyond their curriculum to a fourth grade level, whereas approximately nine students were struggling. This

presented the teachers with new challenges and they were forced to terminate my participation on February 12th. The termination was due to the fact that they now had to justify every lesson plan based on test scores, and because my activities were not quantifiable in the moment, they did not fit into the new agenda. In some ways I felt like both the students and the teachers were being punished by this predicament, because the teachers now had to take all the fun activities out of math class. The school also had to hire a new intervention specialist to come into the classroom and make sure everyone's needs were being met. I did not meet the new intervention specialist, but to my knowledge this person was only certified in special education and did not use educational practices that were informed by movement integrated learning.

On April 30th 2015 I returned to the school to do an exit interview with the teachers to see how everything was going and also receive feedback about the development of my curriculum. They had ended up switching their math curriculum to Engage NY which is based more on common core standards, Engage NY. (2016). Common Core Curriculum. [webpage] retrieved from <https://www.engageny.org>, and involves exploring concepts more deeply and analytically. The teachers said that they were trying to do movement at the beginning of each lesson, but that the students were struggling to connect the movement with the math concepts. They said they valued my presence in the classroom, but would have appreciated if my lessons were incorporated into theirs or just occurring in smaller time increments. As we talked I marveled at how much teaching is similar to facilitating therapy groups. All of the students are at different levels and the teachers must navigate executing lessons that work for everyone. The teachers strive to come to work with a clean happy slate because the students are intuitive and can pick up on their emotional cues, and the teachers must also be capable of embracing not knowing what a class is going to be like or what is going to happen during the school year as evidenced by this

experience.

The true potential value I thought my work could have brought to the classroom was the incorporation of the SEL component into the daily learning routine as guided by my second question: How can social-emotional interventions change the experience of third grade students learning mathematics? As discussed in the literature review, Illinois was the first state to enact SEL standards after the Children's Mental Health report was released in 2003 (Gordon, Ji, Mulhall, Shaw, & Weissberg, 2011). These developmentally informed education practices were designed to essentially bring emotional intelligence into the classroom to enhance academic performance and overall school success (p. 71). From my perspective as a dance/movement therapist, SEL is easily incorporated and is an inherent component of the movement practices which characterize traditional DMT.

The teachers I collaborated with were offered no specific training or materials about the implementation of SEL, even though they were well aware of the mandates. They only ever engaged with the students in a manner that brought attention to emotions, during my observations, if a problem or a conflict arose during the class period. Paradoxically, I felt this was similar to the way in which the students engaged with their own bodies during the movement breaks which occurred a few times throughout the day. During these movement breaks, the teachers would let the students select a video to follow along with from www.gonoodle.com and they would dance around the room with reckless abandon while laughing and watching the video. The teachers knew that movement was good for the students, but I felt like they were only following protocol in offering these movement breaks. I understood that it was recuperative and that children need to be children, however, I saw this activity as furthering the mind/body split that is so prevalent in American society.

One day while I was watching the students jump around during a movement break it occurred to me that there was no intentionality in this activity. The students did not know why they were doing it or how it would benefit them. I thought about how students get to college and use their bodies in excess to escape the stress of everyday life. What I was proposing with my thesis was the use of the body as an intervention for learning, in order for the students to realize that they are integrated beings and that the body could be used to affect the mind in a positive and productive manner – thus, connecting the body to the mind rather than using it as a way to escape reality and thought temporarily. I would have liked to foster more inter and intrapersonal connection between the students using group exercises that would have augmented both emotional intelligence and mind/body integration simultaneously.

Finally, regarding my last question: How can academic counseling informed by body movement and awareness benefit the facilitation of learning mathematics? I found this aspect, though not fully realized, was the most effortless one to impart in the classroom. This was the piece about being therapeutic – being a dance/movement therapist. Shortly after I began coming to the classes students noticed that I engaged with them on a different level than their respective teachers. I told myself that I was only there for the sake of learning and not to do therapy, but because I made an attempt to connect to the students on a body-based level, they instinctively trusted me and would come to me with questions about the lessons. I saw this as a testament to the untapped potential of incorporating the body into the totality of the learning experience, but I also felt that my training in psychology gave me an edge that the teachers were not even offered when the SEL mandates came out. This could be a happy liaison between two different fields if the American education system were open to it. After I had attempted a few of my lesson plans in brief sessions I informally asked one of the students one day how he liked moving during

class. He told me a whole story about how playing catch with his dad helped him to memorize things, and how he enjoyed using his arms during learning. When I did the exit interview, the teachers told me that they felt like education in general was moving towards incorporating movement into the classroom. In my mind, it is only a matter of time.

I did not get to delve deep enough into my work to see if my lesson plans made a difference therapeutically or academically. I think that might take at least a year of implementation as well as more quantitative means of evaluation to determine. However, I can say that there were moments of clarity from a purely qualitative perspective of myself as a dance/movement therapist. Quite possibly my favorite moment was on November 20th, when I improvised the activity with the lower performing students and the one student who was designated as learning disabled was able to be a part of the group and contribute to their cohesive understanding of the lesson. One of my inherent goals throughout the process was to create circumstances where everyone could be a necessary part of the learning process and contribute to the overall comprehension as a class. This comes from a therapeutic standpoint that each individual has strengths, that every person is here for a reason, and that everyone has something to offer the collective including classroom knowledge.

It would have been nice to explore the curriculum more deeply, especially regarding the social emotional learning aspect, as well as the movement aspect. Had I been able to formulate a stronger relationship with the students, there may have been more of a creative collaborative outcome much like the geometry dances discussed in the literature review (Moore and Linder, 2012). Also the math via movement activities could have been correlated to test scores similar to the study reviewed regarding dance/movement therapy and test anxiety (Erwin-Grabner, Goodill, Hill, and Von Neida, 1999). This would have been the perfect opportunity to include more of the

therapeutic aspect of DMT as well as potentially increasing self-awareness and self regulation in and among the students as a group. Because of my strong background in tap dance and the easy translation of rhythms to numbers and patterns in mathematics, it would have been fascinating to create multiplication dances with the students similar to the numbers dances the Australian primary teacher implemented in her classroom (Wood, 2008). This might have served to strengthen the memorization of multiplication facts among the students while also fostering a cohesive group learning experience much like that of a traditional dance/movement therapy group.

Most of the downfalls of this process naturally had to do with time constraints as well as lack of a way to evaluate my program in a way that would translate to the bureaucratic nature of the school system. I could intuitively sense when I was connecting with the students and my activities were helping them, but there was no way to quantitatively measure it on the spot. One day when I was speaking with Ms. D about this topic, she said she could relate to me because she knew as a teacher when she made a difference for her students – she referred to her intuition as “spidey sense.” It was not always easy to explain to administrators what about her lessons were working and why. I would have loved to get more feedback from the students themselves, however, that was not feasible within the limitations of this thesis.

Within the first week of coming to the classroom at the school, I came face to face with the dilemmas encumbering CPS. Before the students came back from lunch and recess, I always spent approximately twenty minutes in the faculty lounge. On October 2nd I encountered several substitute teachers who told me about being displaced or laid off from their jobs. This occurred regardless of tenure, and one of them even told me that she received the notification via e-mail. She had come from a pool of approximately three hundred out-of-work teachers looking for a

job. Another teacher had come from a lower performing school where he claimed the bar for performance was set too high for the school to meet, after it had cleared the previous year's standards. He also claimed that the school had operated on only half the staff it needed to be successful. I could not help but think that this stress the teachers carried only added to the stress of the students to perform well on academic tasks.

Before I even began coming to the classrooms, I had informally interviewed the teachers about the nature of my thesis as well as about their students. I had asked them ahead of time if they noticed any cultural disparities pertaining to achievement in math class. At that time, Ms. A indicated that they almost always had trouble getting through to third grade level Hispanic girls for some reason. I actually noticed and witnessed this several times during my observation of the classes. One day when the lesson was regarding mean, median, and mode, there was a little girl who thought mode meant "most" and therefore the largest number, rather than the number that happens "most often." Frequently, the students who came to ask me questions happened to be the Hispanic girls, which made me wonder if there was something about the way I was relating to them that made a difference on a cultural level. It would be interesting to explore the cultural implications of a movement curriculum in future studies.

Finally, I thought it was interesting that the emotional aspect of learning was almost disregarded much of the time. The teachers were aware of SEL, and they made an effort to get the students excited about taking their daily math tests, but there was never really a discussion about how it felt to do mathematics or take daily tests. Emotions were only addressed if they came up, or they were negative and disrupted the classroom. Positive emotions and experiences were never really discussed either. One of the admirable exercises I noticed was executed by one of the teachers was that she took a poll of her students about how they liked mathematics

before the school year began. She allowed me to read these responses, and they ranged from, “I love math because it always teaches you new things,” to “I felt like I was going to fail,” and “I don’t think math is for me” (personal communication, September, 25th). I thought this was a beautiful gesture ripe with opportunity for growth and expansion, but wondered if there was ever any follow-up after the initial survey.

Summary

The purpose of this curriculum development project was to incorporate emotional intelligence into a third grade classroom from the perspective of a dance/movement therapist, while observing the connection between movement and learning. The three questions that guided this process were: How does movement affect third grade math students’ abilities to take in and retain information at a public school setting? How can social-emotional interventions change the experience of a third grade student learning mathematics? How can academic counseling informed by body movement and awareness benefit the facilitation of mathematics?

The results of this process were only tentative inklings, and were more about my development as a dance/movement therapist than about making conclusions and proving effectiveness. The product was a curriculum of twelve lesson plans that were devised to complement a curriculum and a classroom trajectory at a third grade level. My attempt was to bridge the realms of dance/movement therapy and education, as well as address a whole new domain of learning: the emotional aspect, and the body mind connection. I saw this as a way to expand the horizons and practical application of the body/mind connection in dance/movement therapy, as well as perhaps improving academic outcomes simultaneously.

It was clear throughout the process that several of the students looked forward to the movement integrated learning experiences. In one clear instance it was evident that the

improvised activity helped bring a collection of eight students together, while helping each other to understand the concept of multiplication. The developmental level of the students was a clear factor in their comprehension of the activities, and time constraints were often a barrier to deeper learning. It was apparent that the kinesthetic learning style did not appeal to all of the students, but the relational aspect of social emotional learning almost always did.

In this thesis I sought to pursue a less explored horizon and practical application of my dance/movement therapy training. Though the program development for curriculum project was not about facilitating therapy per se, it could be argued that the activities were therapeutic when considered from a cognitive emotional learning perspective. This endeavor was more in the area of preventative wellness than post-diagnosis psychological intervention. The literature has indicated that if emotional and developmental needs are addressed in an early education context (Boekaerts, 2007; D’Innocenzo, 2014; Foyle, Lyman, & Thies, 1991; Glasser, 1986; Johnson, 2005; Katz, 1988; and Meekums, 2008), then learning outcomes may be improved and students who perceive themselves as successful will be less likely to engage in destructive behaviors later in adolescence (Beilock, 2008; Elias et al., 1997; Greenberg et al., 2003; Linnenbrink, 2007; Pasi, 2001; Pekrun et al., 2007; Ramirez et al., 2012; Turner & Waugh, 2007).

This project was born from the realization that the body is not merely a placeholder or receptacle for the mind, but rather is inherently connected and serves as an extension of the mind. The mind/body connection is one of the foundational principles which guides the efficacy and practice of traditional dance/movement therapy. Therefore, the body can be used as a tool for change within individuals. Why has this change not pertained to cognitive clarity and understanding of abstract concepts? Body movement is a universal language that translates across cultures and brings people together in group settings. Why could body movement not be

used in a classroom setting to bring together students from various backgrounds for the sake of learning?

Neuroscience has demonstrated the effect of movement on strengthening neuropathways within the brain as well as connecting the hemispheres (Hanna 2015; Hannaford, 1995). This thesis also discussed the ways in which early emotional regulation within the brain can either strengthen or weaken neural connections which set up students for success later in life (Schoore, 1994; Schoore, 2003). Emotional intelligence has been found to be a key indicator of success in the corporate workplace (Clarke, 2010; Seema, 2012) and classes enriched with social emotional learning practices have been associated with higher academic performance (Elias et al., 1997; Elias, & Arnold, 2006; Greenberg et al., 2003; Hatch, & Kornhaber, 2006; and Pasi, 2001). I would like to postulate that these outcomes may be executed using a dance/movement therapy modality at an early education level.

Throughout the unfolding of this thesis experience my ideas were clarified and the identity and belief in myself as a dance/movement therapist was brought into clearer form. I more deeply understood the connections between movement and learning, but was continually humbled by the emotional and group aspect of the classroom context. Perhaps this was so much more poignant because of the grade level of the students. I have known for a long time about the healing characteristics of the emotional and group processes in dance/movement therapy, and while this thesis does not present a solution to the problem of education in America, maybe it explores an untapped resource that could be a part of the collective and cultural healing of the education system.

If I could go back and execute my ideas in a way that would be more research and outcome based, I would have to formulate more specific questions. I may ask: How can

movement integrated learning practices informed by dance/movement therapy affect the performance of classrooms at an early education level? Performance would undoubtedly be defined by test scores and comprehension levels of the students, but what I have learned is that there is a whole deeper realm that underlies academic performance even in early childhood. Students could be misunderstanding their teachers on a cultural level, or even feel inadequate about asking questions and reaching out for help. Because movement is a universal language that transcends boundaries, it could be used as a tool to bring students together and make them feel more empowered in their learning experiences.

Students who feel successful and integrated within their bodies as well as within and among their peers and teachers, may be more likely to move forward and achieve to a higher potential later in life. Thus, the reach of dance/movement therapy practices and the power of the body to affect cognition extend further than just the classroom context. Therefore I would like to propose a few more questions which look at the preventative wellness aspect of this work. How can dance/movement therapists impact individuals in a way that is reparative to early trauma, but occurs before potential destructive behavior happens based on poor adaptive functioning in the classroom context? How can the field of dance/movement therapy be used as a preventative measure to benefit the outcomes and functioning of general society as a whole? The formulation of these questions was unexpected, as I had no idea this thesis was about preventative wellness when I began. I knew there was something effective about using movement to support learning, but I had not anticipated what the emotional aspect was going to teach me. As in life, true realizations cannot be rushed because they unfold perfectly, at the right time, like a lotus flower.

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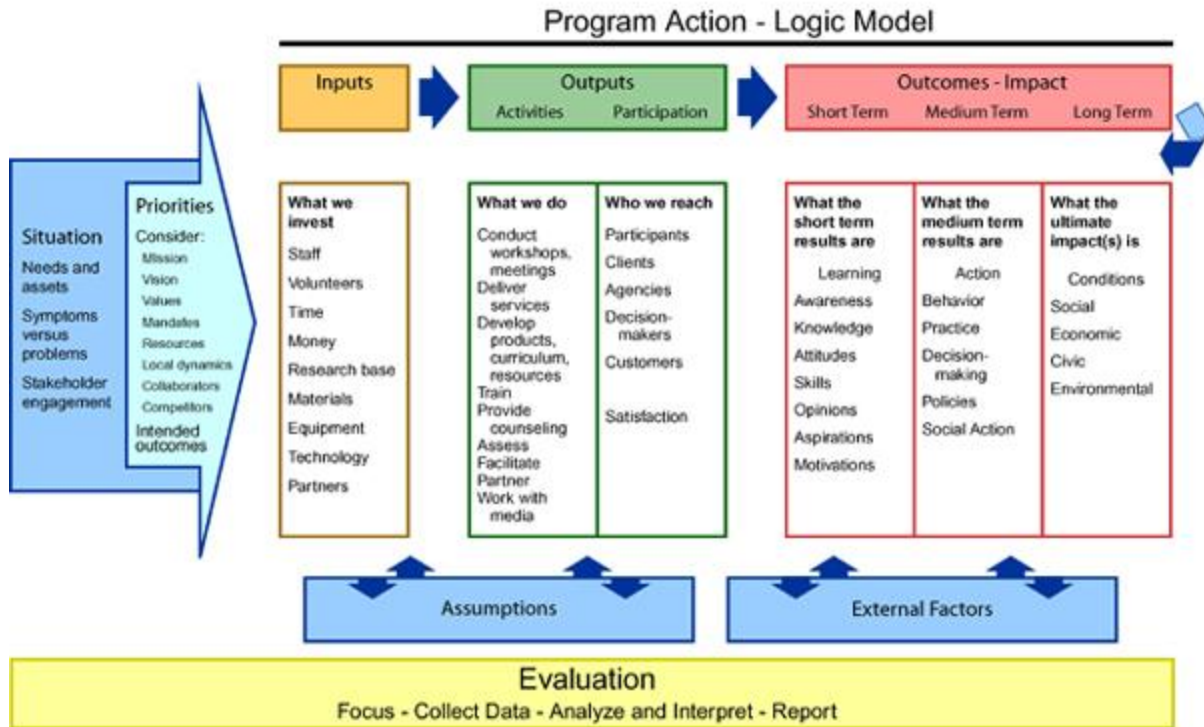
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Appendix A

The Logic Model



retrieved from <http://www.uwex.edu/ces/pdande/progdev/>

Appendix B

DMT Principles Handout

DMT Principles

Shared Beliefs and Values

- Dance/movement is communication
- Body and mind are inseparable, hence you can move the body to move the mind and vice versa.
- Neuropathways are triggered, altered, and created through movement, fostering new behaviors and affective states.
- Dance/movement is functional, expressive and communicative.
- Creativity is fostered and enhanced.
- Dance/movement is contagious and increases one's motivation for action.
- Movement reflects the personality.
- Dance/movement allows for a ritualization of experience.
- Movement is the mediator between our internal perceptions and external reality.
- Dance/movement is relational.
- Dance/movement is stabilizing and mobilizing.
- Internal and external consciousnesses are both elicited through dance/movement.
- Dance/movement is an extension system and helps define culture.
- Dance/movement is both the means of assessment and intervention tool.
- Dance/movement may enhance one's sense of autonomy, self-control, mastery, and self-esteem.
- Dance/movement defines congruency between verbal/non-verbal integration.
- Dance/movement fosters beauty.
- Meaning making may occur through dance/movement.
- Dance/Movement Therapists trust the wisdom of the body.

retrieved from a classroom handout at Columbia College Chicago

Appendix C

Re-typed DMT Principles with Numbers for Correlation

DMT Principles

- 1) DANCE/MOVEMENT IS COMMUNICATION.
- 2) BODY AND MIND ARE INSEPARABLE HENCE YOU CAN MOVE THE BODY TO MOVE THE MIND AND VICE VERSA.
- 3) NEUROPATHWAYS ARE TRIGGERED ALTERED AND CREATED THROUGH MOVEMENT FOSTERING NEW BEHAVIORS AND AFFECTIVE STATES.
- 4) DANCE/MOVEMENT IS FUNCTIONAL, EXPRESSIVE AND COMMUNICATIVE.
- 5) CREATIVITY IS FOSTERED AND ENHANCED.
- 6) DANCE/MOVEMENT IS CONTAGIOUS AND INCREASES ONE'S MOTIVATION FOR ACTION.
- 7) MOVEMENT REFLECTS THE PERSONALITY.
- 8) DANCE/MOVEMENT ALLOWS FOR A RITUALIZATION OF EXPERIENCE.
- 9) MOVEMENT IS THE MEDIATOR BETWEEN OUR INTERNAL PERCEPTION AND EXTERNAL REALITY.
- 10) DANCE/MOVEMENT IS RELATIONAL.
- 11) DANCE/MOVEMENT IS STABILIZING AND MOBILIZING.
- 12) INTERNAL AND EXTERNAL CONSCIOUSNESS ARE BOTH ELICITED THROUGH DANCE/MOVEMENT.
- 13) DANCE/MOVEMENT IS AN EXTENSION SYSTEM AND HELPS DEFINE CULTURE.
- 14) DANCE/MOVEMENT IS BOTH THE MEANS OF ASSESSMENT AND INTERVENTION TOOL.
- 15) DANCE/MOVEMENT MAY ENHANCE ONE'S SENSE OF AUTONOMY, SELF-CONTROL, MASTERY AND SELF-ESTEEM.
- 16) DANCE/MOVEMENT DEFINES CONGRUENCY BETWEEN VERBAL/NON-VERBAL INTEGRATION.
- 17) DANCE/MOVEMENT FOSTERS BEAUTY.
- 18) MEANING MAKING MAY OCCUR THROUGH DANCE/MOVEMENT.
- 19) DANCE/MOVEMENT THERAPISTS TRUST THE WISDOM OF THE BODY.

Appendix D

SEL Mandates for Correlation

Social Emotional Learning Standards

retrieved from http://www.isbe.net/ils/social_emotional/standards.htm

Goal 1: Develop self-awareness and self-management skills to achieve school and life success.	Why this goal is important: Several key sets of skills and attitudes provide a strong foundation for achieving school and life success. One involves knowing your emotions, how to manage them, and ways to express them constructively. This enables one to handle stress, control impulses, and motivate oneself to persevere in overcoming obstacles to goal achievement. A related set of skills involves accurately assessing your abilities and interests, building strengths, and making effective use of family, school, and community resources. Finally, it is critical for students to be able to establish and monitor their progress toward achieving academic and personal goals.				
	Early Elementary	Late Elementary	Middle/Jr. High	Early High School	Late High School
A. Identify and manage one's emotions and behavior.	1A.1a. Recognize and accurately label emotions and how they are linked to behavior.	1A.2a. Describe a range of emotions and the situations that cause them.	1A.3a. Analyze factors that create stress or motivate successful performance.	1A.4a. Analyze how thoughts and emotions affect decision making and responsible behavior.	1A.5a. Evaluate how expressing one's emotions in different situations affects others.
	1A.1b. Demonstrate control of impulsive behavior.	1A.2b. Describe and demonstrate ways to express emotions in a socially acceptable manner.	1A.3b. Apply strategies to manage stress and to motivate successful performance.	1A.4b. Generate ways to develop more positive attitudes.	1A.5b. Evaluate how expressing more positive attitudes influences others.
B. Recognize personal qualities and external supports.	1B.1a. Identify one's likes and dislikes, needs and wants, strengths and challenges.	1B.2a. Describe personal skills and interests that one wants to develop.	1B.3a. Analyze how personal qualities influence choices and successes.	1B.4a. Set priorities in building on strengths and identifying areas for improvement.	1B.5a. Implement a plan to build on a strength, meet a need, or address a challenge.
	1B.1b. Identify family, peer, school, and community strengths.	1B.2b. Explain how family members, peers, school personnel, and community members can support school success and responsible behavior.	1B.3b. Analyze how making use of school and community supports and opportunities can contribute to school and life success.	1B.4b. Analyze how positive adult role models and support systems contribute to school and life success.	1B.5b. Evaluate how developing interests and filling useful roles support school and life success.
C. Demonstrate skills related to achieving personal and academic goals.	1C.1a. Describe why school is important in helping students achieve personal goals.	1C.2a. Describe the steps in setting and working toward goal achievement.	1C.3a. Set a short-term goal and make a plan for achieving it.	1C.4a. Identify strategies to make use of resources and overcome obstacles to achieve goals.	1C.5a. Set a post-secondary goal with action steps, timeframes, and criteria for evaluating achievement.
	1C.1b. Identify goals for academic success and classroom behavior.	1C.2b. Monitor progress on achieving a short-term personal goal.	1C.3b. Analyze why one achieved or did not achieve a goal.	1C.4b. Apply strategies to overcome obstacles to goal achievement.	1C.5b. Monitor progress toward achieving a goal, and evaluate one's performance against criteria.

Goal 2: Use social-awareness and interpersonal skills to establish and maintain positive relationships.	Why this goal is important Building and maintaining positive relationships with others are central to success in school and life and require the ability to recognize the thoughts, feelings, and perspectives of others, including those different from one's own. In addition, establishing positive peer, family, and work relationships requires skills in cooperating, communicating respectfully, and constructively resolving conflicts with others.				
	Early Elementary	Late Elementary	Middle/Jr. High	Early High School	Late High School
A: Recognize the feelings and perspectives of others.	2A.1a. Recognize that others may experience situations differently from oneself.	2A.2a. Identify verbal, physical, and situational cues that indicate how others may feel.	2A.3a. Predict others' feelings and perspectives in a variety of situations.	2A.4a. Analyze similarities and differences between one's own and others' perspectives.	2A.5a. Demonstrate how to express understanding of those who hold different opinions.
	2A.1b. Use listening skills to identify the feelings and perspectives of others.	2A.2b. Describe the expressed feelings and perspectives of others.	2A.3b. Analyze how one's behavior may affect others.	2A.4b. Use conversation skills to understand others' feelings and perspectives.	2A.5b. Demonstrate ways to express empathy for others.
B: Recognize individual and group similarities and differences.	2B.1a. Describe the ways that people are similar and different.	2B.2a. Identify differences among and contributions of various social and cultural groups.	2B.3a. Explain how individual, social, and cultural differences may increase vulnerability to bullying and identify	2B.4a. Analyze the origins and negative effects of stereotyping and prejudice.	2B.5a. Evaluate strategies for being respectful of others and opposing stereotyping and prejudice.
	2B.1b. Describe positive qualities in others.	2B.2b. Demonstrate how to work effectively with those who are different from oneself.	2B.3b. Analyze the effects of taking action to oppose bullying based on individual and group differences.	2B.4b. Demonstrate respect for individuals from different social and cultural groups.	2B.5b. Evaluate how advocacy for the rights of others contributes to the common good.
C: Use communication and social skills to interact effectively with others.	2C.1a. Identify ways to work and play well with others.	2C.2a. Describe approaches for making and keeping friends.	2C.3a. Analyze ways to establish positive relationships with others.	2C.4a. Evaluate the effects of requesting support from and providing support to others.	2C.5a. Evaluate the application of communication and social skills in daily interactions with peers,
	2C.1b. Demonstrate appropriate social and classroom behavior.	2C.2b. Analyze ways to work effectively in groups.	2C.3b. Demonstrate cooperation and teamwork to promote group effectiveness.	2C.4b. Evaluate one's contribution in groups as a member and leader.	2C.5b. Plan, implement, and evaluate participation in a group project.
D. Demonstrate an ability to prevent, manage, and resolve interpersonal conflicts in constructive ways.	2D.1a. Identify problems and conflicts commonly experienced by peers.	2D.2a. Describe causes and consequences of conflicts.	2D.3a. Evaluate strategies for preventing and resolving interpersonal problems.	2D.4a. Analyze how listening and talking accurately help in resolving conflicts.	2D.5a. Evaluate the effects of using negotiation skills to reach win-win solutions.
	2D.1b. Identify approaches to resolving conflicts constructively	2D.2b. Apply constructive approaches in resolving conflicts.	2D.3b. Define unhealthy peer pressure and evaluate strategies for resisting it.	2D.4b. Analyze how conflict-resolution skills contribute to work within a group.	2D.5a. Evaluate the effects of using negotiation skills to reach win-win solutions.

<p>Goal 3: Demonstrate decision-making skills and responsible behaviors in personal, school, and community contexts.</p>	<p>Why this goal is important: Promoting one’s own health, avoiding risky behaviors, dealing honestly and fairly with others, and contributing to the good of one’s classroom, school, family, community, and environment are essential to citizenship in a democratic society. Achieving these outcomes requires an ability to make decisions and solve problems on the basis of accurately defining decisions to be made, generating alternative solutions, anticipating the consequences of each, and evaluating and learning from one’s decision making.</p>				
	<p>Early Elementary</p>	<p>Late Elementary</p>	<p>Middle/Jr. High</p>	<p>Early High School</p>	<p>Late High School</p>
<p>A: Consider ethical, safety, and societal factors in making decisions.</p>	<p>3A.1a. Explain why unprovoked acts that hurt others are wrong.</p>	<p>3A.2a. Demonstrate the ability to respect the rights of self and others.</p>	<p>3A.3a. Evaluate how honesty, respect, fairness, and compassion enable one to take the needs of others into account when making decisions</p>	<p>3A.4a. Demonstrate personal responsibility in making ethical decisions.</p>	<p>3A.5a. Apply ethical reasoning to evaluate societal practices.</p>
	<p>3A.1b. Identify social norms and safety considerations that guide behavior.</p>	<p>3A.2b. Demonstrate knowledge of how social norms affect decision making and behavior.</p>	<p>3A.3b. Analyze the reasons for school and societal rules.</p>	<p>3A.4b. Evaluate how social norms and the expectations of authority influence personal decisions and actions</p>	<p>3A.5b. Examine how the norms of different societies and cultures influence their members’ decisions</p>
<p>B: Apply decision-making skills to deal responsibly with daily academic and social situations.</p>	<p>3B.1a. Identify a range of decisions that students make at school.</p>	<p>3B.2a. Identify and apply the steps of systematic decision making.</p>	<p>3B.3a. Analyze how decision-making skills improve study habits and academic performance.</p>	<p>3B.4a. Evaluate personal abilities to gather information, generate alternatives, and anticipate the consequences of</p>	<p>3B.5a. Analyze how present decision making affects college and career choices.</p>
	<p>3B.1b. Make positive choices when interacting with classmates.</p>	<p>3B.2b. Generate alternative solutions and evaluate their consequences for a range of academic and social situations.</p>	<p>3B.3b. Evaluate strategies for resisting pressures to engage in unsafe or unethical activities.</p>	<p>3B.4b. Apply decision-making skills to establish responsible social and work relationships.</p>	<p>3B.5b. Evaluate how responsible decision making affects interpersonal and group relationships.</p>
<p>C. Contribute to the well-being of one’s school and community.</p>	<p>3C.1a. Identify and perform roles that contribute to one’s classroom.</p>	<p>3C.2a. Identify and perform roles that contribute to the school community.</p>	<p>3C.3a. Evaluate one’s participation in efforts to address an identified school need.</p>	<p>3C.4a. Plan, implement, and evaluate one’s participation in activities and organizations that improve school climate.</p>	<p>3C.5a. Work cooperatively with others to plan, implement, and evaluate a project to meet an identified school need.</p>
	<p>3C.1b. Identify and perform roles that contribute to one’s family.</p>	<p>3C.2b. Identify and perform roles that contribute to one’s local community</p>	<p>3C.3b. Evaluate one’s participation in efforts to address an identified need in one’s local community.</p>	<p>3C.4b. Plan, implement, and evaluate one’s participation in a group effort to contribute to one’s local community.</p>	<p>3C.5b. Work cooperatively with others to plan, implement, and evaluate a project that addresses an identified need in the broader community.</p>

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