2019

The Impact of Planned Purposeful Movement on Student Achievement in English Language Arts

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THE IMPACT OF PLANNED PURPOSEFUL MOVEMENT ON STUDENT ACHIEVEMENT IN ENGLISH LANGUAGE ARTS

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A Dissertation Submitted to the
Gardner-Webb University School of Education
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

Gardner-Webb University
2019

Approval Page

This dissertation was submitted by Molly J. Dibble under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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Acknowledgements

This dissertation is evidence of the amount of support I have received during this journey. First and foremost, I want to thank my husband, Geronimo Blancaflor, who encouraged me to pursue this dream when I was not sure about it myself and demonstrated extreme patience throughout the whole process. I want to thank my parents, Paul and Jeaniene Dibble, who have always supported my drive for education and in life in general. To my extended family, thank you for your ongoing support in this and every challenge I seek.

I began this journey of continued education with two gifted ladies, LaToya Gantt and Carrie McKeown, who started with me in the master's program at Gardner-Webb University. Together we decided to enter the doctoral program. Sadly, LaToya's body did not let her finish the program. I hope she is looking down with pride, as she was often my inspiration to keep persisting. Carrie, thank you for your support, meetings at your house, laughs, and your ongoing friendship. Karen Garmon, for whom I am so thankful, joined our group after being included in our cohort; thank you for your continued support, motivation, and grittiness. I am blessed to have experienced this program with you three brilliant ladies; this journey would have been incomplete without you. Karen Styers, I am so glad that our cohorts were combined so I had the chance to get to know you. You helped me get through parts of this program when I did not know where else to turn. To my entire cohort, you ladies are fabulous, and I am honored to have spent 2 years studying with you.

To my extended family and friends, I appreciate your understanding of numerous declines to invitations and missed calls and texts in the last 2 years. Keiran McClarren,

you were pivotal in me being able to complete my dissertation study. Thank you for your friendship and the work you put in for me to achieve this dream. To the school and teachers who housed my study, thank you for allowing me in your school.

My chair, Dr. Clark, I cannot imagine anyone else leading me through this process. Your ongoing support and feedback have made me a better writer, researcher, and student. Thank you for all the time you spent reading and editing my work. Dr. Parker, Dr. Greer, Dr.Wesson, thank you for sharing your knowledge with me these past 2 years. Dr. Palermo, thank you for sharing your knowledge, but also thank you for leading our cohort through a very tough season. Thank you to my committee members, Dr. Lamb and my old friend Dr. DeWaele. I appreciate your time and advice.

Last, I want to thank my school family. To all the teachers I work with, thank you for your ongoing encouragement. To my administration team at school, Elaine Hofmann, Tim Belton, and Stephen Howe, you all have endured me being a first-year assistant principal and a doctoral candidate at the same time. I appreciate your support, understanding, patience, and encouragement. I hope to bring what I have learned to aid the continuous improvement of our school, district, and beyond.

Abstract

THE IMPACT OF PLANNED PURPOSEFUL MOVEMENT ON STUDENT ACHIEVEMENT IN ENGLISH LANGUAGE ARTS. Dibble, Molly J., 2019: Dissertation, Gardner-Webb University

Ongoing research has pointed to the human brain's need for movement, yet the average student spends the majority of the school day sitting. Research links brain-based learning with improved student achievement. The intent of this study was to answer two questions: What is the impact of including planned purposeful movement in English language arts instruction on student achievement while using a district-mandated, scripted curriculum; and does planning for the inclusion of movement strategies in lesson plans impact the use of movement strategies in instruction? In this mixed methods study, qualitative data from teacher interviews were collected and merged with quantitative data from assessment scores, quarter grades, and teacher surveys to find the strength of the impact. Participants included three elementary, fourth-grade teachers at one elementary school in a large urban school district in North Carolina. This study introduced using planned purposeful movement within a district-mandated, scripted curriculum. Correlations between planned purposeful movement and student achievement in common assessments was not found (-0.075 Spearman's rho). Correlations between planned purposeful movement and student achievement in quarter grades was found and is statistically strong (0.834 Spearman's rho). Teacher interviews also pointed to a correlation between planned purposeful movement and student achievement. The descriptive data used to study the relationship of planning for movement and the use of movement in instruction found that teachers were likely to use movement when they

planned for it.

Keywords: action-based learning, planned purposeful movement, learning modalities

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Chapter 1: Introduction

The average student sits for 4.5 hours every school day (Grauer, 2013). Not only is this harmful to students' health, it is also detrimental to their learning (Ainslie et al., 2015; Bright, n.d.). The importance of physical activity to learning was recorded in Plato's (1943) writing, *The Republic*. Plato said,

> For these two, then, it seems there are two arts which I would say some god gave to mankind, music and gymnastics for the service of the high-spirited principle and the love of knowledge in them—not for the soul and the body except incidentally, but for the harmonious adjustment of these two principles. (Book 3, p. 411e)

Plato's common-sense thoughts about movement and learning would eventually be supported by modern neuroscience. Many practices used in education today are contrary to neuroscience (Jensen, 2008). Brain-based learning theory considers how the brain learns best. Jensen (2008) said, "Brain-based education is the engagement of strategies based on principles derived from an understanding of the brain" (p. 4). Giving the brain an appropriate environment in which to learn is a core facet of brain-based learning. "No intelligence or ability will unfold until, or unless, it is given the appropriate model environment" (Jensen, 2008, p. 6). The use of planned purposeful movement (PPM), engaging students in content through movement, provides the brain with such an environment (Lyding, 2012). PPM is rooted in brain-based learning theory and takes into account how most students' brains prefer to learn, therefore improving student achievement.

The increase in formal assessments has exacerbated the issue of teachers not instructing in the modality needed by most students (Jensen, 2008). Not only has this

culture of assessment changed the way teachers plan and instruct, it does not fully assess students and ignores key brain principles (Jensen, 2008). These assessments ignore variables such as nutrition, sleep, and stress, all of which impact students during testing (Jensen, 2008). Learning is temporal and does not always adhere to the schedules placed by testing; with some learning there is a time lag, while other learning occurs instantly (Jensen, 2008). Learning can take on many forms through use of different modalities such as kinesthetics, visual, auditory, or a combination. "Learning is embedded in diverse and multiple pathways. Some associative, some location, some emotional" (Jensen, 2008, p. 225); however, learning is often only assessed with paper and pencil, not considering the students' strengths and how they might best display their knowledge. Only a small percentage of what students learn is from the typical semantic lesson in class (Jensen, 2008). Semantic learning requires repetition and needs to be made meaningful to the students to accomplish long-term retention (Jensen, 2008). The brain learns better by making mistakes than through rote memorization that tends to take place in semantic learning (Jensen, 2008). Students also learn and recall better or differently in one environment than another (Jensen, 2008). When students are testing, however, environment and modality are mostly ignored.

Jensen (2008) described how a student can be misidentified as a poor reader through testing. He said that if one were to dig deeper, he/she may find that the student actually reads better than 90% of his/her peers, but the student may be underchallenged, the reading may lack meaning to the student, or the student may be afraid to make a mistake (Jensen, 2008). After scoring low on the test, the reader may be grouped with "lower readers" and now perceives him/herself as a poor reader and associates negative emotions with reading (Jensen, 2008). If the student had been assessed in a way that used

brain-based learning principles, the student may have developed a different attitude towards reading. The challenge is bridging teaching strategies that are in accordance with brain-based learning and the student's ability to demonstrate knowledge on standardized assessments. While as a whole, standardized assessments do not adhere to brain-based learning principles, they serve three purposes:

1. Objectivity – Assessing students with the same questions, under like conditions.
2. Comparability – Objectivity yields comparability of student achievement.
3. Accountability – Holds schools, teachers, and students accountable for their learning (Churchill, 2015).

Because standardized assessments fill the three needs listed above, they will likely remain an integral part of education. This leaves a hole between how students learn best and how they are assessed.

Statement of the Problem

There is a general misunderstanding of how to best provide instruction for the majority of our students, as the assessment culture has a firm hold in education today (Blaydes, 2016; Kuczala, 2016; Lyding, 2012). The problem is being able to teach students in a fashion that they learn best while remaining in the confines mandated by public education. Eighty-five percent of all students are kinesthetic and almost 100% of students from poverty rely on their kinesthetic strengths (Blaydes, 2016). After teaching students in the best modality for their individual brains, educators must then help students to translate their knowledge on standard assessments that do not use the same modality. PPM can be used in conjunction with traditional teaching methods and guided curriculums to aid students' ability to learn material. Purposefully planning for

movement in instruction uses brain-based learning principles, leading to students' deeper understanding of the material, which can then be displayed on a standard assessment.

Background, Context, and Theoretical Framework for the Problem

Brain-based learning theory. Brain-based learning theory is teaching and learning in a way that is compatible with how the brain is naturally designed to learn (Jensen, 2008). The advancement in technology (computerized axial tomography [CAT] scans, functional magnetic resonance 3 imaging [fMRI], and positron emission tomography [PET] scans) that allows scientists to observe the brain performing tasks, including learning, have brought scientific proof of brain-based learning theory (Sousa, 2011). Before this technology was available, scientists could only look at the brain postmortem. Scientists now know that the brain has plasticity, the ability to change, and continually reorganizes itself based on input (Sousa, 2011). While this reorganization, neuroplasticity, occurs throughout life, it is more rapid in young brains (Sousa, 2011). "Thus, the experiences the young brain has in the home and at school help shape the neural circuits that will determine how and what that brain learns in school and later" (Sousa, 2011, p. 5). Educators are now becoming aware of the neuroscience of learning and the implications it has for schools and classrooms (Sousa, 2011). Incorporating brain research into daily teaching practice to improve the quality of learning is beginning to take hold in many schools, although there are still skeptics (Sousa, 2011).

Brains of students are developing rapidly; therefore, it is important for educators to consider neuroscience when planning for instruction and use kinesthetic activities to attain and sustain student attention. Research indicates that using a variety of senses stimulates brain connections, and these connections influence what and how a child learns (Medina, 2014). Sousa (2011) explained that the quality of transfer that occurs

during new learning is dependent on the quality of the original learning. "If the original learning was well learned and accurate, its influence on new learning will be more constructive and help the student toward greater achievement" (Sousa, 2011, p. 150). Medina (2014) stated that unisensory learning is less effective than multisensory learning. "Learning abilities are increasingly optimized the more multisensory the situation is" (Medina, 2014, p. 171). Understanding that learning is sensory, educators should consider instruction that is developmentally appropriate, including kinesthetic activities that compliment neuroplasticity, the ability of the brain to respond and shape itself in response to experiences (Ratey, 2008).

Purpose of the Study

The purpose of this study is to engage students in PPM during instruction while adhering to the norms of a guided English language arts curriculum. This approach to instruction complies with the principles of brain-based learning. Jensen (2008) described brain-based learning as ESP: E – active **E**ngagement, S – purposeful **S**trategies, and P – based on **P**rinciples derived from neuroscience. Lyding (personal communication, October 2, 2017) described brain-based learning as the "secret sauce," including emotional engagement, behavioral engagement, and cognitive engagement. The candidate will aid classroom teachers in planning for and including ESP and the "secret sauce" in their English language arts lessons to better meet the needs of all learners.

Research Questions

1. To what extent does PPM in reviewing and teaching material impact student achievement in English language arts?
2. To what extent does planning for purposeful movement impact the likelihood of teachers using movement for instruction?

Rationale, Relevance, and Significance of Study

While the importance of kinesthetic learning is supported by research, it is being set aside due to the pressure of meeting the requirements of the standards-based movement caused by the academic push down (Wohlwend, 2009). Sousa (2011) explained why such practices are contrary to how the brain learns:

> When you take a walk, the cerebellum, the motor cortex in the cerebrum, and the midbrain work together to coordinate the movement of your body. They also coordinate and stimulate the flow of thoughts by triggering neurons to fire signals throughout their networks. Sometimes, creative solutions to complex problems can arise just by taking a walk. Despite the realization that physical activity enhances brain function and learning, students spend most of their classroom time sitting. (p. 238)

At the school site, assessments are used to set individual goals for each student who is not on grade level. The teachers monitor each student's progress weekly through data collection. Monthly grade-level meetings are held to look at the progress and to readjust or write new goals as necessary. Collecting weekly data takes a tremendous amount of time. The pairing of weekly data collection with the volume of academic material teachers must cover (due to the curriculum design) results in a significant amount of "in seat" time for students (Grauer, 2013). Teachers struggle with the pressures of all they need to teach and making time to include appropriate activities like building concepts through movement in their instruction becomes difficult, as it takes time to learn and practice new techniques. National Research Council (2000) called for research to address this problem:

> Much of the work that is needed to bridge research and practice focuses on the

> education and professional development of teachers, the curriculum, instruction and assessment tools that support their teaching, and the policies that defined the environment in which teaching takes place. These are areas about which practitioners have a great deal of knowledge and experience. Thus it is important to have educators partnered with researchers undertaking these research projects. (p. 252)

The aim of this study was to bridge the research of using kinesthetic techniques to teach and review material with teaching practices in the classroom.

National Research Council (2000) also called for research on the inner relations between learning and learning environments between teaching and learning: "This research should build on current findings in areas such as: the conditions and experiences that support knowledge scaffolding" (p. 276). The researcher guided teacher participants in using brain-based learning principles to give students learning experiences that are more appropriate to the students' learning styles.

As mentioned above, 85% of learners are kinesthetic learners (Blaydes 2016). Still, they are often misunderstood. Their need for movement can be seen as a behavior problem – as these are the students who are often told to sit still in their desks (Major, 2016).

> Unfortunately, the more we urge them to sit still, the more they seem to need to move. Once we understand that movement is a learning style, the more success we will have with these very special learners. We can learn to make the need to move work FOR us. (Major, 2016, para. 1).

When students are allowed to experience the curriculum through their bodies, deeper emotional, interpersonal, and kinesthetic connections are made to academic subjects

(Griss, 2013).

> While the "formal" curriculum consists of the courses, lessons, and learning activities students participate in, as well as the knowledge and skills educators intentionally teach to students, the hidden curriculum consists of the unspoken or implicit academic, social, and cultural messages that are communicated to students while they are in school. Students who are made to sit still and are unsuccessful in school are given the message that their talents are not valued. (Hidden Curriculum, 2015, para. 1)

Using kinesthetic techniques to engage those learners, who often cannot sit still and are seen as a disruption, can be seen as throwing them a lifeline – allowing them to become leaders in the class, strengthening the whole learning community (Griss, 2013).

Kinesthetic learners, while they make up the majority of learners, are not the only group who will benefit from PPM. The more modalities used to rehearse, the more paths that are established for retrieval (Wolfe, 2010). Using purposeful movement in instruction provides additional neural pathways in students' brains which can be useful for all students in retrieving information.

The significance in this study was in the design in which the candidate infused PPM into a district-mandated, guided, English language arts curriculum. The candidate coached teachers in including movement into the instruction and review of material being taught in the classroom. The movement that was planned was purposefully designed to help students understand and demonstrate competency in the standards and objectives of the curriculum. This study went beyond "brain breaks," which are used for students to take a short break from academic work to move, and flexible seating, where students are allowed to operate exercise equipment while learning. While both strategies have merits

in brain-based learning, this study looked at using movement to facilitate learning. The movement activities planned in this study neither took away from class instruction nor required special equipment but was the modality of class instruction.

Definitions of Terms

Brain-based learning theory. "The engagement of strategies based on principle derived from an understanding of the brain" (Jensen, 2008, p. 4).

PPM. Engaging students in content through movement, including a range of strategies from short, content-related activity breaks, gestures to create mental imagery, and total physical response such as simulation role play (Lyding, 2012).

Neuroplasticity. The ability of human brains to constantly respond and shape themselves in response to the world around them (Ratey, 2008).

Neurogenesis. The growing of new neurons (Ratey, 2008).

Brain Derived Neurotropic Factor (BDNF). "Improves function of neurons, encourages their growth and strengthens and protects them against the natural process of cell death" (Ratey, 2008, p. 40).

Student achievement. Refers to academic progress made over a period of time, as measured from the beginning to the end of the defined period (Great Schools Partnership, 2013).

Assumptions

The researcher assumed that participants would answer the survey and interview questions in an honest and candid manner. The candidate maintained the confidentiality of all participants to help ensure that they were honest in answering surveys. The researcher also assumed that all participants had a sincere interest in participating in the research and did not have any other motives.

Limitations

Limitations included working within the confines of the EL curriculum, having four teachers participating in the study, and researcher bias. While it was possible to include PPM within the EL curriculum, teachers were not be allowed to stray from the scripted lessons, and PPM had to be added within the script. Four teachers volunteered for the study, which is only 17% of the staff. The researcher is a certified action-based learning trainer and has delivered many professional developments on the topic. The researcher refrained from demonstrating bias by preparing a complete literature review and reported the data exactly as it occurred.

Delimitations

The researcher decided to not measure student engagement with the use of PPM. Because of the distance of the researcher to the school site, it was impossible for the candidate to observe students on a regular basis. Also, if the study showed a correlation between student achievement and PPM, increased student engagement may be implied. The researcher will consider student engagement in future research. The researcher chose this school specifically because the researcher delivered action-based learning training to all teachers who were on staff during the 2017-2018 school year. The teaching staff was interested and engaged in the training and expressed an interest in more action-based learning training. The principal is also a supporter of kinesthetic learning and therefore was supportive of housing the study.

Summary

Research indicates that students are able to learn best when educators use practices that are rooted in brain-based learning (Jensen, 2008); however, because of the assessment culture and the academic pushdown in education, many brain-based learning

principles are being ignored, namely using movement to increase neural pathways in students' brains (Wohlwend, 2009). If students are taught through the kinesthetic modality, they are not assessed kinesthetically and therefore are not always able to demonstrate their learning (Jensen, 2008). The assessment culture is entrenched in education and schools are resolute in their use of standard assessments to track student achievement. Therefore, the aim of this study was to assist teachers in embedding kinesthetic techniques in their instruction through PPM in their guided/scripted English language arts curriculum. The study determined that including movement while still adhering to the mandated curriculum helped students bridge the gap of the modality used to learn and achievement on assessments that do not use the same modality.

Chapter 2: Literature Review

Introduction

Education and the format in which teachers instruct has changed in the past 50 years. Many initiatives in education have led to different school programs and forms of testing. There are distance learning programs, Montessori schools, academic preschools, Waldorf schools, end-of-grade/course testing, benchmark testing, etc. (Lyding, 2012).

These programs and tests were built from ideas of what is best for students to learn and to measure their learning, but it is unsure whether they take into account brain science and how the brain learns and displays learning best (Jensen, 2008). The literature review that follows outlines the principles of brain-based learning theory and how it relates to PPM. It discusses how the brain is designed for movement and requires an enriched environment to fully develop. Research on learning and movement is reviewed as well as a detailed description of how brain cells work. Current work on the subject, the mind/body connection, after which the research study was patterned is also explained as well as contrary points of view. In addition to research on brain-based learning and learning and movement, information on the curriculum which was used within the study, Expeditionary Learning (EL Education), is provided.

How the Brain Learns

It is important to understand how the brain learns to grasp brain-based learning theory. The human brain is designed for interactive learning (Jensen, 2013). Evolutionary history explains how the brain is developed and works (Medina, 2014). The brain is designed for four main reasons: to solve problems, for survival, for an unstable outdoor environment, and to be in constant motion (Medina, 2014). According to Medina (2014), the human body latched on to genetic adaptations that assisted humans

with survival long enough to pass genes to the next generation. To survive different environments, one can become stronger or smarter, and humans became smarter (Medina, 2014).

All human behavior, including learning, can be traced to communications between neurons (brain cells; Wolfe, 2010). The constant communication between neurons causes the brain to require oxygen and glucose at 10 times the rate of the rest of the body (Wolfe, 2010). The brain alone is responsible for 20% of the body's energy consumption (Wolfe, 2010). Neurons communicate by chemical and electrical signals (Wolfe, 2010). The neuron receives information through its dendrites which send the message to the nucleus. The nucleus sends the message down the axon where it is given to another neuron through the synapse with the help of a neurotransmitter. Figure 1 depicts the parts of a neuron.

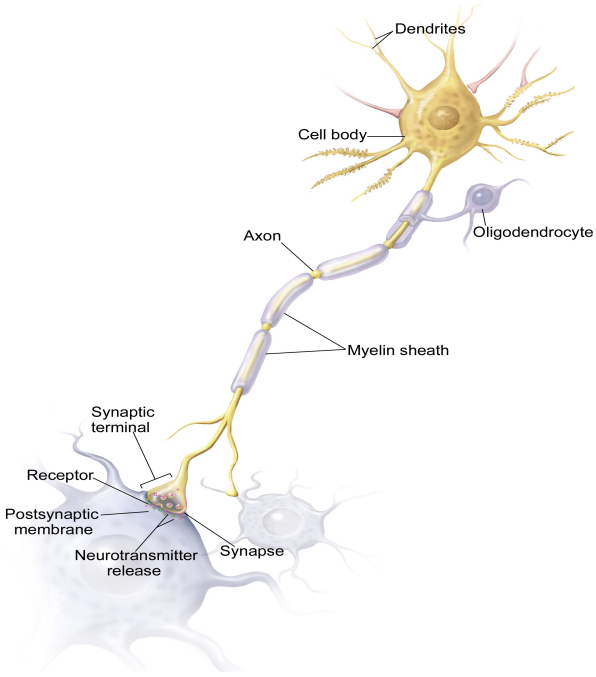

Figure 1. Diagram of Neuron (U.S. National Library of Medicine, 2018).

Neurons are one component for learning, along with brain organization and information substances (Kovalik & Olson, 2010). The average brain contains 100 billion neurons, each neuron has one axon and as many as 100,000 dendrites (Kovalik & Olson, 2010). Intelligence is known as the way in which neurons organize as a result of new learning (Kovalik & Olson, 2010). The brain responds to enriched environments by growing. "Growth" includes branching of dendrites, myelination of axons, enlargement of synapse, and increased size of neurons (Kovalik & Olson, 2010). When a brain experiences reduced enrichment, even for a little as 4 days, it can result in measurable shrinkage of dendrites (Kovalik & Olson, 2010). Humans have 19 senses, far more than the five senses that are traditionally taught (Kovalik & Olson, 2010). There is a direct correlation between the number of senses that are activated and the amount and locations of brain activity (Kovalik & Olson, 2010). "Quite simply, the greater the range of sensory input, the greater the physiological activity and growth in the brain. The result is more learning and a greater likelihood that such learning will be retained in long term memory" (Kovalik & Olson, 2010, p. 2.8). Retention and learning are different. Learning can be short term, while "Retention requires that the learner not only give conscious attention but also build conceptual frameworks that have sense and meaning for eventual consolidation into the long-term storage networks" (Sousa, 2011, p. 91). Information that is stored in long-term memory can be recovered when needed. The stronger the connections in the neural pathways, the easier it is to remember the information.

Action-based learning relies on the brain/body connection. "Learning happens from the feet up, not the neck up" (Blaydes, personal communication, July 14, 2016). Movement is fundamental to the brain, as the body and brain work in tandem, not in

isolation (Kovalik & Olson, 2010). What the brain communicates to the body depends on the messages the body is sending to the brain; they collaborate (Kovalik & Olson, 2010). The only organisms that require brains are organisms that move (Medina, 2014). Movement is crucial to every brain function, as half of the brain is devoted to organizing action (Kovalik & Olson, 2010). The frontal cortex processes motor and mental functions simultaneously (Kovalik & Olson, 2010). A person's ability to learn and retain old information is improved by biological changes in the brain brought on by new activity (Kovalik & Olson, 2010).

Theoretical Framework

Brain-based learning theory is "the engagement of strategies based on principles derived from an understanding of the brain" (Jensen, 2008, p. 4). As science progresses and more is known about the brain, more is also known about how the brain learns. Brain-based learning theory emerged in the 1980s behind the driving force of the new fields: neurobiology and cognitive neuroscience (Jensen, 2008). The invention of the MRI and PET scans also encouraged brain-based learning theory, because for the first time, one could study the brain while the subject was awake (Jensen, 2008). In 1983, Leslie Hart argued that classroom threats impaired cognitive processes, meaning the classroom practices that had become common place in education were contrary to how children learn best (Jensen, 2008).

Howard Gardner in 1983 also connected brain function to new models of thinking (Jensen, 2008). Gardner originally identified 7 intelligences in his theory of multiple intelligences (Herndon, 2018). The current list now includes 9 intelligences: verbal-linguistic, mathematical-logical, musical, visual-spatial, bodily kinesthetic, interpersonal, intrapersonal, naturalist and, existential (Herndon, 2018). Gardner's theory states that

individuals have strengths in different intelligences, and learning can be enhanced by delivering instruction using strategies that best fit the individual (Herndon, 2018). Schools traditionally focus attention on the verbal-linguistic and mathematical-logical intelligences, often overlooking the other intelligences (Armstrong, 2018). The theory of multiple intelligences expands education beyond the semantic learning tools, engaging students in learning through various pathways in which the students may experience greater success (Armstrong, 2018).

In the 1990s, neuroscience branched into biochemistry, psychology, sociology, nutrition, and education. Peer-reviewed journals emerged in each field: Biological Psychiatry in psychiatry; Journal of Social Neuroscience in sociology; Journal of Nutritional Neuroscience in nutrition; and Mind, Brain, and Education in education (Jensen, 2008). Today, educational experts such as Eric Jensen, Susan Kovalik, Karen Olsen, and Patricia Wolfe have used brain-based learning theory as the basis of their work.

Jensen (2008) said that brain-based learning takes into consideration how the brain learns best. "The Brain does not learn on demand by a school's rigid, inflexible schedule. It has its own rhythms. If you want to maximize learning, you first need to discover how nature's engine runs" (Jensen, 2008, p.4). A brain-based naturalist will work to discover a student's natural deterrents and motivators so that learning emerges as a natural consequence (Jensen, 2008). The brain can still learn through traditional instruction; brain-based learning is knowing why one strategy works better than another. "The brain is involved in everything we do at school, so to ignore it is irresponsible" (Jensen, 2008, p. 7). Once a brain-based naturalist discovers how the brain learns and displays learning best, he/she will incorporate those practices in his/her teaching.

Brain-based learning looks past the established conventions and assumptions about learning to the latest scientific research about how the brain learns. Brain-based learning is motivated by the belief that learning can be accelerated and improved if teachers base their instruction on the science of learning (Hidden Curriculum, 2015). Recent discoveries have found that the human brain physically changes when it learns (Hidden Curriculum, 2015). Brains are not fixed, they are susceptible to change throughout our lifetime, and the ability of the brain to rewire and remap itself via neuroplasticity is profound (Jensen, 2013). Recent discoveries in cognitive science have revealed that the human brain physically changes when it learns and that after practicing certain skills, it becomes increasingly easier to continue learning and improving those skills; learning effectively improves brain functioning, resiliency, and working intelligence (Jensen, 2013). The human brain is designed for interactive learning (Jensen, 2013). The human being is more helpless at birth than most other mammals. Humans are born more than "open" to environmental input; humans require movement to develop the brain properly (Jensen, 2013). Jensen (2013) explained that without interactive visual, auditory, and tactile input, systems misfire and underperform: "Our brains are designed to actively manage our experiences, not passively 'download' them" (para. 17). Useful, practical, functional knowledge is based in activity not passivity (Singer, 1995). Interactive learning experiences in a relevant environment are processed in far differently and more potent ways than sitting in a classroom and reading or memorizing a text (Singer, 1995).

Gozuyesil and Dikici (2014) measured the effect sizes of the quantitative studies that have examined the effectiveness of brain-based learning on student achievement by using a meta-analysis method. This method statistically combined the quantitative data

from studies of the like topics in order to reach a general conclusion from the results (Gozuyesil & Dikici, 2014). Gozuyesil and Dikici analyzed 42 research studies which investigated brain-based learning theory and student achievement. The authors found that 35 of 42 comparisons had positive effect sizes (Gozuyesil & Dikici, 2014). "The results of the meta-analysis suggest that brain-based learning leads to greater academic achievement than traditional teaching methods" (Gozuyesil & Dikici, 2014, p. 646).

Action-Based Learning

Action-based learning is a program rooted in brain-based learning theory, which focuses on the structure and workings of the brain in regard to learning (Blaydes, 2016). Eighty-five percent of students are kinesthetic learners, and almost every student in poverty relies on their kinesthetic strengths for learning, making action-based learning a needed program at the school (Blaydes, 2016). There are three components to action-based learning: (a) six-part framework for creating a kinesthetic classroom, (b) learning lab to help students close physical, developmental gaps, and (c) learning readiness physical education to help struggling students focus and control behavior.

Six part framework for creating a kinesthetic classroom. The six-part framework for creating a kinesthetic classroom for classroom teachers includes the following.

Part one, preparing the brain. Specific brain compatible movements, such as crossing the midline, improve neural connections. Neurons can communicate more effectively; therefore, cognitive abilities are improved (Kuczala & Lengel, 2010). Each hemisphere of the brain controls the opposite side of the body. The corpus callosum (a bundle of 250 million nerve fibers between the right and left hemispheres) allows the two hemispheres to talk to each other. Integrative movements help students prepare for

learning by forcing the hemispheres to work together, improve energy and blood flow, and stimulate the brain to improve focus and concentrate (Kuczala & Lengel, 2010). In a classroom, a teacher could prepare the brain by having students perform exercises that cross the midline, such as sweeping figure eights with their arms in front of their bodies, before moving to a new subject or topic.

Brain Gym was a program designed in the early 1980s by Paul and Gail Dennison for the purpose of preparing students' brains to learn and improve attention (Educational Kinesiology Foundation, 2016). Brain Gym practices include actions that cross the midline such as figure eights, cross crawls (students touch their left elbows to their right knees while their right arms move behind them, as if marching), hook ups (students sit in their chairs and cross their right legs over their left legs at their ankles. Students then place their right wrists over their left wrists and curl their hands inward so that their fingers may interlock), and brain buttons (students press their fingertips lightly against their foreheads above each eye, about halfway between the eyebrows and the hairline. Students then close their eyes and breathe slowly; Educational Kinesiology Foundation, 2016). Gibb (2007) conducted a case study of four elementary students and the use of brain gym in their learning. Gibb's study found through observations and student surveys that attention was positively impacted through Brain Gym practices. All four students mentioned that Brain Gym helped them learn and helped them in finishing their work (Gibb, 2007). Using physical exercises to engage both hemispheres of the brain improves students' ability to pay attention and complete tasks.

Part two, providing brain breaks. Every student has a "working memory." The working memory temporarily holds all the new information coming to the brain (Kuczala, 2016). The new information is then processed and then stored in the long-term memory

(Kuczala, 2016). The working memory is not endless. If a person was filling a swimming pool with a bucket, they would put the bucket under the faucet until the bucket was full, then take it to the pool and empty it. A person's short- and long-term memory work in the same way. If the person holds the bucket under the faucet too long, the bucket will overflow, and that water will never make it into the pool. The same would happen to the working memory if it were treated in the same manner. If the working memory is full and the brain is not given time to process the information and dump it into the long-term memory, it will be lost (Kuczala & Lengel, 2010). Brain breaks provide the brain the time it needs to process the information (Kuczala & Lengel, 2010). Brain breaks also lessen the feelings of being overwhelmed by information overload, refocus the student's brain to return to learning, and reenergize the brain and body. In the classroom, when a teacher notices the students' state is no longer conducive to learning, he/she may lead his/her students in an energizer, which could be a dance, exercise, or game that lasts 3-5 minutes, then continue with the day's learning.

Howie, Beets, and Pate (2014) studied the effect of brain breaks for different amounts of time on student on-task behavior in the first study of its kind. The study included 96 fourth- and fifth-grade students in five classroom groups, all of whom participated in the different lengths of time: 5, 10, and 20 minutes of class exercise breaks as well as 10 minutes of sedentary activity breaks all led by the researchers (Howie et al., 2014). On task behavior was observed by video tape before and after the breaks (Howie et al., 2014). Results of the study found that 10 minutes of physical activity breaks increased time on task the most compared to sedentary attention control, 87.6% versus 77.1% (Howie et al., 2014).

Part three, supporting exercise and fitness. Physically fit students perform better

in the classroom (Kuczala & Lengel, 2010). There is a correlation between academic skills and physical fitness scores (Kuczala, 2016). Students who achieve proficiency on fitness tests are more likely to show proficiency on academic tests (Ratey, 2008). Fitness tests assess four components of fitness: cardiorespiratory fitness, muscular strength, muscular endurance, and flexibility. The more components in which a student tests proficient, the higher his/her academic scores tend to be (Ratey, 2008). Cardiorespiratory fitness alone seems to have the biggest impact on students' scores (Kuczala & Lengel, 2010). Classroom teachers do not have to, nor are they expected to engage students in a full workout. Sixty seconds of movements such as jogging in place or jumping jacks can refocus a student's brain while giving it fresh oxygen. When students experience exercise in classes other than physical education, it can send the message that fitness is important (Kuczala & Lengel, 2010). A teacher can use a fitness break in conjunction with a brain break by leading students in simple exercises such as jumping jacks, running in place, walking around the room, push-ups, and sit-ups; however, when extended time can be given for exercise, students will experience more benefits. Aerobic exercise improves brain functions, including learning (Ratey, 2008). Aerobic exercise kick-starts the brain chemicals needed for forming new memories (Kovalik & Olson, 2010). Thirty-five minutes of aerobic exercise can impact the brain in the following ways:

1. Stimulate neurogenesis (growing of new brain cells).
2. Spur new stem cells to develop into nerve cells.
3. Cause a shrunken hippocampus (where memories are formed) to return to normal size.
4. Elevate brain derived neurotropic factor (BDNF), a protein that builds, protects, and maintains neuron circuitry.

5. Improve most mental health conditions (Kovalik & Olson, 2010).

The type and kind of movement matters, as the more complex the movements, the more complex the synaptic connections.

Naperville, Illinois, a demographically advantaged school district with only 2.6% in the low-income range, is one of the few school systems that mandates daily physical education for all students in kindergarten through 12th grades. When a study was completed on the students' percent body fat and fitness scores, it was found that Naperville students' body fat percentages were far below the national norms, with only one obese male of a 130 total (Ratey, 2008). Ninety-eight percent of students tested as proficient in the fitness tests (Ratey, 2008). In 1999, Naperville signed up to take the Trends in International Mathematics and Science Study (TIMSS) test on its own (Ratey, 2008). Naperville competed with 38 countries who also took the TIMSS test that year. Ninety-seven percent of Naperville's eighth graders took the test, a representation of all students, not singling out only the brightest students (Ratey, 2008). In science, Naperville finished first, just ahead of Singapore; and on the math section, Naperville scored sixth behind Singapore, Korea, Taiwan, Hong Kong, and Japan (Ratey, 2008). "When we look at Naperville, two factors really stand out: its unusual brand of physical education and its test scores. The correlation is simply too intriguing to dismiss" (Ratey, 2008, pp. 14-15). While the data are not conclusive, Naperville scores higher than similar schools who have traditional physical education programs (Ratey, 2008).

In 1999, a teacher visited Naperville's physical educational program and brought it back to Titusville, Pennsylvania, a town where the median income is $25,000 and 75% of kindergarteners receive government assistance for lunch (Ratey, 2008). The district installed fitness centers in the secondary schools and restructured the school day which

took time from academic classes to make time for daily physical education (Ratey, 2008). Since the implementation of daily physical education with a focus on fitness, the district test scores have risen from below the state average to 17% above in reading and 18% above in math (Ratey, 2008). The success of the physical education program in both high socioeconomic demographics and low socioeconomic demographics show how fitness can help student achievement in all school settings.

Part four, developing class cohesion. Information that is most crucial to the brain has to do with survival. A student's brain is not able to perform at optimal levels unless the student's survival needs are met (Kuczala & Lengel, 2010). The second most important information to the brain is emotion. When students feel stressed and/or uncomfortable in their classroom, it is hard for their brains to learn new information (Kuczala & Lengel, 2010). The parts of the brain involved in higher level thinking shut down when a student's emotional state is compromised. The third priority in the brain is receiving and learning new information; therefore, if a student is stressed or uncomfortable in the classroom environment, it plays a role in the student's ability to learn new information (Kuczala & Lengel, 2010). In the classroom, class cohesion can be built through cooperative games and activities. Games can be short simple games in which students participate, or longer cooperative activities that include students being engaged in the day's learning. Hattie (2015) conducted a meta-analysis of teaching strategies and interventions and their influences on student achievement. Hattie found the effect size of strong class cohesion to be 0.44, statistically significant.

Part five, reviewing content. When cognitive information is combined with movement, retaining and recalling data becomes easier (Hannaford, 2005). Memories and neural pathways fade when they are not used (Jensen, 2005). A simple review game

that can be used is physical multiple choice (Kuczala & Lengel, 2010). The class agrees on physical movements for the letters A, B, C, and D. The teacher asks the question, gives the possible answers, then the students do the physical movement for what they believe to be the correct answer. Using this strategy strengthens the neural pathways and students' ability to retain the information by connecting a physical movement with the answer to the question (Kuczala & Lengel, 2010).

Part six, teaching content. Implicit learning activates the body and brain at the same time so that learning and retention take place more easily (Jensen, 2000). More information can be absorbed and may last longer. Implicit knowledge can be obtained by every age group and forms bridges that connect the body and brain (Jensen, 2000). An example of teaching content through movement is moving through the circulatory system. The class becomes the circulatory system with different students being lungs, arteries, veins, chambers in the heart, and blood cells. Each student plays their part while the blood cells move through the system from the heart to the lungs, back to the heart, then out to the body. Students then switch parts so that they act out all the different parts of the system. The studies below describe the effectiveness of reviewing and teaching through movement.

Dunman (2010) conducted an experimental study comparing the effects of teaching through lectures and quizzes versus teaching through physical movement. The experiment had a control group that was taught through lecture and quizzes and an experimental group that was taught through purposeful planned movement. Pre and posttests were given to each group and compared. This study found that PPM in the classroom improved student achievement. "Based on the findings of neuroscience, brain-based learning guides, according to the principles and workings of the brain, increase

academic achievement, and provide equal opportunities for individual differences" (Dunman, 2010, p. 20). Students who are visual or auditory learners still see and hear information when being delivered in a kinesthetic form; however, kinesthetic learners do not move when lessons are delivered through lecture and notes. Therefore, teaching through movement can benefit more students than just teaching through lecture.

Beaudoin and Johnston (2011) completed a similar study about the impact of kinesthetic learning techniques in high school algebra classes. The study occurred in one title one school with one teacher teaching algebra II. Two classes were used as a control group, and two classes were used as the test group. Pretests and posttests were given and compared. The mean was found for the pretests, posttests, and gains. The treatment group's gains on the posttest produced a mean of 84%, while the control group's gains on the posttest produced a mean of 65.9%. Purposeful movement was found to increase student outcomes in algebra. The researchers spoke with the classroom teacher and were told that the control group students were initially the higher performers than the experiment group. The weaker students outperformed the higher level students through instruction that used purposeful movement.

Masera (2010) examined the effects of traditional versus tactile/kinesthetic versus interactive whiteboard instruction on short- and long-term work recall and test scores of elementary students. The sample included 87 children, 45 kindergarteners, and 42 first graders. The students were subdivided into three different groups and taught site words using three different methods: traditional, interactive whiteboard, and tactile/kinesthetic. The students were taught 15 words per session for a total of 45 words. The students were given pretests, short-term posttests immediately after instruction, and long-term posttests 6 weeks after instruction. Gain scores calculated by subtracting pretest scores from the

short- and long-term posttests determined student achievement. The data showed significantly higher short- and long-term word recall scores when students were instructed through tactual/kinesthetic instructional methods over the traditional (p less than 0.05) or interactive whiteboard (p less than .001) approaches (Masera, 2010).

Willington (2005) conducted a meta-analysis to find if teaching to learning styles significantly makes an impact on student learning. Willington argued that there is a common error in studies of modalities, since often the same resources are not used to provide instruction and students are more interested in the specially prepared conditions than the actual modality used. The three studies described above refute Willington's claim. Part of teaching to different modalities is providing the materials and resources to fit the learning style. One would not use the same resources to teach to a visual learner as one would use to teach to an auditory learner. Also, from data shown in the studies above, students are more engaged and interested when taught in their modality. The conditions that are prepared in these studies are to best fit the students' learning needs, which results in students who are more engaged in the learning.

The National Research Council (2000) described a study of rats and the use of movement in learning. The study compared the results of learning in rats who were made to exercise, given the opportunity to exercise, and the different types of exercise available to the rats.

> Animals in a complex environment not only learn from experiences, but they also run, play, and exercise, which activates the brain. The question is whether activation alone can produce brain changes without the subjects actually learning anything, just says activation of muscles by exercise can calls them to grow. (National Research Council, 2000, p. 119).

One group of rats was taught to traverse an elevated obstacle course; these acrobats became very good at the task with over a month of practice. A second group of mandatory exercisers was put on a treadmill once a day, where they ran for 30 minutes, rested for 10 minutes, then ran for another 30 minutes. A third group of voluntary exercisers had free access to an activity wheel attached directly to their cage, which they used often. A control group of cage potato rats had no exercise. Both mandatory exercisers and the voluntary exerciser showed higher dendrites and blood vessels than either the cage potato rats or the acrobats who learned the skills that did not involve significant amounts of activity (National Research Council, 2000); however, when the number of synapses per nerves was measured, the acrobats showed more growth. Learning happens at synapses; exercise does not. Therefore, different kinds of experiences condition the brain in different ways. "Synapse formation and blood vessel formation are two important forms of brain adaptation, but they are driven by different physiological mechanisms and by different behavioral events" (National Research Council, 2000, pp. 119-120). Exercise helps to develop new brain cells but does not cause the learning. While the acrobatic rats did not show a bigger increase in dendrites and blood vessels as the exercising rats, they showed more growth in the synapses than any of the groups, making the argument that learning is made more efficient when learning and moving simultaneously.

Learning lab to close developmental gaps. The learning lab focuses on seven developmental milestones that a child must achieve before effectively learning how to read, write, and do math. These milestones include cross lateralization, gross and fine motor skills, strength and endurance, balance, visual tracking, rhythm and beat competence, cardiovascular fitness, mindfulness, and problem-solving. "Sensory

components of balance, coordination, spatial awareness, directionality, and visual literacy are developed as the child rolls, creeps, crawls, spins, twirls, bounces, balances, walks, jumps, juggles, and supports his/her own weight in space" (Blaydes, personal communication, July 14, 2016). If a student has a gap in any one of these skills, it affects the student's ability to learn (Hess, 2017). The more gaps a student has, the more learning is affected. Most of these gaps are filled by the time a child is 3 or 4 years old; however, today's babies and toddlers do not always have the same opportunities to move as years before due to the current culture. What can be perceived as progress has left children with developmental gaps, as many babies are left in car carriers for long periods of time and many children are given electronic devices to keep them occupied instead of exploring the world around them. Children are also spending less time climbing, sliding, and playing than before. Developmental gaps occur when children's movements are restricted and/or not encouraged (Hess, 2017). These gaps are more prevalent in children living in poverty (Hess, 2017). If a student has a physical developmental gap, it can be filled later in life through practice, like in the learning lab.

> Brain science strongly supports the link of movement to learning. The brain and body's movement and learning systems are interdependent and interactive. For example, motor development provides the framework that the brain uses to sequence the patterns needed for academic concepts. The body's vestibular system controls balance and spatial awareness and facilitates the student's ability to place words and letters on a page. When a student walks or crawls in the learning lab in specific patterns, the brain's ability to encode symbols is increased. The four visual fields needed for eye tracking is strengthened. Proper development and remediation of these systems are critical to a child's ability to

learn. (Hess, personal communication, March 6, 2017)

Using a learning lab to fill the gaps described by Hess (2017) results in a brain more prepared to learn reading, writing, and math. Schools have implemented learning labs as part of their intervention plans. Learning labs are usually housed in a room or designated space with various types of equipment set up into stations. The equipment used includes but is not limited to balance boards, hula hoops, balance beams, ladders, and stationary fitness equipment. Incorporated into those stations are academic concepts that are being studied in the classroom or concepts in which the students are struggling. For instance, students may jump between the rungs of a ladder laying on the ground while saying the site words that are placed between the rungs. Students practice performing skills that they have missed in development and also practice academic concepts relevant to their current learning in these stations. An organization, Healthy Schools Oklahoma, has implemented 33 learning labs in Oklahoma schools (Healthy Schools OK, n.d.). Their objective is for each child in the school to spend at least 40 minutes a week participating in physical activity designed to support academic learning (Healthy Schools OK, n.d.). In one school, discipline referrals decreased from 60 to six in 1 year, while teachers and students report having better concentration and comprehension (Healthy Schools OK, n.d.).

Learning readiness physical education. Students recommended for learning readiness physical education are students who are identified as one or more of the following: reading below grade level, below grade level in math, and/or exhibiting inappropriate school behaviors. The learning readiness physical education class is a period or two prior to an academic reading class or math class in which they are enrolled. Students in learning readiness physical education need to keep their heart rate in their

target heart rate for 30 minutes to experience the maximum benefit (Ratey, 2008).

Participation is not required but strongly encouraged, and parents must meet with the physical education teacher providing the program either individually or by attendance at a meeting to explain the science behind the program. This program was introduced in Naperville, Illinois in 2004 with a freshman literacy class. The class focused on students who were one to two grade levels behind their peers (Naperville Central High School's Learning Readiness Physical Education Program, n.d.). Students who were enrolled in the freshman literacy class were given the option to take part in learning readiness physical education where students were physically active the class before freshman literacy (Naperville Central High School's Learning Readiness Physical Education Program, n.d.). The students who were part of the learning readiness showed 52% more growth in literacy than their peers who were not in learning readiness physical education in the first semester (Zientarski, 2015). In math, the growth of learning readiness physical education class was much higher, with 93% more growth than students who did not take learning readiness physical education (Zientarski, 2015). The data show a strong correlation between learning readiness physical education and improved student achievement.

Expeditionary Learning (EL Education)

The use of the EL curriculum for English language arts is mandated by the district for third through eighth grades. This is the second year English language arts teachers in the district have used the curriculum. EL is a guided curriculum that provides teachers with detailed lesson plans, reading materials, assignments, activities, and assessments. EL is based on the common core standards to produce students who are college and career ready (EL Education Curriculum, 2018). EL structures classrooms with highly

collaborative activities to allow students to engage in conversations rooted in rich academic topics (XXXX County Public Schools, 2016). The goal of the EL curriculum is to contribute to student success in order to be globally competitive and contributors to the community (XXXX County Schools, 2016). EL outlines three learning pathways for students:

1. Building background knowledge through discovering the purpose for skills, identifying questions related to the task, and having opportunities to build knowledge through the text.
2. Extended reading and research by becoming experts on the topics; gaining academic vocabulary that is content specific; adapting to different audiences, tasks, and purposes; and seeking out various viewpoints.
3. Extended writing by writing from sources that are deeply understood, working in collaboration with peers, sharing learning with peers, making connections between information and arguments, and applying current research (XXXX County Schools, 2016).

Teachers and students are provided with books that were selected as the best books for delivering grade-level content (XXXX County Schools, 2016). Students use a central text throughout the learning module that is supplemented with other books, articles, and primary source documents (XXXX County Schools, 2016). By organizing the modules in this way, EL provides a balance in literary and informational texts with appropriate levels of complexity (XXXX County Schools, 2016).

In choosing this curriculum, the district compiled a team of professionals including English language arts, Intervention, English as a Second Language, and Special Education to use the Instructional Materials Evaluation Tool (IMET, 2016). The district

team used this tool to determine that the curriculum is aligned to the common core standards. The core of this tool is the instructional shifts which are currently the district's highest priority (Lightfoot, 2017). These shifts include text complexity, academic language, reading, writing, speaking, listening, and building background knowledge around nonfiction texts (IMET, 2016). The EL curriculum scored high in the IMET tool and therefore was chosen for the district.

Summary

To understand how to best teach students, one must understand how the brain learns using brain-based learning theory. The brain is made up of neurons that organize themselves through learning experiences (Sousa, 2011). The more senses used during those experiences, the more effective the learning (Medina, 2014). Action-based learning is rooted in brain-based learning theory and capitalizes on the brain's preferences to learn through movement (Blaydes, 2016). Action-based learning includes a framework for a kinesthetic classroom, learning labs, and learning readiness physical education. Research that has studied the effectiveness of using physical activity to learn has mostly shown that students are more engaged and show higher achievement when allowed to move during learning than in more traditional educational settings (Jensen, 2008). The curriculum in which the researcher embedded PPM is EL Education. This guided curriculum was written with the common core standards as a guide and is designed to produce students who are college and career ready.

Chapter 3: Methodology

Introduction

Brain-based learning theory uses neuroscience in order to develop lessons that can be delivered in a manner in which the brain learns best. Action-based learning, which is grounded in brain-based learning theory, uses movement to learn, focus attention, and manage behavior. Action-based learning includes the following: six part framework for a kinesthetic classroom, learning lab, and learning readiness physical education. This study focused specifically on parts five and six of the framework for a kinesthetic classroom: reviewing content and teaching content. This study sets itself apart from previous studies by embedding PPM into a district mandated, guided English language arts curriculum. The researcher used this argument to gain permission to conduct the study at the school site. Permission was granted by the district and the school principal (Appendices A and B). By adding PPM into the curriculum, the researcher determined if there is an association between learning content kinesthetically and student achievement.

The methodology of this study is organized into sections. The first section restates the research questions and explains the rationale for action research through a mixed methods design. The triangulation and convergence of the data are also explained. The target population and participants are discussed in the next section. The data collection is explained in detail followed by a description of the planned data analysis. Finally, limitations and delimitations are detailed.

Research Design

As stated in Chapter 1, this study was designed to answer the following two questions:

1. To what extent does PPM in reviewing and teaching material impact student

achievement in English language arts?

2. To what extent does planning for purposeful movement impact the likelihood of teachers using movement for instruction?

The researcher used action research for her study. Anderson and Herr (2015) described action research as "inquiry that is done by or with insiders to an organization or community" (p. 4). The researcher used theories and research of PPM that indicate best practices and guided teachers in using those practices in their lessons. The candidate observed and discerned what happened in the classroom in regard to the teaching practices (Johnson, 2012). Through action research, the researcher formed a community with teacher researchers who together generated crucial knowledge and transformation (Anderson & Herr, 2015). This form of research was appropriate and necessary because it used strategies that have been researched and put them into practice in real-world classrooms to discover their effectiveness.

The researcher chose to use a mixed methods design. This purposeful decision allowed the researcher to examine and analyze data through a wider lens, as the strength of both help answer questions in a more complete way. Mixed methods design relies on both quantitative and qualitative procedures to collect, analyze, and mix both to discover answers to research questions (Creswell, 2015). "Quantitative research provides an opportunity for generalization and precision; qualitative research offers an in-depth experience of individual perspectives" (Creswell, 2015, p. 14). Creswell (2015) explained that it is appropriate to use mixed methods when the use of only quantitative or qualitative research is insufficient for answering the research questions. More specifically, the combination of quantitative and qualitative research enables the researcher to

1. Obtain two perspectives, one drawn from closed-ended participant responses (quantitative) and one drawn from open-ended participant responses (qualitative).
2. Obtain a comprehensive view of the study and view more data that could answer the research questions.
3. Add to details about the setting, place, context, personal experiences to the quantitative information. (Creswell, 2015, p. 14)

The candidate triangulated the data by using a convergence model. Convergence occurs as the researcher intends to link the results of quantitative and qualitative data analysis so that they can be compared or combined (Creswell & Plano Clark, 2018).

> The basic idea is to compare the two results with the intent of obtaining a more complete understanding of a problem, to validate one set of findings with the other, or to determine if participants respond in a similar way if they check quantitative predetermined scales and if they are asked open-ended qualitative data. (Creswell & Plano Clark, 2018, p. 65)

The convergent design enabled the researcher to study the research problem from its qualitative and quantitative viewpoints. "The merging provides both a quantitative and a qualitative picture of the problem and because both forms of data provide different insight, their combination contributes to seeing the problem from multiple angles and multiple perspectives" (Creswell, 2015, p. 35). Figure 2 details the workings of the convergence model.

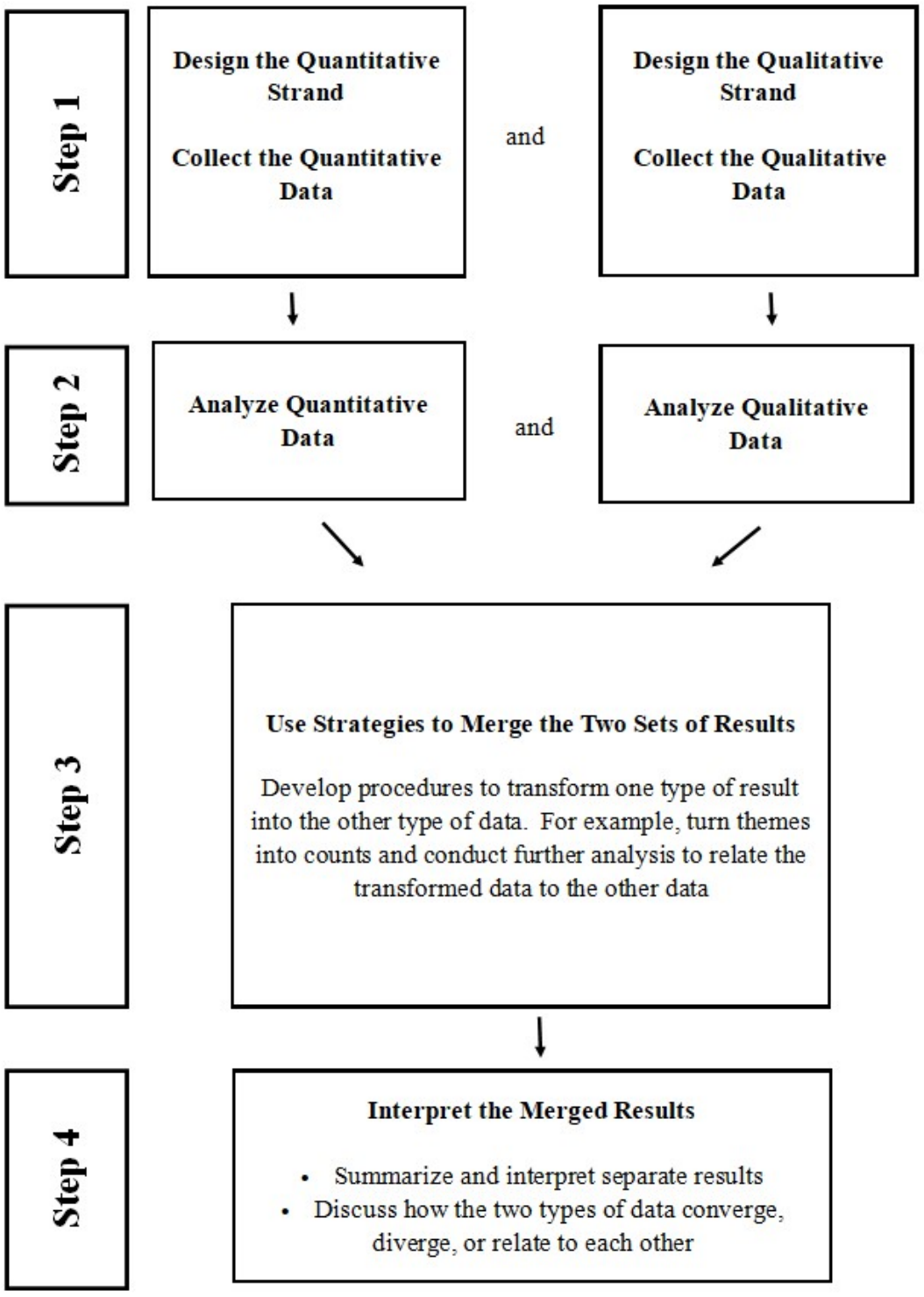

Figure 2. Convergence Mixed Methods Design Flowchart (Creswell & Plano Clark, 2018).

The quantitative and qualitative data were designed, collected, and analyzed separately. The integration involved merging the two databases by transforming the qualitative results into codes and themes, using the Dedoose program. The Dedoose program facilitates data management and analysis of qualitative research (Dedoose, n.d.). The codes and themes were turned into quantitative variables and statistically analyzed the emergent variables with the quantitative database (Creswell & Plano Clark, 2018). Quantitative data sources were common assessment data, student grades, pre/post-study teacher surveys and teacher logs. The qualitative data sources were a teacher survey with open-ended items administered pre/post-study to the teachers and teacher interviews.

Research Setting

The study was completed in an elementary school in central North Carolina. The school has a total of 763 students in grades kindergarten through fifth grade. The school's demographics are as follows: 2% are Asian/Pacific Islander, 24% are African-American, 18% are Hispanic, and 51% are Caucasian. Forty-two percent of the students qualify for the free and reduced lunch program. There are 40 teachers on staff at this school; 23 have advanced degrees and three are nationally board certified. The experience level of the teachers is diverse with eight teachers with less than 3 years of experience, 14 teachers with 4-10 years of experience, and 18 teachers with 10 or more years of experience. The teachers at this school have one daily common planning period scheduled by grade level. During this common time, the teachers complete administrative tasks such as weekly newsletters, grading, and other paperwork. The teachers have a designated time once a week after school to meet as a professional learning community and review their progress in the curriculum and share materials and ideas. This is the time the teachers use to discuss the plans for the EL curriculum and is

also the time the researcher met with the teachers in person or by video conference. Teachers have a block of time from 8:50-10:35 to teach the EL curriculum daily.

The researcher asked this school to house the study for two reasons: the diversity of the school and the openness of the staff to try PPM. As described in the student demographics above, the school is diverse in its population. While it is not a Title I school, it is on the cusp with 42% free and reduced lunch population. Also, the researcher experienced a great deal of enthusiasm from the teaching staff while delivering action-based learning training in 2017. The principal, a strong proponent of teaching with kinesthetic techniques, asked the researcher to deliver action-based learning as a professional development session for his staff. The staff was excited and engaged in learning the techniques, and the researcher received many emails from the staff asking for more training. Because of the support of the teachers and the principal, the researcher chose this school for the site of the study.

Participants

The researcher presented the study to the whole school staff, 40 teachers. Of the school staff, four fourth-grade teachers volunteered. All participants signed an informed consent to participate and have experienced full confidentiality. The details of the participants, their experience in teaching, and class size are detailed in the Table 1.

Table 1

Description of Teacher Participants

Teacher	Years of Experience	Year of Experience in Fourth Grade	Class size
1	8	5	25
2	11	4	27
3	22	1	26
4	10	5	26

The student demographics of all the classes are consistent with the school student demographics. All of the teachers received training in action-based learning last school year, delivered by the researcher. While the teachers understand the concepts of PPM, they desired more hands-on assistance to help the techniques work in their classrooms.

The fourth-grade classrooms are clustered together in the same hallway. All of the fourth-grade teachers follow the same schedule, including the times that subjects are taught, specials (i.e., physical education, music), planning time, lunch, and recess (Appendix C). English language arts is taught in the morning, which is when PPM was embedded. All of the classrooms are arranged with students sitting in groups of three or four. Each fourth-grade classroom also has a large carpet in which the teachers can "meet" with the students as a whole group.

Researcher's Role

The researcher's role in the study was one of a practitioner researcher. The researcher acted as a resource person for the teachers participating in the study, not as an expert who does research (Stringer, 2007). The researcher assisted stakeholders by offering strategies for embedding PPM in their lessons as well as supporting them as they worked toward effective solutions (Stringer, 2007). The researcher provided the participants with initial training on the lesson tuning protocol within which the

participants discussed ways to incorporate movement into their teaching practices. The researcher led the lesson tuning meetings and worked collaboratively as well as asked clarifying questions in order to develop lessons. The researcher is not a member of the school staff but is an employee in the same district.

Research Procedures

To begin the study, the researcher surveyed the teachers about their current use of PPM. This survey provided a measure of how much the teachers used PPM before the study began. The researcher used this measure to compare with the use of PPM at the end of the study.

The teachers provided the researcher with students' English language arts grades before and after the study. The different types of assignments that make up the grade include classwork, homework, assessments, written samples, and projects. To assure anonymity, the teachers were given numbers and their students were given coinciding numbers. For instance, Teacher 100 numbered her students 101, 102, 103, etc.; and Teacher 200 numbered her students 201, 202, 203, etc. The researcher compared students' grades pre- and post-study to find the impact of PPM on student achievement.

The researcher met with the teacher participants once a week for 9 weeks to tune their English language arts lesson plans. The teachers used the district mandated EL Education curriculum for English language arts. This is the second year the teachers have used this curriculum. EL is a guided curriculum that includes detailed lesson plans. During the weekly meetings, the researcher led the teacher participants in a lesson tuning protocol designed by West Ed (2017; Appendix D). The researcher was granted permission to use the protocol for the study (Appendix E). The fourth-grade teachers were all teaching and tuning the same lessons. The protocol focused on helping the

teachers add PPM into those lessons by following the steps below:

1. Determine roles
2. Present lesson materials and objectives
3. Determine focus – adding PPM
4. Review and clarify materials
5. Review focus standards
6. Tune the lesson – add PPM
7. Reflect on conversation (West Ed, 2017).

The EL curriculum includes over 60 protocols to use with students, some of which include movement. An example of a movement protocol is the "Mystery Quote" protocol (EL Education Curriculum, 2018). In this protocol, quotes, phrases, or sentences are written on notecards, one for each student. The cards are given to the students who, without reading the card to their partner, tapes the quote on the partner's back. When given the signal, the students mingle around the room and stop when prompted. In 1 minute or less, the students read each other's note card and think about one hint to give their partner about the quote. In 1 minute, total, the partners share their hint about the quote. Students repeat as necessary, then convene at the end for each to share a final inference about their quote. Students are then shown a list of quotes used to see if they find their quote based on the hints of their classmates. The teachers and researcher looked to the protocols such as the one described above that use movement to use for instruction in their lesson plans. The lesson tuning protocol focused the teachers' attention on using the best, most appropriate movement protocols for their lessons. If there was not a protocol in the curriculum that was appropriate, the lesson tuning helped the teachers create their own PPM activities. The researcher and the lesson tuning

protocol were instrumental in guiding teachers into creating their own movement activities when needed. First, the team reviewed the standards and objectives the lesson was addressing to ensure the activity met the goals of the lesson. Then the subject matter and tools that are already included in the lesson were discussed. Finally, the teachers brainstormed with the researcher about how to best incorporate movement into that lesson and design a protocol. Because each lesson was different, each protocol that was designed was also different. For instance, if the lesson was about animal defenses, the researcher and teachers could design a protocol where students can act out defenses from different animals. If they were a possum, they might freeze; if they were a porcupine, they might extend their pretend quills. Teachers used the purposeful movement additions to their lessons as they executed their lessons during the week. The teachers were expected to include PPM in at least three English language arts lessons a week. To measure the frequency that teachers use PPM, they kept a log. The log included the date the teacher planned to use purposeful movement, the protocol/activity planned, and whether the teacher followed through with the plan. The log was kept on a google doc where the teacher could easily input and the researcher could monitor.

Throughout the 9 weeks, the teachers assessed student achievement through common assessments provided by the EL curriculum, just as they did the 9 weeks prior to the study. These assessments included mid- and post-assessments. The teachers provided the researcher with assessment results for their students mid- and post-study. The researcher used the same process using coinciding numbers for teachers and students to assure anonymity for teachers and students. The researcher compared the growth margins of the students using the assessment scores mid- and post-study to determine the impact of PPM on student achievement. The assessment measurement was different than

the student grades, as the assessments look at student proficiency and achievement on specific standards. The student grades include an average of all student work within the module including student practice work.

At the end of the 9 weeks, the researcher surveyed the teachers again, using the same survey questions that were used pre-study, to find if usage of PPM changed. The researcher compared the post-study survey answers with the pre-study survey.

Also, at the end of the 9 weeks, the researcher interviewed (Appendix F) the teachers. The purpose of the interview was to delve deeper into the use of PPM and the impact on student achievement. The teachers had the opportunity to expound on the answers they gave, and the researcher gained a more complete understanding of the impact of the intervention.

Data Collection

Each research question was answered with at least three pieces of data, shown in Table 2.

Table 2

Data Collection and Analysis Plan

Research Question	Data	Data Collection	Data Organization	Data Analysis
To what extent does PPM in reviewing and teaching material impact student achievement in English language arts?	Common Assessments	Obtain common assessment scores from teachers	Common assessments will be organized by student numbers	Compare percentage growth in module mid-assessments to post-assessments pre-study to percentage growth in module mid-assessments to post-assessments post-study
	Student Grades	Obtain student grades from teachers	Student grades will be organized by student numbers	Find percentage growth in student grades from pre-study to grades post-study
	Interviews	Researcher conducts teacher interviews	Interviews will be transcribed	Interviews will be coded for themes and frequency using Dedoose
To what extent does planning for purposeful movement impact the likelihood of teachers using movement for instruction?	Teacher Logs	Teachers keep log of use of PPM	Logs will include date, type of activity and follow-through of plans	The percentage of how many times PPM was used when it was planned for will be found for each teacher
	Survey	Use Survey Monkey to survey teachers	Survey data will be organized by question topic.	Compare changes in answers pre-study with answers post-study
	Interviews	Researcher conducts teacher interviews	Interviews will be transcribed	Interviews will be coded for themes and frequency using Dedoose

The quantitative data that were collected for this study include

1. Student growth on common assessments
2. Student grades
3. Teacher surveys

Common assessments. The researcher collected student scores on common assessments pre and postintervention and compared the students' growth margin from before intervention began to amount of growth after intervention. The mid and post common assessments are written in the English language arts curriculum the teachers use, Expeditionary Learning (EL). The assessments are valid and reliable as the creators of the EL assessments followed the backwards design method detailed below.

1. Gained understanding of Common Core State Standards (CCSS) including the anchor standards.
2. Thoroughly analyzed grade level standards and the requirements of students, including the increase of rigor in moving up grade levels.
3. Strategically bundled the standards that require similar skills so that they can be assessed together.
4. Identified texts and appropriate excerpts from the texts.
5. Determined appropriate assessment types for assessing the standards.
6. Created assessment questions and prompts.
7. Piloted the questions, prompts, and texts where any issues with assessments were highlighted and addressed (Expeditionary Learning, 2014).

Student grades. Students' grades in English language arts were collected and compared to the pre-study to find if students' grades were impacted by PPM after intervention. Student grades incorporate the average of all graded material. Graded material includes but is not limited to projects, homework, classwork, written work, and assessments. All of the grades recorded are based on the plans, assessments, projects, etc. written into the EL Education curriculum. EL also provides rubrics for assignments that all teachers use when assigning grades. All of the EL curriculum, including writing

assignments, projects and classwork, were written with backward design, starting with the common core standards (Expeditionary Learning, 2014). All parts of the curriculum were piloted to ensure reliability and validity (Expeditionary Learning, 2014).

Teacher surveys. The researcher surveyed the teacher participants before and after the study (Appendix G). The survey questions were written and used by Lyding (2012). The candidate gained permission, through email, from Lyding to use and modify the survey as needed for this study (Appendix H). Lyding ran a Cronbach Alpha to determine the consistency of the questions on the survey. A coefficient of 0.700 or higher is considered reliable (Laerd Statistics, 2017). The Cronbach Alpha for these survey questions is (0.915).

Table 3

Teacher Survey Quantitative Questions

Survey Question	Research Question 1	Research Question 2
In the past month, how frequently have you purposefully planned movement strategies ahead of time in your English language arts instruction?		X
How frequently do you use movement in instruction without planning for it in English language arts?		X
How much does planning for movement impact your use of purposeful movement in English language arts?		X

The modified survey questions have been piloted with a field of 20 teachers. The researcher wanted to find the participants' level of understanding of the questions. The feedback from the field of 20 teachers stated they needed a definition for, as well as

examples of, PPM to accurately answer the questions. The researcher added the definition and examples of PPM into the directions for the survey based on this feedback. The survey questions were answered with a 4-point Likert scale: a great deal, some, very little, not at all. The survey questions told how often teachers used PPM before the study and after the study. The survey also captured teachers' thoughts about the use of movement and if it impacted student achievement.

The qualitative data that were collected for this study include

1. Teacher interviews
2. Teacher Logs

Teacher interviews. Teachers were interviewed about changes in student achievement after intervention.

Table 4

Interview Questions

Interview Questions	Research Question 1	Research Question 2
In what ways have you noticed a difference in your students' learning since including PPM into your lessons?	X	
What specific differences did you notice?	X	
What might be some differences in students' learning that was not made evident in the assessments?	X	
Were there students who showed growth in class, but did not show growth on assessments or grades? Why do you think this is so?	X	
How did you use movement in your classroom prior to participating in the study?		X
How are you using movement in your lessons now differently than you did before the study?		X
How does planning for movement affect your use of movement in your English language arts lessons?		X
What impact did the lesson tuning protocol have on your usage of movement in your lessons?		X

The interview questions were written by the researcher and were piloted with a field of five teachers. The researcher piloted the questions with teachers who have received action-based learning training to ensure the agreeance between the interview questions and the research questions. The researcher also wanted to find the participants' level of understanding of the questions as well as the flow of the questions. The piloting occurred in two rounds. The first round, three teachers were asked the questions. The researcher found that the questions could be answered with a "yes" or "no," and the participants did not elaborate on their answers. The researcher adjusted the questions to

be more open and thought provoking and piloted them with two more teachers. The researcher received more complete answers on which the participants found it easy to elaborate. The interviews allowed for teachers to describe changes they see that may not be indicated in the quantitative data. Teachers also had the opportunity to describe any change in frequency of using PPM throughout the study. The interviews gave the teachers the opportunity to fully explain their answers, giving the researcher a more complete account of the impact of planning for and using purposeful movement in instruction.

Teacher logs. The teachers kept a log where they recorded the lessons in which they planned for purposeful movement and whether they included the movement as planned or did not include the movement in the instruction (Appendix I). These logs were kept in lieu of classroom observations. The logs include the date, the activity or protocol, and a place to indicate if the teacher did or did not include the movement in the lesson. The logs were kept in a google document where the teachers could easily document and the researcher could monitor. The researcher piloted these logs with five teachers for 5 days. The researcher piloted the logs to find ease of use and level of understanding on how to use the logs. The feedback from the five teachers indicated that the logs were simple in design and easy to understand and enter information on a daily basis.

Data Analysis

The candidate conducted an action research study using a mixed methods design. The qualitative and quantitative data were converged and analyzed to determine associations. The two variables are student achievement in English language arts and the amount of PPM included in the English language arts lesson plans. The researcher used a

Spearman's rho correlation to find if there was an association. The Spearman's rho correlation also told the strength of the association. A Spearman's rho correlation is often used to determine if there is a relationship between two variables (Laerd Statistics, 2017, p. 4). The Spearman's rho correlation calculated a coefficient, rs or ρ, which is a measure of the strength and direction of the association/ relationship between two continuous or ordinal variables (Laerd Statistics, 2017).

The Spearman's rho correlation analysis carries three assumptions:

1. The two variables can be measured on a variable and/or continuous scale.
2. The two variables are paired observations.
3. There needs to be a monotonic relationship between the two variables (Laerd Statistics, 2017).

The data collected for this study satisfies assumption one, as all data have been given ordinal or continuous values. Students' grades were reported as number 1, 2, 3, or 4.

Table 5

Meaning of Elementary Grades

Grade	Meaning
1	Below Standards
2	Approaching Standards
3	Meeting Standards
4	Exceeding Standards

(XXXX County Public Schools, 2018).

The researcher made the data continuous by finding the percentage growth between the grades pre- and post-study. The teacher survey used a Likert scale containing four values. The teacher logs were numbered with how many lessons were planned with purposeful movement and how many lessons were delivered with

purposeful movement. The researcher converted the data to continuous data by calculating a percentage of number of times the teachers used PPM in their lessons divided by the number of times the teachers planned for PPM. The qualitative data, teacher interviews, were coded for themes using the Dedoose program and converted to ordinal values. The study satisfied assumption two as the two variables, planning for purposeful movement and the impact of planning for purposeful movement on student achievement, are paired observations that were studied together to discover if an association exists. Finally, assumption three was satisfied as the researcher assumed that the study would show a monotonic relationship between planning for purposeful movement in English language art lessons at least 3 times a week and student achievement in English language arts. The variables and research design comply with the three assumptions of the Spearman's correlation, making it an appropriate analysis for this study. Using a Spearman's correlation in the analysis of the data determined the degree to which the two variables, planning for purposeful movement and the impact on student achievement, are monotonic (Laerd Statistics, 2017); monotonic meaning if the value of planning for purposeful movement increases, so does the value of student achievement (Laerd Statistics, 2017). The Spearman's correlation provided the researcher with a chart that indicated the correlation coefficient and the statistical significance of the correlation coefficient (Laerd Statistics, 2017). A Spearman's coefficient range is between -1 and +1 (Laerd Statistics, 2017).

Table 6

Spearman's Coefficient Range

Coefficient	Strength
.00-.19	Very Weak
.20-.39	Weak
.40-.59	Moderate
.60-.79	Strong
.80-1.0	Very Strong

(Laerd Statistics, 2017).

Table 6 details the coefficient range. If the coefficient is between .60 and 1.0, it determines that the association between planning for movement and student achievement is strong. Conversely, if the coefficient ranges between .00 and .36, it can be determined that the association between the two variables is weak.

Limitations

The limitations of this research design include the number of teachers participating, researcher distance to the school, and researcher bias. There were four teachers taking part in the study. While this gave data for four classes in the school, it is only a fraction of the school; however, this study provided data for a whole grade level in the school. The researcher is not a member of the school staff where the study took place. The researcher could be reached by phone or video conference but was not available by person on a consistent basis. The researcher is a certified trainer in action-based learning and a strong proponent of the practice of using PPM. The candidate remained objective in the collecting and analyzing of data by reporting the data exactly as it occurred. The researcher also used another a program to transcribe interviews and to review the interview codes to limit bias.

Delimitations

The researcher chose to use teachers' logs instead of observing the teachers'

lessons. The teachers' schedules did not allow for the candidate to see every lesson because all of the fourth-grade teachers teach English language arts during the same time period. Also, because the candidate does not work at the same school, the candidate could not be present for every lesson. The candidate also chose not to study student engagement through PPM. Again, because the researcher is not on staff at the school site, the researcher was not available to observe student engagement. In addition, the district does not allow videoing from outside research projects. Student engagement could be a subject for future studies.

Summary

This study utilized an action research approach to capture the best practices of PPM and its impact on student achievement. The four teacher participants had an understanding of the study and volunteered to participate in the action research. The research design is a mixed methods study including the following data collection: student scores on common assessments, student grades, teacher survey questions using Likert scale, teacher interviews, and teacher logs. Data analysis was ongoing throughout the study. Transcripts of qualitative data were analyzed and coded for themes using the Dedoose program. The qualitative and quantitative data were converged and analyzed, and the findings are presented in Chapter 4.

Chapter 4: Results

Restatement of Purpose

As stated in Chapter 1, the purpose of this study was to determine if there is a correlation between teachers planning for and using PPM in their English language arts instruction and their students' achievement in English language arts. Chapter 2 explained the relationship between using kinesthetic techniques during instruction and student achievement. Chapter 3 explained action research and mixed methods, described the setting, explained the intervention of PPM in English language arts class, and detailed the data collection tools. This chapter discusses the data analysis results from this study and organizes the data in three main sections. First, a record of the data sources is provided describing how and when the data were collected. Second, an explanation is provided for the statistical analysis used to analyze the quantitative data. The process of coding the qualitative data is also explained. Third, the results of the quantitative and qualitative data are provided for each data source.

Descriptive Data

Participants. As described in Chapter 3, the participants were four fourth-grade teachers from an elementary school in a large school district in central North Carolina. The teachers' years of experience range between 8 and 22 years, and their class sizes are between 26 to 27 students. All of the teachers volunteered for the study and had received training in action-based learning from the researcher in the school year prior to the study. One teacher opted out of the study near the end, leaving three teachers in the study (Appendix J). The student data are comprised of 68 students who attended the school both first and second quarter and had data points for all assessments and grades.

Survey data. The teachers were surveyed about their use of PPM before and

after the study. The survey questions were written and used by Lyding (2012) in a previous study. The candidate gained permission through email from Lyding to use and modify the survey as needed for this study. Lyding ran a Cronbach Alpha to determine the consistency of the questions on the survey. A coefficient of 0.700 or higher is considered reliable (Laerd Statistics, 2017). The Cronbach Alpha for these survey questions is 0.915.

The teachers indicated that they increased their planning for and use of PPM. The tables below show results by survey question.

Table 7

Survey Question 1

In the past month, how frequently have you purposefully planned movement strategies ahead of time in your English language arts instruction?		
Teacher	Pre-Study	Post-Study
100	Very Little	A Great Deal
200	Very Little	A Great Deal
300	Very Little	A Great Deal

Before the study, movement was not something this team of teachers planned for in their lessons. During the study, once a week the teachers met with the researcher with the purpose of including movement in their English language arts lesson plans. The survey shows that the teachers increased their frequency of planning for movement during the study.

Table 8

Survey Question 2

How frequently do you use movement in instruction without planning for it in English language arts?		
Teacher	Pre-Study	Post-Study
100	Very Little	Very Little
200	Some	Some
300	Some	Some

The teachers indicated that they do not often include movement in their lessons without planning for it ahead of time. This is true for pre- and post-study behaviors.

Table 9

Survey Question 3

How much does planning for movement impact your use of purposeful movement in English language arts?		
Teacher	Pre-Study	Post-Study
100	Not at All	A Great Deal
200	Very Little	A Great Deal
300	A Great Deal	A Great Deal

All three of the participating teachers found that planning for movement greatly impacts their usage of movement in their instruction after actively and purposefully planning for instruction that includes movement strategies.

Student achievement data. The student achievement data are comprised of common assessments and students' quarter grades in English language arts. The researcher was unable to obtain preassessment data for the students as the teachers only

gave mid- and post-unit assessments for each learning module. The teachers did not give pre-unit assessments because of the weight of the content in the curriculum. For instance, in quarter two, students read a considerable amount of informational text about animal defense mechanisms. Because the students were unfamiliar with the content of the informational texts, the teachers felt that pre-unit assessments would not be a true measure of what the students were able to do, therefore not giving a true beginning measure of their students' ability. The researcher collected the mid- and post-unit assessment data for each student pre and postintervention. The researcher also collected students' final quarter grades for each student for pre-study, quarter one, and post-study, quarter two. Scores for all graded assignments for elementary students in this district are reported with numbers 1-4. Number 1 indicates the student is below the standards, 2 indicates the student is approaching the standards, 3 indicates the student is meeting the standards, and 4 indicates the student is exceeding the standards. The same scoring system is used for quarter grades.

Each teacher taught two units per quarter giving each student two mid-unit assessments and two post-unit assessments. The mid-unit assessment scores were subtracted from the post-unit scores to find the amount of growth each student made for each unit. The mean was found from the growth of the two instructional units to find the overall growth for each student. All the students' data were combined to find the average growth for each unit and overall. First, the researcher studied the student data by class, then as a whole.

Table 10

Measures of Student Growth in Assessments

	Q1 Average Growth	Q2 Average Growth	Difference	Male Difference	Female Difference
100	0.23	0.0	-0.23	-0.23	-0.23
200	0.13	0.24	0.11	-0.07	0.39
300	-0.02	0.0	0.02	-0.04	0.1
Overall	0.11	0.08	-0.03	-0.11	0.09

The addition of PPM did not increase students' overall growth in English language arts assessments. Students in Teacher 200's class experienced the only overall positive growth in the grade level. Students in Teacher 300's class did not any experience overall growth in quarter two but improved slightly on the negative growth experienced in quarter one. Female students experienced more growth than male students.

Quarter grades were collected for each student in English language arts. Quarter grades include assessment scores as well as classwork, projects, and work samples. Quarter one grades were subtracted from quarter two grades to find the measure of growth, then the average of the students' growth measure was found. First, the researcher studied the student data by class, then as a whole.

Table 11

Measures of Student Growth in Quarter Grades

	Quarter 1	Quarter 2	Difference	Male Difference	Female Difference
100	2.54	2.64	0.1	0.09	0.09
200	2.78	2.87	0.09	0.07	0.11
300	2.32	2.4	0.08	-0.08	0.2
Overall	2.5	2.7	0.2	0.03	0.13

All classes experienced positive growth in final quarter two grades in English language arts. The three classes experienced similar growth. Again, female students experienced more growth than the male students.

Teacher log data. During the lesson tuning sessions, the researcher and teachers reviewed the standards of the lessons of the animal defense unit, then studied the protocols included in the EL curriculum that involve movement. The teachers used and modified a few of these protocols frequently.

Back to back, face to face protocol. This protocol was popular with students and teachers. During this protocol, students traveled around the room until the teacher gave them the cue to stop. The students then partnered with the nearest student and stood back to back. The teacher posed a question or topic for the students to ponder. They were not allowed to talk until the teacher said, "face to face." The students would turn around and start discussing the question of topic with their partner. When the teacher signaled to end the discussion, the students began to travel around the room (EL Education Curriculum, 2018). The teachers modified this protocol telling students to travel like the animal they just discussed with their partner.

Volley for vocabulary protocol. The teachers created 3 to 4 groups of students and gave a volleyball to each group. Vocabulary words were taped to each ball. The students tossed the ball to each other in the circle. When a student caught the ball, they acted out the word that was closest to their right thumb (EL Education Curriculum, 2018).

The pinky partner protocol. Students stood with their writing samples, holding their pinky in the air. When the teachers gave them a cue, the students silently traveled around the room until they found a partner and locked pinkies with him/her. First, one student would share his/her work, then the other student would share (EL Education Curriculum, 2018). The teachers modified this protocol for students to act out the story being read to them by their partner, then switching roles.

The teachers and researcher also created protocols to use for PPM when the movement protocols provided by the curriculum were not appropriate for the lesson.

Role playing defense mechanisms. This protocol was used to help students remember the different defense mechanism animals use. The teacher called out the name of an animal and all of the students would pretend to be that animal. The teacher then would say, "danger!" All of the students would pretend to use the defense mechanism of that animal.

Defense tag. This protocol mimicked the game, tag, but students were assigned different animals. The students traveled like their assigned animal and when the taggers approached, they pretended to use their defense mechanism. Students were assigned different animals every time the game restarted.

Throughout the study, each teacher kept a log of when she planned for PPM in English language arts, which protocol was to be used, and if she followed through with

her plans. The logs were kept in lieu of classroom observations because the researcher does not work at this school and was unable to observe on a regular basis. The logs were used to show if planning for movement impacted the frequency PPM was used in the instruction of English language arts lessons. The teachers were asked to include PPM in their lesson plans for 3 English language arts lessons a week for 9 weeks. None of the teachers reached three lessons a week.

Table 12

Teacher Log Data

Teacher	# lessons planned for PPM	# lessons followed through	% followed through	% ELA lessons including PPM
100	17	13	76%	48%
200	16	14	86%	52%
300	22	22	100%	81%
Total	55	49	89%	60%

While no teacher reached 27 lessons with PPM, there is a high percentage of follow-through when PPM was included in their lesson plans. PPM was included in an average of 60% of English language arts lessons. When used, PPM protocols lasted 10 to 15 minutes on average, which amounts to 15% of the English language arts block. Teacher 300 had received more prior training from the researcher in action-based learning, by her own choosing due to her personal interest, than the one session the other teachers received.

Lesson tuning notes. During the lesson tuning process (West Ed, 2017), the researcher took notes, capturing the conversations and decisions made during the meetings. The notes were not included in the original research design; however, when

reviewing the data, the notes contained information that was helpful in explaining the data. The researcher's notes were coded for themes and frequencies as shown in Table 13. The themes and frequencies were reviewed by a peer who corroborated with the researcher on the data. The themes reflect the recurring ideas and feelings expressed by the teachers as were captured in the researcher's notes. The researcher recorded when teachers commented on their frustrations and successes as well as overall attitudes of the study. The codes reflect the six most discussed and/or expressed ideas and feelings during the lesson tuning process (West Ed, 2017). Difficulties with curriculum was used when the teachers expressed difficulties of adding movement into the curriculum. Difficulties with protocol was used when teachers shared that they experienced trouble using a protocol. Excited about protocol was used when the teachers showed enthusiasm for either a protocol they were planning for or a protocol they had used. Pressures of district was used when the teachers were reluctant to try PPM because of the pressure of delivering the curriculum as it is written. Sharing ideas was used when the teachers began sharing what they had used in their classrooms or how they modified a protocol to work better in a lesson. Finally, student success was used when the teachers shared stories about how protocols helped certain students.

Table 13

Lesson Tuning Themes and Frequencies

	Difficulties with Curriculum	Difficulties with Protocol	Excited about Protocol	Pressures of District	Sharing Ideas	Student Success
Frequency	20	13	16	29	12	15

During the lesson tuning sessions, the teachers expressed concern of being able to

cover all of the material required by the curriculum while including unfamiliar movement protocols in their lessons. The teachers were, at times, uneasy about including protocols that were not included in the curriculum because of the pressures of delivering the curriculum with fidelity. These concerns impacted the number of times the teachers included movement protocols in their English language arts lesson plans. Conversely, during the second half of the study, the teachers began feeling more comfortable and confident with the movement protocols and began sharing ideas, what was working in their classes as well as specific student successes. Even with the increased interest in the second half of the study, concerns about the curriculum remained a theme throughout.

Interview data. Teachers were interviewed about changes in student achievement after intervention. The interview questions were written by the researcher and were piloted with five teachers. The interviews allowed for teachers to describe changes they see that may not be indicated in the quantitative data. Teachers also had the opportunity to describe any change in frequency of using PPM throughout the study. The interviews gave the teachers the opportunity to fully explain their answers, giving the researcher a more complete account of the impact of planning for and using purposeful movement in instruction.

Each teacher agreed to the interview, all of which were recorded. The recordings were transcribed, and the transcriptions were used in the Dedoose application to code for themes and frequencies. The interviews also gave the researcher insight to each teacher's use of PPM and helped to explain some differences in achievement data. The transcriptions of the interviews were used to code for themes and frequencies. The codes were weighted for positive and negative responses. For instance, if the teacher responded that student achievement improved, the code was weighted with the number 2. If the

teacher explained that student achievement did not improve, the code was weighted with the number 1. All of the themes were positive, except for one code in student achievement. The themes that emerged and how often they appeared in the interviews are shown in Table 14. The themes, frequencies, and weights were reviewed by a peer who corroborated with the researcher on the data.

Table 14

Interview Codes and Frequencies

Teacher	Planning	Achievement	Instruction	Movement	Past Usage of Movement	Engagement
100	17	9	11	12	1	3
200	12	8	10	17	2	3
300	8	2	6	6	4	2
Total	37	19	27	35	7	8

The six codes presented in Table 14 represent the codes with the highest frequencies during the interviews. Student engagement is not part of this study but was a reoccurring theme in the interviews and therefore was included in the codes and will be discussed in Chapter 5.

Summaries of the interviews and tables of themes and frequencies for each question are provided in the order the questions were asked.

Question 1: In what ways have you noticed a difference in your students' learning since including PPM into your lessons? During this question, engagement was mentioned eight times, while achievement was mentioned four times.

Table 15

Question 1 Themes and Frequencies

Theme	# Positive	# Negative	Total Frequency
Engagement	8	0	8
Achievement	3	1	4

Teachers 100 and 200 mentioned seeing better focus from their students when using movement, and student-to-student talk improved. Teacher 100 (personal communication, January 22, 2019) said, "The student engagement has gone up in the lessons, and the student to student talk has increased, like their ability to focus during student to student talk, and engagement during student to student talk." While student engagement is not included in this study, all three teachers mentioned engagement being a difference that they noticed in the students' learning.

Question 2: What might be some differences in students' learning that was not made evident in the assessments? The teachers answered this question with statements about improved student achievement six times and movement three times.

Table 16

Question 2 Themes and Frequencies

Theme	# Positive	# Negative	Total Frequency
Movement	3	0	3
Achievement	6	0	6

All three teachers said that students' speaking and listening skills greatly improved. Teacher 300 (personal communication, January 24, 2019) specifically mentioned improvement in her students' writing, stating, "Their writing has also improved. I saw a lot of really good growth in writing this quarter. Especially compared

to first quarter." She (personal communication, January 24, 2019) went on to say, "When you put the writing side by side, it looks like a totally different kid. It's not. It's the same kid." The English language arts curriculum has specific speaking and listening standards, but those standards are not addressed in the assessments and therefore not showcasing student growth in those areas.

Question 3: Were there students who showed growth in class but did not show growth on assessments or grades? Why do you think this is so? The teachers spoke positively about student achievement nine times and movement six times.

Table 17

Question 3 Themes and Frequencies

Theme	# Positive	# Negative	Total Frequency
Movement	6	0	6
Achievement	9	0	9

All three teachers noted that their lower level students benefited the most from including PPM in their lessons. Teacher 100 (personal communication, January 22, 2019) explained this, saying, "Our assessment text level was really difficult, and the questions sometimes are really difficult to understand." She (personal communication, January 22, 2019) further explained, "The kids that would do better if we were reading it to them don't perform well on the assessments." While the lower level students improved, their reading levels were still too low to be able to read the assessments independently; therefore, the students' achievement, as indicated by assessment scores, did not change.

Question 4: How did you use movement in your classroom prior to participating

in the study? Past usage of PPM is the least of the themes from the teacher interviews. All teachers alluded to past usage of PPM, but only seven times total. While talking about past usage of PPM, the teachers also mentioned instruction, planning, and movement.

Table 18

Question 4 Themes and Frequencies

Theme	# Positive	# Negative	Total Frequency
Movement	5	0	5
Instruction	5	0	5
Planning	4	0	4
Past Usage of PPM	7	0	7

Teacher 300 explained in her interview that her style of teaching did not change substantially during the study. All three of the teachers had received action-based learning training, but Teacher 300 had experienced several action-based learning trainings with the researcher and had incorporated many strategies into her daily teaching already. Of the three teachers, she mentioned past usage of PPM the most. In describing her past usage, she (personal communication, January 24, 2019) said, "We did a lot of walks around the room, movement with language. We did a lot of go noodle. They did a lot of hand gestures and that was all before the survey and the study." Teachers 100 and 200 said they used movement more in math and had not thought about using it in English language arts prior to the study. Teacher 200 stated (personal communication, January 23, 2019) stated, "I think it's just a bit easier to do it in a math class. So I didn't use it very much in reading and writing lessons, it was more just kind of turn and talk to your

partner, but not a lot of moving around." Two of three teachers did not regularly use PPM in English language arts prior to the study.

Question 5: How are you using movement in your lessons now differently than you did before the study? Planning was the most frequent theme for this question, followed by movement and instruction.

Table 19

Question 5 Themes and Frequencies

Theme	# Positive	# Negative	Total Frequency
Movement	11	0	11
Instruction	10	0	10
Planning	15	0	15

All three teachers said they are being more purposeful about how they are planning for movement. They also said that using movement to teach reading and writing was very different than what they had done prior to the study. Teacher 200 (personal communication, January 23, 2019) explained this, saying,

> I don't think to put the movement in on the spur of the moment, so planning for it helps me to give the kids those more natural breaks and helps me to realize how I can structure the lesson a little better around these times when they can get up and move.

All three teachers spoke to designing lessons so that PPM is a forethought and not an afterthought.

Question 6: What impact did the lesson tuning protocol have on your usage of movement in your lessons? Teachers spoke of planning while answering about the

lesson tuning protocol 18 times, followed by movement and instruction.

Table 20

Question 6 Themes and Frequencies

Theme	# Positive	# Negative	Total Frequency
Movement	18	0	18
Instruction	12	0	12
Planning	18	0	18

All three teachers explained that the protocol made them more aware of what specific standards they were addressing with PPM. Teacher 100 (personal communication, January 22, 2019) stated that having the planning meetings where the protocol was used made her plan for the movement: "It just made me more conscious about what's coming and what I could do to incorporate the movement into each lesson." Using movement to teach the English language arts standards was an important part of this study.

The researcher also found codes that overlapped.

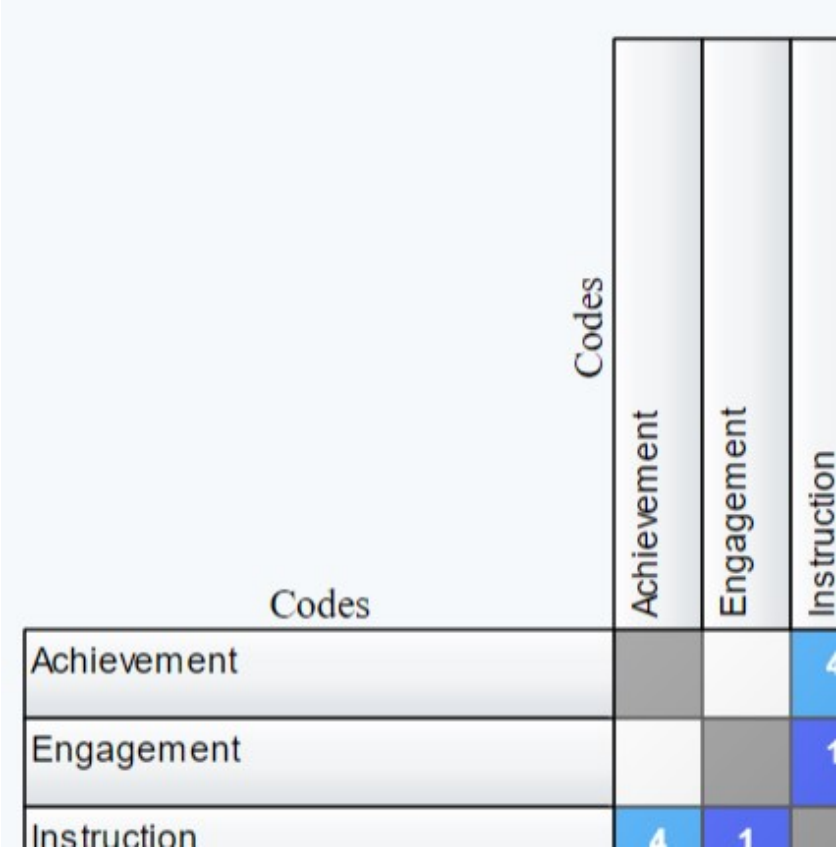

Figure 3. Code Co-Occurrence (Dedoose, n.d.)

During the interviews, the teachers often spoke of planning and movement together as well as movement and instruction. This is indicated in Figure 3. Planning and movement co-occurred 28 times, and instruction and movement co-occurred 25 times. This shows a connection in planning for and using movement in instruction. Movement and achievement co-occurred nine times, as all three teachers made statements about movement in relation to their students' achievement in English language arts. Teacher 300 (personal communication, January 24, 2019) stated, "I saw a lot of really good growth in writing this quarter. Especially compared to first quarter." Planning and past usage of PPM only co-occurred four times, showing that planning for PPM was not a practice used often by the teachers prior to the study.

Correlational Analysis

The research questions in this study focused on the impact of PPM by seeking the strength of the relationship between planning for PPM, using PPM in English language arts instruction and student achievement in English language arts. Spearman's rho (R) correlational measures were used to find the association between the use of PPM and student achievement, for common assessments and for quarter grades. A coefficient between 0.6 and 1.0 indicates a strong association (Laerd Statistics, 2017). Due to the small sample size of the teacher group, teacher data could not establish statistical significance, so descriptive data were used for analysis.

Research Question 1: To what extent does PPM in reviewing and teaching material impact student achievement in English language arts? A Spearman's rho analysis was performed using student assessments and student grades data. The findings from the quantitative analysis were compared to the interview data to give the researcher a complete picture from the perspective of the teachers of the impact of PPM on student achievement.

Operational definitions of variables. The dependent variables are common assessments and quarter grades. Growth was found for every mid- and post-unit assessment, then averaged to find the overall growth. This was completed for both assessments in quarter one and both assessments in quarter two. The mean of the overall growth of all 68 students in quarter one and quarter two was found and used in the Spearman's rho analysis. Quarter one grades were subtracted from quarter two grades for each student to find the measure of growth. The mean was found for all 68 students and used in the Spearman's rho analysis.

The change (growth) in assessment scores across two units in each of the first and

second quarters were compared to assess growth in module mid-unit assessments to post-unit assessments pre-study (quarter one) to growth in module mid-unit assessments to post-unit assessments post-study (quarter two). With two units covered per quarter, the mean growth across both units within each quarter was utilized to compare the overall growth in the unit assessments.

Table 21

Overall Growth Q1, Overall Growth Q2 Crosstabulation of Common Assessments

Overall Growth Q1	Overall Growth Q2					
	-1.0	-0.5	.0	.5	1.0	Total
-1.0	0	0	0	2	0	2
-0.5	0	1	5	3	1	10
.0	0	5	23	6	0	34
.5	1	2	7	4	1	15
1.0	0	0	5	2	0	7
Total	1	8	40	17	2	68

By looking at the crosstabulation table (Table 21), 23 students (34%) showed no growth in the units in both quarter one and quarter two. Interestingly, of the 12 students who showed negative growth in quarter one, 11 of these students recorded either no growth or positive growth in quarter two. Of the nine students who showed negative growth in quarter two, eight of them showed no growth in quarter one, while one also had negative growth in quarter one. The correlation table (Table 22) shows if there is a correlation.

Table 22

Spearman's rho Correlations for Common Assessments

		Overall Growth Q1	Overall Growth Q2
Overall Growth Q1	Correlation Coefficient	1.000	-0.075
	Sig. (2-tailed)		0.543
	N	68	68
Overall Growth Q2	Correlation Coefficient	-0.075	1.000
	Sig. (2-tailed)	0.543	
	N	68	68

As indicated by the Spearman's rho analysis, there was no correlation (rs=-0.075) between PPM and student achievement in the overall student growth in common assessments.

Table 23 shows the crosstabulation of pre-study grades (quarter one) and post-study grades (quarter two).

Table 23

Crosstabulation of Q1 and Q2 Grades

Quarter 1 Grade	Quarter 2 Grade				
	1	2	3	4	Total
1	6	2	0	0	8
2	0	12	3	0	15
3	0	2	39	3	44
4	0	0	0	1	1
Total	6	16	42	4	68

Fifty-eight (85%) students earned the same grade in both quarter one and quarter two. Interestingly, eight students earned a better grade in quarter two than quarter one, while only two received lower grades in quarter two than quarter one. Additionally, of the 23 students who received grades of one or two in quarter one, five students (22%) improved their grade after the intervention.

A Spearman's rho analysis was conducted on the grade data shown in Table 24.

Table 24

Spearman's rho Correlation for Grades

		Overall Growth Q1	Overall Growth Q2
Q1 Grade	Correlation Coefficient	1.000	0.847
	Sig. (2-tailed)		0.000
	N	68	68
Q2 Grade	Correlation Coefficient	0.847	1.000
	Sig. (2-tailed)	0.000	
	N	68	68

The quarter grades show a highly positive correlation as indicated by the correlation coefficient, 0.847.

The findings from the quantitative data were compared to the qualitative data gathered in the teacher interviews. The teachers mentioned movement a total of 19 times and movement and achievement together nine times. The teachers explained that they noticed growth in their lower level learners, but it did not show in the assessments because the reading level of the assessments were still too high for the students to read them independently. Teachers also commented that students improved in speaking and listening skills, addressing English language arts standards SL 4.1, 4.2, 4.3, and 4.4 (North Carolina Standard Course of Study for English Language Arts, 2017). Those standards are not tested in the common assessments but are included in the quarter grades. The teachers also described the improvement in writing. The second half of the second quarter was writing intensive, therefore much of the PPM was incorporated into

writing lessons. Teacher 300 remarked that her students' writing improved so much that it did not look like it came from the same student. Other work samples such as classwork, writing samples, and projects are included in the quarter grades. These are pieces of work that displayed the growth of the lower level learners that was not made evident on the common assessments.

Research Question 2: To what extent does planning for purposeful movement impact the likelihood of teachers using movement for instruction? The teacher logs, teacher surveys, and teacher interviews were analyzed and compared. According to the surveys, all three teachers used PPM more during the study, when they were planning for it, than before the study. Every teacher answered "very little" to the question about how often they planned for movement the month before the study. Every teacher answered, "a great deal," to the same question post-study. All three teachers also said that planning for movement impacted their use of movement during instruction "a great deal." While the number of times the teachers planned for movement in English language arts class varied between the three, the teacher logs showed that when the teachers planned for movement, they would follow through with their plans at least 76% of the time. All three teachers said in their interviews that the lesson tuning protocol made them more aware of lessons to come and they put more thought into how to incorporate movement into their lessons. They also said that they were more likely to use movement in their instruction when they planned for it. This was made evident in Figure 3 where planning and movement co-occurred 28 times and movement and instruction co-occurred 25 times. Of all the themes presented in Table 13, movement and planning were used with the most frequency. Planning to include movement in English language arts instruction impacted the teachers' use of PPM in their lessons.

Connections to Theoretical Framework

Teachers in this study engaged in brain-based learning by using movement strategies that are derived from an understanding of the brain (Jensen, 2008). It was expected that through the use of these strategies, students would show improved achievement in English language arts. The teachers were motivated by the belief that the movement strategies they used would accelerate learning (Hidden Curriculum, 2015). The results showed that students did grow, but the growth was not always made evident on the common assessments included in the scripted curriculum. Students showed growth, however, in quarter grades; and the teachers commented on student growth in their interviews after the study. While the anticipated growth in assessments did not transpire, the growth in grades and observations from the teachers point to agreement with the theoretical framework of the study, that learning is improved when teachers base instruction on the science of learning (Hidden Curriculum, 2015).

Summary

Student growth in common assessments and grades was compared to teacher interview data in the area of student achievement. These comparisons were analyzed to determine if a relationship exists between PPM and student achievement. A Spearman's rho correlation analysis was conducted to determine the strength of the relationship between the variables. No significant correlation was found between PPM and student achievement in the common assessments; however, a significant correlation was found between PPM and quarter grades. The qualitative data, teacher interviews, also pointed to an increase in student achievement in areas such as writing, speaking, and listening, which were not included in the common assessments. The researcher only used descriptive statistics to describe the teacher data due the small sample size. Three

teachers is not sufficient to be statistically significant. The descriptive statistics show that these teachers increased the amount of PPM used in instruction when they wrote it into their lesson plans. Their logs showed that movement was used in instruction at least 76% of the time it was planned. In the survey, all three teachers indicated that they planned for movement more post-study than pre-study. The teachers stated in the interviews that the lesson tuning protocol made them more aware of the standards they were addressing and how best to use movement to teach those standards. Further discussion of these results is presented in Chapter 5

Chapter 5: Findings

Summary

The focus of this study was to find if there is a correlation of including PPM in instruction and student achievement, and if planning for movement impacted the frequency in which PPM was included in English language arts lessons. The results presented in Chapter 4 do not show a correlation between PPM and student achievement as measured by common assessments but do show a correlation between PPM and student grades. The qualitative data, taken through teacher interviews, also pointed to a connection between PPM and student achievement. The descriptive data used to find the perception of the impact of planning for movement showed that all three teachers were more likely to use PPM when it was discussed beforehand and included in their lesson plans.

Conclusions

Findings. Two research questions were used determine the correlation of PPM to student achievement and the correlation of planning for movement and frequency of use of movement in instruction. Common assessments written into the EL curriculum, quarter grades, and teacher interviews were used to find the correlation to PPM and student achievement. Teacher surveys, teacher logs, and teacher interviews were used to find the impact of planning for movement on usage of movement in instruction.

Research Question 1: To what extent does PPM in reviewing and teaching material impact student achievement in English language arts? The Spearman's rho analysis indicated that there was no significant correlation, $r_s=-0.075$, between the use of PPM and student achievement on the common assessments; however, the Spearman's rho analysis that was conducted on the students' quarter grades did find a significant

correlation, rs=0.847, between the use of PPM and student achievement. In addition, the teacher interviews were transcribed and coded for themes. Teachers spoke positively about student achievement 18 times and achievement and movement co-occurred nine times. The teachers explained in the interviews that they noticed the biggest growth in their lower level students. Teacher 200 (personal communication, January 23, 2019) spoke of this when asked if there were students who grew but did not show it on the assessments:

> Specifically, my lowest learners, because they're working so far below grade level that they're making growth, but they're not able to complete assessments independently, so their grades (on the assessments) are still showing that they're below grade level, because they are, but it's not reflecting the growth that they've actually made.

While lower level students did improve, their reading levels were still too far below grade level and they were unable to complete assessments independently, therefore scoring 1s and 2s. The correlation coefficient found in the Spearman's rho analysis for PPM and common assessments showed no correlation. It should be noted, however, that student growth on common assessments did not show a significant decrease during the intervention. Teachers also shared that students' speaking and listening skills improved. The speaking and listening standards are addressed in assignments and projects that are included in the quarter grades but were not addressed in the common assessments. Based on the statements the teachers made during the interviews and the strong correlation found between PPM and quarter grades, the researcher concludes that PPM does positively impact student achievement.

Research Question 2: To what extent does planning for purposeful movement

impact the likelihood of teachers using movement for instruction? The descriptive data used to find the association between planning for movement and the use of movement is positive. All three teachers increased their planning for movement as indicated by their answers on the survey question asking how often they used PPM the last month. All three teachers answered "very little" in the pre-study survey and "a great deal" in the post-study survey. Past usage of PPM and planning only co-occurred in the interviews four times, while movement and planning co-occurred 28 times, pointing to an increase in the teachers planning for movement. Their survey answers also said they increased their use of movement. All three teachers answered that planning for movement impacted their use of movement "a great deal." The teacher logs showed that when movement was planned for a lesson, the teachers followed through with their plans at least 76% of the time. The teachers also stated in their interviews that they were more likely to use movement when they planned for it. This is particularly noted in the high co-occurrence of planning and movement in their interview data. None of the teachers were successful in planning for movement at least three times a week as the study was designed. The teacher who planned and implemented the most, planned for 22 lessons with PPM and followed through in 100% of those lessons. The teacher who planned the least PPM planned for 16 lessons and followed through in 86% of those lessons. The number of lessons did not hit the benchmark, but the connection of planning for and including movement in instruction is positively high. Based on the statements the teachers made during the interviews, the teachers' answers on the survey and the high percentage of follow-through recorded on the teacher logs, the researcher concludes that planning for PPM impacts the use of PPM during instruction.

Connections to literature. Jensen (2013) said that the brain is designed for

active learning. Blaydes (personal communication, July 14, 2016) stated, "Learning happens from the feet up, not the neck up." The teacher participants in this study incorporated kinesthetic techniques to give their students brain-based learning experiences in English language arts. By incorporating movement into their instruction, the teachers engaged students in implicit learning, so retention could take place more easily (Jensen, 2000). Every teacher said that student engagement increased during the intervention for a total of eight times. While student growth was not shown in the common assessments, growth was found in student grades and observed by teachers as reported through the interviews. Teacher 200 (personal communication, January 23, 2019) spoke about her use of movement saying, "it helped a lot with them (students) being able to express their thinking." Teacher 200 was recalling when students were acting out different animal defense mechanisms. After students were able to physically act out the defense mechanisms, they were better at explaining it in conversation and in writing. This is in agreement with Hannaford (2005) who stated that when cognitive information is combined with movement, retaining and recalling data become easier.

While there were improvements in student grades and in teacher observations, there was not a correlation between PPM and common assessments. The teachers worked to include PPM in their scripted curriculum while keeping the pace and the rigor that is written in the curriculum. Including the movement in the lessons at least three times a week, for a total of 27 lessons, proved to be too difficult for the teachers. The teacher with the highest number of lessons including PPM only planned and followed through for 22 lessons. Teachers leaving out PPM to more closely follow the curriculum points to Jensen's (2008) idea that the brain does not learn by a school's inflexible schedule, the brain has its own rhythms.

Chapter 2 discussed the work of Willington (2005) and his meta-analysis about teaching to learning styles and student learning. Willington saw the different materials and procedures used to teach to the different learning styles as a common error in the studies. The researcher disagreed with this conclusion, stating that materials and procedures must be changed to reach the needs of the different learning modalities. The researcher points to her own study as evidence that one must change materials and procedures in order to effectively teach to the different learning styles. The study detailed here was conducted in the confines of a scripted curriculum, EL. Teachers attempted to plan and include movement protocols within the scripts. While this study did see some positive correlations with PPM and student grades, the teachers pointed to the difficulty, stress, and pressures of the scripted curriculum as barriers to planning for and including movement in their instruction. The teachers cited this as the main reason they did not reach the benchmark of including PPM in 27 lessons. While taking notes during the lesson tuning (West Ed, 2017) session, the researcher recorded that the pressures of "getting through the material" took over the plans for delivering material in the most effective way. The teachers also expressed frustration in the common assessments that are written into the curriculum that do not allow for differentiation for students to truly show what they know. If teachers experience autonomy of plans and assessments, they may be more successful in delivering the material in a way that would satisfy students' kinesthetic needs. Delivering instruction through a script makes differentiating for learning modalities more difficult.

Active learning relies on the brain/body connections that are made while learning through movement (Blaydes, 2016). Students in this study were provided opportunities to move in their learning, showing that movement is fundamental to the brain as it works

with the body, not in isolation, demonstrated by growth in student grades and statements made by the teachers in the interviews (Kovalik & Olson, 2010). Teacher 200 (personal communication, January 23, 2019) commented on this connection, saying,

> Our EL, language arts, lessons are very, very long, or the period of time that we have for doing the lessons is really long. So, they get antsy and the movement helps to keep them more engaged in the lesson.

When students sit for long lesson periods without movement, they do not have the advantage of the mind/body connection; but when they are allowed to move and their body is involved in the learning, as in this study, they do have the advantage of the mind/body connection and it is shown in their engagement, growth in grades, and teacher observations. The movement provided to the students during the study aided in their ability to learn information by causing biological changes in the brain brought on by the new activities (Kovalik & Olson, 2010). These students were allowed to experience the curriculum through their bodies, forming deeper emotional, interpersonal, and kinesthetic connections to the academic subject, English language arts (Griss, 2013).

Limitations

There are limitations that became apparent in the course of the study. These limitations include small number of teacher group, teachers not planning for movement at least three times per week, and the use of mid-unit assessments versus pre-unit assessments.

The proposed research plan included four teachers in the study, which was already a limitation due to its small size. One teacher exited herself from the study after experiencing difficulties with her class, making the sample size smaller. The researcher feels she could have been a better support for this teacher had the circumstances of the

study been different, which will be discussed in recommendations.

The researcher met with the teachers every week to plan how to incorporate movement in their lessons for the next week. While the team reviewed all the lessons and followed the lesson tuning protocol, there was a discrepancy in the planning meetings and the plans that were written in the teachers' plan books. The number of times the teachers planned for movement were 22, 17, and 16. The district's emphasis on the importance of the scripted curriculum being implemented with fidelity sometimes discouraged the teachers from including the movement in their planning, especially if the protocol discussed in the lesson tuning meetings was not a protocol provided in the curriculum.

The research plan included finding growth from pre-unit assessments to post-unit assessments. When the researcher collected the pre-study data, she found that the teachers only give mid-unit and post-unit assessments with the EL curriculum. The reasoning for not giving pre-unit assessments is that the curriculum is content heavy. A pre-unit assessment would not truly show what the student could do because they would not yet be familiar with the subject specific content, in this instance, defense mechanisms of animals. This is a limitation for the study because the intervention was put into place at the beginning of the second quarter; therefore, mid-unit assessments were conducted after the intervention began. While growth was still measured from mid-unit and post-unit assessments pre-study (quarter one) and post-study (quarter two), having pre-unit assessments may have given a more true measure of growth.

Implications

Educational practice. The researcher found three implications this study has on educational practice: the need for coaching, the need for observation and modeling, and

the challenges of scripted curriculums.

All four teachers who were originally part of the study had received training from the researcher in action-based learning the school year prior to the study. It was evident at the beginning of the study, however, that three of the four teachers really did not know where to begin in planning to use movement in instruction. One teacher, by choice due to personal interest, had received several trainings in action-based learning from the researcher. She is the one teacher who had been using PPM the most in the past and felt the most comfortable in the lesson tuning sessions. She is also the teacher who planned for and followed through with PPM the most. This indicates that one training is not enough for teachers to begin using the intervention on their own successfully. The researcher noticed about half way through the quarter that the teachers became more confident and independent in the lesson tuning sessions. They began to rely less on the researcher's input and began finding and creating their own movement protocols. As they became more confident, according to their answers in the interviews, their delivery of movement during instruction also improved. Had the researcher not met with and helped coach the teachers through the process, they may have all given up on the intervention. Implementing strategies that are new to teachers takes time and coaching. This study used the lesson tuning protocol (West Ed, 2017) as a coaching tool for a whole quarter to help the teachers become more competent and independent in incorporating PPM into their lesson plans. After using the tool for 4-5 weeks, the teachers began feeling comfortable, and the researcher moved from a coaching role to more of a consultant role.

Being able to observe and model the intervention for teachers is important. While the coaching that was provided by the researcher helped the teachers in their

implementation of movement during instruction, the implementation may have been more successful if the researcher had been able to observe and model the movement protocols. Movement inside the classroom can be intimidating for teachers who are not accustomed to those strategies. Allowing students to move can give teachers the feeling that they are losing control. If the strategies can be modeled for the teachers, they can feel more comfortable in teaching with the same or similar strategies. Brain-based learning is motivated by the belief that learning can be accelerated and improved if teachers base their instruction on the science of learning, but teachers must be shown how this can work in their classrooms (Hidden Curriculum, 2015). One teacher exited herself from the study stating that the movement was too difficult for her class. Her reasoning was she had many students with ADHD. The researcher, having extensive experience with students of that population, could have given additional help if she could have modeled in the teacher's classroom and observed her during the implementation period.

Scripted curriculums are not ideal for differentiating for learning modalities. While the EL curriculum includes protocols that include movement, most of the protocols do not. EL has 60 protocols, 14 of which include some sort of movement. Of those 14, only six were found useful for the modules being taught during the study. While the teachers and researcher were able to create some of their own protocols, the pressure from the district to deliver the curriculum with fidelity made the teachers uneasy at times. Giving teachers autonomy in what strategies they use in instruction and assessment increases the opportunities for them differentiate for learning modalities. The human brain is designed for interactive learning (Jensen, 2013). "Our brains are designed to actively manage our experiences, not passively 'download' them" (Jensen, 2013, para. 17). Without interactive visual, auditory and tactile input, systems misfire and

underperform (Jensen, 2013).

Recommendations

Recommendation based on data. The data from the study indicates that PPM does correlate with growth in student grades. The researcher recommends that teachers include PPM as part of their teaching systems. The data from the study also show that planning for movement during instruction greatly increases the use of PPM during instruction. Because PPM is linked to increased student achievement, it is recommended that teachers plan movement protocols and strategies that address the curriculum standards ahead of delivering the instruction. Using tools such as the lesson tuning protocol (West Ed, 2017) used in this study helps teachers link the standards to be taught with appropriate movement protocols. The lesson tuning protocol (West Ed, 2017) also gives teachers the opportunity to share movement ideas with one another and provide each other with feedback. The conversations that can be conducted during the protocol allow the teachers to have a greater understanding of PPM and become comfortable with the movement protocols.

Recommendations for implementation of active learning. The researcher observed that the coaching the teachers received from the researcher was not always effective, due to the researcher being unable to observe the teachers in action and not being able to model the protocols. The researcher recommends that when implementing a movement intervention to provide modeling and coaching based on the observations of the classrooms. This will help teachers be more comfortable with new techniques and make them better prepared to use them on their own. The ideal active learning implementation would follow the model below.

1. Initial training: A certified action-based learning trainer conducts a learning

session including the science behind kinesthetic teaching and the 6-part framework for creating a kinesthetic classroom (Kuczala & Lengel, 2010).

2. Lesson Tuning: The certified trainer meets with teachers and goes through the lesson tuning process (West Ed, 2017). During this process, the teachers and trainer review the goals and standards of the lesson and decide the best approach for including movement. The lesson tuning is used to ensure that the movement is used for learning, not just for the sake of moving (West Ed, 2017).
3. Modeling: The certified trainer models a lesson for the teachers. The trainer will follow the tips and techniques outlined in the 6-part framework for creating a kinesthetic classroom (Kuczala & Lengel, 2010). The teachers will see firsthand how the trainer organizes the students, uses cues to start and stop movement, and maintains control in what sometimes can feel like chaos (Blaydes, 2016).
4. Observation: The certified trainer observes the teachers implementing movement into their lesson. The trainer takes coaching notes on what the teacher does well and notes on what can be improved following the framework of a mentor coaching cycle (Dunne & Villani, 2007).
5. Coaching and Reflecting: The trainer and the teacher meet so the trainer can share his/her coaching notes and listen to and/or answer the teacher's questions and concerns. The trainer is able to provide objective feedback, discuss the effectiveness of the movement with the students and enable the teachers to make decisions on how to best implement movement in their classroom (Dunne & Villani, 2007).

6. Continuous Planning and Coaching: The trainer continues to plan with teachers and coach until teachers are competent and confident in the new teaching style. As the teachers begin to take ownership in the process, the coaching can be reduced to consultation (Dunne & Villani, 2007).

Recommendations for future research. The researcher has five recommendations for future studies of the same or similar topic: longer study period, use measures that show growth of lower level learners, include student engagement in the study, use a larger participant group, and use observation data.

The research design for this study was 9 weeks long, or one quarter of the school year. Differences and growth in learning were found; however, the researcher believes that with more time, the outcomes may have been significantly stronger. The majority of the teachers did not show the researcher confidence in deciding on, making, and using movement protocols until the second half of the quarter. A longer study would give teachers and students more time to grow accustomed to the new teaching techniques.

The mid- and post-unit assessments that were written in the curriculum were still too difficult for the lower level students, according to teachers, even after the implementation of PPM. A different measure that allows for lower level students to truly show what they know would give a more complete picture of the growth that can be accomplished through PPM.

Student engagement was a theme that occurred during the teacher interviews. When the teachers were asked, "What difference have you noticed in students' learning," all three teachers said their students were more engaged in the learning. A future study could find the association between PPM, student engagement, and student achievement.

Because the teacher participant group was small, the data were not statistically

significant. A larger study with more teacher participants would provide more data and the findings would be more statistically significant and more beneficial to future use of PPM.

Finally, observations of the PPM in the classroom would be helpful in a study about kinesthetic techniques. Relying on the teacher logs made it difficult for the researcher to gauge how effective the strategies were in the classroom. Through observations, the researcher could provide more effective coaching and see the effectiveness, or ineffectiveness, firsthand, providing more complete data.

Final Remarks

It is essential that research on the topic of PPM continues. It is necessary to determine how to best differentiate instruction for learning modalities in order to reach kinesthetic learners in the classroom setting. In future movement studies and initiatives, teachers must be given the proper training and examples in order to become confident and successful in using PPM. Teacher 200 (personal communication, January 23, 2019) stated in her interview, “I realize that I'm up in front of the class moving around as much as I want, and they're the ones stuck in their seats, and that can be really difficult.” She (personal communication, January 23, 2019) also stated, “I definitely think it's (PPM) been a positive for my classroom.” This reflection from Teacher 200 points to the positive changes that can happen through PPM with teachers and their students. The researcher encourages the future use and study of PPM in classrooms.

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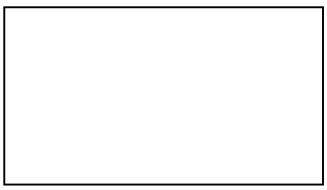
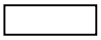
Appendix A

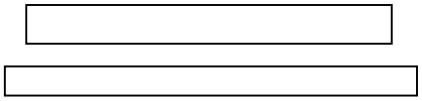
Permission to Conduct Study from District





Appendix B

Permission to Conduct Study from Principal



Appendix C

Teacher Schedule

8:00-8:30	Arrival-breakfast-unpack Morning Work-Read to Self
8:35-8:50	Positivity Project and Morning Meeting
8:50-10:35	Language Arts/Writing
10:15	Working Snack
10:40-11:10	Recess
11:10-11:50	Specials
11:50-12:40	Science
12:40-1:20	Lunch (30 minutes)
1:25-3:00	Math
2:55	Safety Patrol Leaves for Duties
3:00-3:30	Dismissal- Car Riders, walkers, vans, bus

Appendix D

Lesson Tuning Protocol

Lesson Tuning Protocol

Rev. 5/18

PURPOSE

The purpose of this protocol is to support collaborative conversations around the tuning or validation of curriculum, instruction and assessment resources. Please note that the times below are based on a forty-five minute time frame. Adjust times as needed.

PREPARATIONS AND MATERIALS

Make sure you have enough copies of the following documents.

- Completed Prep Sheet for Tuning
- Relevant Lesson Materials & Data
- Copies of Tuning Protocol
- Feedback Guides
- Content, literacy and/or language standards
- Tools for Analyzing Standards

PROCESS

1. **Determine Roles and Set Norms (1 minute)**
   - **Roles:** Facilitator, Presenting Teacher(s), Time Keeper, Note-Taker, Other: _____
   - **Norms:** Pausing, Paraphrasing, Posing Questions, Putting Ideas on the Table, Providing Data, Pay Attention to Self and Others, Presuming Positive Intentions, Other: _____
2. **Present Materials (3 minutes)**
   - Presenter provides important background information about specific classes and students' needs.
   - Presenter shares any relevant student work and/or formative assessment data.
   - Presenter provides brief overview and description of the materials.
   - Presenter describes the objective of the lesson and explains how it will be measured.
3. **Determine the Focus for Feedback (1 minute)**
   - Presenter poses a question or identifies an element of the lesson for the group to focus on to guide feedback.
4. **Review and Clarify Materials (3 minutes)**
   - Read / review materials.
   - Ask clarifying questions that prompt answers with QUICK responses – e.g. yes/no.
5. **Review the Focus Standards (10 minutes)**
   - Identify and discuss the stated and implied knowledge and skills in the focus standard.
   - Use the *Tool for Analyzing Standards* as a resource.
6. **Tune the Lesson (25 minutes)**
   - Identify lesson elements to focus on for feedback.
   - Silently read, analyze, and take notes.
   - Share praise of effective practice.
   - Discuss and offer feedback.
7. **Reflect on Conversation (2 minutes)**
   - Beginning with the presenting teacher, participants share insights and take-aways from the conversation.
   - Facilitator collects feedback about the process.
8. **Schedule Observation - If Applicable**
   - Determine if presenting teacher is interested in a follow-up observation. If so, schedule a date.
   - Clarify what the observation will look for.

Appendix E

Permission to Use Lesson Tuning Protocol

Hi Molly,

Thanks for emailing. The protocol is available as a free resource from the following website: https://www.wested.org/service/vital-collaboration-developing-and-revitalizing-professional-learning-communities/

VITAL Collaboration: Developing and Revitalizing Professional Learning Communities — WestEd

www.wested.org

[redacted]

Feel free to use it. I would just recom[redacted]end including the link in the citations /references.

What are you studying? And, what ab[redacted]ut the protocol interests you? Would love to hear about your inquiry.

Warmly,

[redacted]

[redacted]

[redacted]of School and District Servic[redacted]

W[redacted] - Learning Innovations

(p[redacted]

protocol 4 of 29

Appendix F

Teacher Interview Questions

Planned Purposeful Movement – Teacher Interview

In what ways have you noticed a difference in your students' learning since including planned purposeful movement into your lessons?

What specific differences did you notice?

What might be some differences in students' learning that was not made evident in the assessments?

Were there students who showed growth in class, but did not show growth on assessments or grades? Why do you think this is so?

How did you use movement in your classroom prior to participating in the study?

How are you using movement in your lessons now differently than you did before the study?

How does planning for movement affect your use of movement in your English language arts lessons?

How did the lesson tuning protocol affect your use of movement in your lessons?

Appendix G

Teacher Survey Questions

Planned Purposeful Movement – Teacher Survey

1. In the past month, how frequently have you purposefully planned movement strategies ahead of time in your English language arts instruction?

   __ A great deal
   __ Some
   __ Very little
   __ Not at all

2. How frequently do you use movement in instruction without planning for it in English language arts?

   __ A great deal
   __ Some
   __ Very little
   __ Not at all

3. How much does planning for movement impact your use of purposeful movement in English language arts?

   __ A great deal
   __ Some
   __ Very little
   __ Not at all

Appendix H

Email from Dr. Lyding

9/16/2018

Re: Still working on my Ed.D :)

[redacted]

Sun 4/22/2018 3:06 PM

To: Molly Dibble _ Staff [redacted]

Hi Molly,

It is great to hear from you! Working with your ELA classes since they already have built-in testing, is an excellent plan! Good job handling the curve ball the district gave you. I ran into a few of those myself, but you should definitely be able to do you work within the scripted curriculum.

Will there be others using the curriculum who are not working with you? I just wouldn't want everyone thinking that the new scripted program is the reason for your results.

I also think it would be interesting to measure student enjoyment between the straight scripted program and the ones using movement. Since you are not able to survey students, will you have people watching for engagement? If so, can you have the same people watch the same lesson in a class that is scripted but not using movement? This would be ideal but is not always possible in the real world.

I would love to have you use and cite my work! Feel free to use the different surveys and observation protocol. My teacher survey was a combination of my work and the work of others. The *instructional self-efficacy constructs* were adapted from Bandura's Teacher Efficacy Scale (Bandura, 1977) and the *teacher beliefs constructs* were adapted from the Teacher's Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001). I created the rest of the questions. I ran a Cronbach Alpha to determine the internal consistency.

> I created the observation protocol. I strongly recommend using it or something like it. The use of the observation protocol not only provided great data, but it also helped the teachers "buy in" to the process because they were measuring the engagement. They knew the students, and they knew their typical level of engagement.
>
> I used the *Engagement During a Learning Activity* model by O'Donnell, et al. (2009) to determine the areas I would observe. If I did it again, I would also consider what Almarode (2014) has to say about engagement.
>
> If you use it, you can teach your teachers the "Secret Sauce" that I created to use with my preservice teachers. I would love to have you use it, and cite it as my work. I do not have it in print yet – (other than this email and all over my teaching and presentations). The Secret Sauce is something that I created to help my preservice teachers think more intentionally about engagement when they are planning their instruction. It connects directly to Almarode's three types of engagement – emotional, behavioral, and cognitive. When my preservice teachers create a lesson, they are required to evaluate it using the Secret Sauce.
>
> The Sauce is three questions. "Is it fun?" (emotional engagement) "How many students are involved?" (Behavioral engagement) "What is the level of Blooms or DoK?" (cognitive engagement).

Good luck, and I look forward to hearing more. Let me know if I can help you in any other ways!

[redacted]

Appendix I

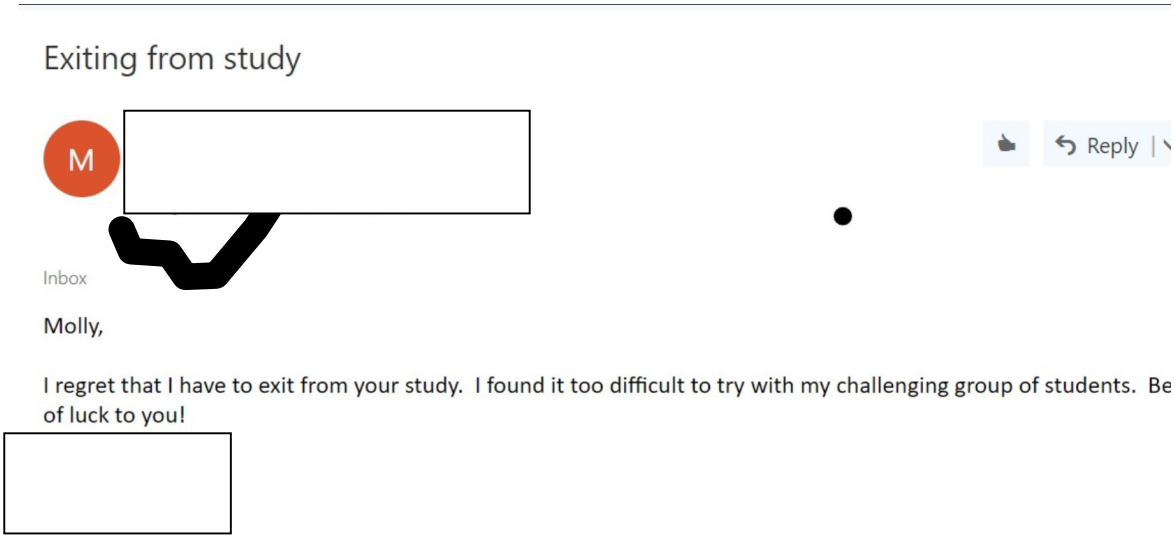
Teacher Log

Planned Purposeful Movement Lesson Log **Teacher # __________________**

Date	Activity/Protocol	Included in Lesson	Not Included in lesson

Appendix J

Teacher Exiting Study Email


Exiting from study
M
Reply
Inbox
Molly,
I regret that I have to exit from your study. I found it too difficult to try with my challenging group of students. Be
of luck to you!