BRAIN-BASED LEARNING THEORY: THE INCORPORATION OF MOVEMENT TO INCREASE THE LEARNING OF GRAMMAR BY HIGH SCHOOL STUDENTS

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Eva P. Pennington

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APPROVED:

COMMITTEE CHAIR	Dr. Carol Mowen
COMMITTEE MEMBERS	Dr. Mark Angle
	Dr. Evelyn Bailey
CHAIR, GRADUATE STUDIES	Dr. Scott Watson

ABSTRACT

Eva P. Pennington. BRAIN-BASED THEORY: THE INCORPORATION OF MOVEMENT TO INCREASE LEARNING OF GRAMMAR BY HIGH SCHOOL STUDENTS. (Under the direction of Dr. Carol Mowen) School of Education, September, 2009.

This study investigated the use of kinesthetic movement as a vehicle by which to teach grammar to high school students. Brain-based theorists believe that, since the anatomical parts of the brain that coordinate basic physical movement are also the physical components used to coordinate the movement of thought, movement is necessary for optimal learning to occur. While purposeful incorporation of movement in the classroom is a popular and increasingly important aspect of brain-based theory, little empirical evidence exists to support the experiences, conjectures, and evidence across multiple disciplines and neurological findings when applied to the high school student. The study involved 277 secondary students currently enrolled in College Prep English courses grades 9-11 and were assigned to classes by computerized random selection. The control group received traditional grammar practice, and the treatment group received kinesthetic exercises. The *t*-tests results were not significant; however, student affect was meaningful as determined by positive results from three out of the four emergent categories from teacher logs.

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CHAPTER I: INTRODUCTION

Theoretical Context

Oh, what a beautiful thing the human being is, and how extraordinary the mind! It is not divorced from the body. Rather, they are intertwined, as a successful marriage, a union and a bond. –Author Unknown

The human body and mind work together to allow problem solving, learning, and remembrance of events. The body does more than simply hold up the head; the physical body is an integral part of learning. In fact, thinking and learning cannot occur apart from the body (Flanagan, J. R., Vetter, P., Johansson, R. S., & Wolpert, D. M., 2003; Katz & Steinmetz, 2002; Middleton & Strick, 2001; Weiss, 2001; Pert, 1997; Hannaford, 1995). Willis (2007) stated that the importance of body movement is not a new thought, but the specific incorporation of physiological movement into the academic curricula, drawing upon neurology and brain-based research, is an altogether new application in the field of education. Never before have neuroscience and classroom instruction been so closely linked because evidence based on neuroimaging may help determine the most effective ways to teach.

The belief that movement increases learning is a central element to overall brain-based theory—the theory that one best learns when one experiences educational material in a manner that agrees with the natural tendencies of the brain, rather than against it. Hansen and Monk (2002) have researched the cerebellum and its relation to learning. For years, the role of the cerebellum in coordination and balance activities have been well

known, but its involvement in the learning process has only been recently discovered. Neurologists have claimed that the region of the brain that processes movement, the cerebellum, is the same region that processes the movement of thought (Strick, Dum, & Fiez, 2009; Flanagan, Vetter, Johansson, & Wolpert, 2003; Weiss, 2001). The discovery that the same brain anatomy was active during both movement and thought processing became an integral part of brain-based learning theory. The amount of movement neccesary to activate the brain was not empirically determined; however, Leppo, Davis, and Crim (2000) suggested even the most elementary movement (such as walking) caused neural firing to activate in the deepest, most foundational areas of the cerebellum.

In addition to finding the activation of the same anatomical structure during physical activity and cognitive thought, Corbin found that physical activity also spurred additional positive processes throughout the brain. Corbin (2008) stated physical activity optimized high-level thought processes due to the creation of a higher quantity of stronger memory pathways and capitalized on the brain's natural plasticity ability. Plasticity is the brain's tendency to reshape and form to better cope with a learning environment. This innate ability is particularly relevant in hippocampus and cerebellum formation and improvement, which are the primary anatomical structures for long term memory. When cells in the cerebellum form better circuitry, future movement improves. Kinesthetic movement increases brain activation, and brain activation is necessary for learning and memory. Brain-based researchers and theorists believe that movement is critical to the thought process for these reasons.

Evidence of brain activation through movement, participation in general physical movement, the use of movement as a metaphor for learning, and the integration of

movement in the classroom for academic purposes are foundational in understanding brain-based theory. The reoccurrence of these aspects of kinesthetic movement throughout various disciplines of education and of neuroscience supported the claims of brain-based theory and its inclusion in the academic classroom.

Brain Preparation for Optimal Learning

Physical activity incorporates both hemispheres of the brain, so it can serve as an activation tool for learners. Anatomically, the two hemispheres of the brain contain all the supporting structures. While each hemisphere has a focus, they do not work independently. Incorporating movement activates the corpus callosum, which is a thick fibrous bundle of axons between the hemispheres. The corpus callosum facilitates communication between the hemispheres and is more active after movement.

In Corbin's analysis of the most effectual ways to access the full potential of the brain, he dedicated a chapter solely to physical activity and movement (2008). Physical activity is one of the most encompassing activators for learning and memory. Movement regulates energy cycles and hormone secretions, which affect attention span. It is also a mood stabilizer and allows optimal conditions for learning. Continually challenging the brain parallels challenging one's muscles: both can decline or improve with proper usage (Jensen, 2000).

Movement influences the functions of the brain, and educators should not overlook this connection. (Corbin, 2008) stated, "movement has shown to be the one thing that tends to engage all learners and activate both sides of the brain" and suggested that movement provides critical emotional engagement necessary for motivation and attention (p.68). (Caine, G., Caine, R.N., McClintic, Klimek (2005) encouraged the use of

natural movements in the classrooms to increase student achievement. Some examples included: role playing, dancing, clapping, or using manipulatives.

Movement assists in making learning connections. Fahey and de los Santos' (2002) suggested using real or model objects for learners to manipulate as kinetic hooks that "are encoded in context and […] retrieved more easily" (p.382). Learning increases due to the multiple memory pathways in the brain due to movement and multi-sensory input.

Specific Applications of Movement in Education

Shaywitz & Shaywitz (2004) determined through functional magnetic resonance imaging (fMRI) brain scans that students with reading difficulties (such as dyslexia) show a less active occipital region in the left hemisphere than more successful readers. Their study showed significant gains in the treatment group (n=37). After one year, the students increased reading fluency and also showed more activation in several left hemisphere regions. This suggested that instruction did increase activation of neural hardware as shown in the (fMRI) and informed future teaching methodology.

Several educators applied movement as a way to increase brain activation. Peebles (2007), an educator, used specific movement techniques and incorporated phonological practice that Shaywitz & Shaywitz discussed. Her teacher research revolved around two fluency strategies that purposefully involved movement: The Reader's Theatre and Rhythm Walks. As a result of these movement activities that involved repetition, movement and phonological awareness, Peebles witnessed that "movement holds the key to connecting struggling readers to the art of reading fluency" (p. 583). Peebles' work is significant to education because it offers students a practical way to

activate the occipitotemporal region of the brain that has been used as an indicator of reading skill.

In another kinesthetic study based on reading development, Rule, Dockstader, and Stewart (2006) separated third grade students into three groups: a kinesthetic, a tactile, and a control group. After 18 hours of instruction and practice, students were tested on phonological awareness using the same test as before they started. Kinesthetically instructed students improved by 18.9 points, the tactile group by 18.6 points, and the control group by 8.2 points. While these data were not analyzed statistically beyond gain scores, some evidence existed that kinesthetic learning improved reading development. In brain-based research, movement is encouraged for all age groups, not just the younger population. Jensen (2008) stated that an active body increased the activity of a mind and encouraged good learning practice for all age groups. Furthermore, movements that activated the vestibular system "benefit[ed] all infants, children and teens" (Hannaford, 1995, p. 163). The activation of the vestibular system is important because it is the most dominate contributor to sensations. This system maintains balance, posture, and overall body awareness. The activation of this system induces learner focus.

In another study, the students preferred having the oppportunity for movement. Della Calle, Dunn, Dunn, Geisert, & Sinatra (1986) examined student preference and effect of mobility (opportunity to move at different times throughout the lesson) in the middle school classroom. Of the 412 students who were surveyed to determine their preference, 217 expressed a proclivity for movement. The procedure was used on a randomized selection of 80 students: 40 categorized themselves as preferring mobility on the survey, and 40 preferred a more traditional passive learning environment. The results

revealed that students who assessed themselves as preferring mobility did show significant gains on a split- plot ANOVA (analysis of variance) and scored higher in the mobile atmosphere. However, the more significant data in this study is the fact that more than half of the participants claimed that they had a mobility preference. This showed that students preferred to learn with the opportunity to move, rather than sitting silently in their desks.

Successful Inclusion of Movement beyond Education

The use of movement for successful experiences is not limited to an academic environment. Enghauser (2007) proposed that one primary focus of the body is to prepare for learning and the interaction of sensory information. Building kinesthetic awareness through dance improved more than just dancing ability. As one learned to move through dance, increased bodily awareness improved other disciplines as well. This may indicate a connection between the body and the mind that prepares the student for academic success.

Other therapists shared similar findings that reiterated this connection. Mills and Daniluk (2002) spoke of the body-mind duality and suggested that the physical body communicates beyond interpretation of language. The therapeutic use of movement enhances the emotional, cognitive, and physical integration of the individual. Participants in the healing study shared feelings of being reconnected with their bodies and being able to anchor themselves in safety while overcoming past events through dance. Participants shared that they did not realize how much was stored in the body, the fact that body memory exists, that movement was a powerful way of reconnecting the fractured self. Therapeutic movement brought several themes from the participants. They

acknowledged an intimacy that was created beyond words and a sense of personal freedom—the right to be in charge of one's own experience. They preferred a movement session to a talking session for these reasons.

Grammar: The Vehicle for the Research

The Importance of Grammar Instruction

Grammar instruction is an important aspect of educational curriculum. Nunan (2005) noted that readers not only judge writing, but also the writers, according to their skill and command of the language. For this reason, grammar became a worthwhile subject, and Nunan asserted that teachers must prepare students to operate within these social boundaries. He believed standard grammar patterns not only reflected the educated class, but, when students understood the grammar system, it also increased confidence and gave them the ability to think and communicate with depth of insight. Heyden (2003) argued that students should understand grammar to avoid negative judgments when they graduate high school. Furthermore, Heyden has shown that people claimed that grammar mistakes bother them and business and academic professionals responded with an attitude of judgment when they noticed the improper use of language, as determined by Standard American English (SAE). Thompson (2002) stated that grammar knowledge is essential because it constitutes metacognition. He warned that omitting isolated exercises may result in the likelihood that some essential knowledge will not be taught at all. This concern is relevant because if educators do not have the ability to teach grammar successfully, they may be reluctant to teach it thoroughly.

The focus of this study was on the incorporation of movement in the English classroom. The evaluation of grammar knowledge and refinement was shown through the

pre and post-tests. Grammar was a useful vehicle by which to address these concerns for several reasons. A basic understanding of grammar is fundamental for higher levels of communication, for standardized tests such as high school graduation tests, or for national tests, such as the SAT. Also, unlike the interpretation and subjectivity that often arise in the literature class, grammar is an objective aspect of the language, which lends itself well to this research purpose. A basic understanding of the framework of the English language is an important aspect of classroom instruction, so it became the vehicle by which to research the use of movement in the classroom.

A Brief History of Grammar Instruction

Grammar instruction has been a controversial topic since it was first implemented in the early 1900s and has remained controversial well into contemporary times. The most extreme view, and one the most widely accepted, is that of the Braddock Report. Braddock (1963) claimed that grammar instruction produced a harmful effect on students and did not improve student writing. Hadley (2007) has thoroughly analyzed and revealed the flaws in this argument. For instance, there were several studies with positive results that were omitted from Braddock's original study. Hadley also revealed the incongruence between Braddock's experimental study and Hillocks' (1986) meta-analysis. While both of these major studies condemned the teaching of grammar, discrepancies existed. For example, ironically, Braddock's study would have not been even included in Hillocks' meta-analysis due to Hillock's criteria for research design (Hadley, 2007).

The Braddock Report was quite influential in the sixties, and aspects of traditional instruction were lost in the pursuit of a more progressive style of education. David

Mulroy noted in his book, *The War Against Grammar* (2003), the 1963 Braddock publication paralleled the simultaneous SAT drop in both verbal and quantitative scores (p. 10). He found indications of a more lax and declining language arts program throughout the sixties and seventies, as schools accepted the dogma against teaching grammar. While specific fault may not lie in the connection between grammar instruction and test scores, Mulroy noted the lack of grammar study and pedagogical replacement with cultural studies, particularly in foreign language courses. He concluded that "it is hard to give any kind of language instruction to students who lack the conceptual framework provided by the terms of basic grammar" (p. 3). He implied students should understand the basic analysis of a sentence, particularly if they were going to analyze and compare entire works.

The debate about the best way to teach grammar has not been resolved. Kolln and Hancock (2005) agreed that the grammar controversy has continued throughout the years in spite of the negative earlier claims of Braddock and Hillock. One example of this is when, in 1989, teachers formed an official assembly of National Council of Teachers of English (NCTE): The Assembly for Teaching of English Grammar (ATEG) in response to the popular anti-grammar beliefs at that time. Others have argued that grammar instruction cannot be altogether dismissed due to Braddock's previous claims. Perhaps Braddock's negative view of grammar was not against the subject of grammar, but against the style of grammar instruction at that time (Hadley, 2007).

While the history of grammar instruction in the last one hundred years is somewhat controversial, the role of grammar in the educational experience continues to be a valuable one. Kolln and Hancock (2005) have stated that, currently, there is an

ignorance about grammar that pervades the field and creates little awareness of potential uses (p. 24). Further, Einarsson (1999) believed that grammar should be treated as any other classical study, such as mathamatics, chemistry, or biology, a unique subject with its specific concepts, or skill set. Quantitative data pointing to a specific, outstanding grammar instruction methodology have not yet been defined for educators to embrace. However, these authors and their suggestions will be discussed more in detail.

Current Grammar Instruction Practice

Popular pedagogical belief started from the initial thoughts of Noguchi (1991): that students should receive grammar instruction in-context, which is defined as students recieving grammar instruction within their normal writing instruction. However, (Sams, 2003) noted that what educators were calling in-context grammar instruction had little effect on student writing. The main problem was that the students had little consciousness of the rules that the teacher announced during the instruction. Even for teaching grammar in-context, the need for a basic understanding of grammar terminology still exists. Isolated instruction means that students cannot apply grammar to their writing in context as they lack the terminology of the subject matter. This study exists to determine a more effective means of teaching the rudimentary elements of a classic subject.

The Validity of the Study

Brain-based educational theory incorporates several disciplines to show the necessity of kinesthetic movement in learning. For example, neuroscientists can see direct images of the brain and can observe specific activation of brain anatomy due to movement. Educational psychologists and therapists also have data that reveal that students, clients, and patients experience success due to the incorporation of kinesthetic

movement in their sessions. Kinesthetic movement also incorporates multiple pathways of the brain and allows more opportunities for memory mapping. While brain-based theory is popular and growing in academia, little empirical evidence exists to support the experiences, conjectures, and evidence of experts across disciplines that seemingly reflect neurological discourses. Almost equally as desirable as the need to evaluate the brain-based principle of movement is the current demand for improvement of grammar instruction. This study investigated the effectiveness of kinesthetic movement as a vehicle by which to teach grammar to high school students.

The results of this study will provide empirical data as a result of kinesthetic application of brain-based theory. The null hypotheses of this study are as follows: (1) Incorporating movement in grammar instruction will have no effect on learning outcomes. (2) There will be no statistical difference between the pre- and post-scores of short-term grammar learning due to kinesthetic instruction. (3) Students who show a high level of kinesthetic preference did not show significantly higher ability in grammar than those who did not show a high level of kinesthetic preference. (4) There will be no difference between student affect within the control group and the treatment group.

Research Question

The primary question investigated in this study was: *Does the use of kinesthetic movement increase learning of grammar in high school students?* More specifically, this study investigated if incorporating movement into the explanation and practice of the grammar elements of a fifteen-lesson unit improved student learning. Results from a control and treatment group—differentiated by the use or non-use of kinesthetic movement--will show if there was a significant difference. Each group received either a

traditional or kinesthetic treatment for five weeks. The students had a pre- and a post-test to show any potential differences. The data gathering and analysis revolved around the pre- and post-test scores, student surveys, and teacher logs. If the grammar instruction that incorporated movement was more effective than the traditional methodology, then the post-test results would be higher. In order to analyze the difference between pre- and post-test scores, and their relationship with kinesthetic preference, results from the student surveys were included. Lastly, the teacher logs were analyzed qualitatively.

The Methodology

Participants and Brief Design

The quasi-experimental design included 277 participants assigned to homogenously grouped College Preparatory English classes through a computerized random database. Demographically, the students averaged 14-18 years old and were from a middle class economic background. The majority of the students (73%) were Caucasian, 13% were Hispanic, 12% were African American, and there was a small percentage of other minority representation.

The instruments used to teach grammar during this research study were: Holt, Rinehart, and Winston's *Elements of Writing: Language Skills* and kinesthetic activities. The traditional group completed handouts from Holt, Rinehart, and Winston's *Elements of Writing: Language Skills*. This is a traditional grammar text, which provides student handouts for each element of grammar study. The kinesthetic tools were not from one specific book or program but were researcher created. The kinesthetic activities were thoughtfully created by the researcher through personal experience in the classroom, other educators, and online resources. The validity of the kinesthetic activities was

determined by the experts in the field who are listed with their area of expertise in the Appendix D.

Two similar tests from Holt, Rinehart, and Winston's *Elements of Writing: Language Skills* were used as bases for the pre-tests and post-tests. The researcher made minor adjustments to purposefully make similar the sentence structure, level of difficulty, and equal representation for each grammar element. Aside from the researcher gathering testing data as a result grammar instruction, students also completed a forty-question survey to show the different attitudes and perceptions that various subpopulations had. The questionnaire also determined how outlying demographics factors and other kinesthetic preferences and interests significantly correlated to achievement and instruction style. The data from this survey were used to analyze any correlation between the outside factors and their possible contribution to the grammar post-test scores. Seven experts in the field determined the validity of the pre- and post-tests, the traditional and kinesthetic activities, and the student survey.

Brief Procedures

Instructor selection was evaluated by the teachers' current class sizes, grade level, and grammar instruction experience. However, the researcher taught the control (traditional) group in order to avoid bias. In addition, all instructors kept a brief log of each grammar lesson as they taught it. This included the date, the lesson, a brief description, and the time length of the lesson to allow for qualitative data collection. Also, the kinesthetic instructors received a training seminar on how to model the activities.

A pre-test was given before the introduction of the methodologies. Then, the control group received the traditional instruction, while the treatment group received the kinesthetic instruction. The fifteen grammar lessons lasted approximately 15 minutes each. Each participant had the same total grammar instruction time available. Each class received 15 lessons, either traditional or kinesthetic, and all were completed within five weeks. After participation in all lessons, students took a post-test and completed the surveys. The surveys were taken after all components of instruction were complete so that the results did not influence student perception. The teacher kept the logs throughout the duration of the study. Scores were analyzed statistically using descriptive statistics and *t*-tests. Students also participated in a survey in order to more accurately interpret the results of the pre- and post-tests.

Significance of the Study

Despite the growing popularity of brain-based research, much of the evidence has not been the result of educational measures, but have been based on pedagogical theory. The majority of the previous studies focused on younger children, which lacked application to the high school student due to differences in brain development and academic disciplines. Other examples combined more than one treatment, such as music and movement, so that the findings were unclear about the specific use of movement. Teachers have incorporated ideas into the classrooms and have summarized their experiences, but they failed to analyze their positive experiences with statistical results. A smattering of activities focused on math, but few studies specifically spotlighted the area of grammar in English study. The need for this study exists due to brain-based claims that

movement increases learning, yet specific application for the high school English student lacks information for support.

Definitions

Brain-based Learning Theory is based on neuroscience and suggests how the brain learns naturally. Neurologists and educators have based this theory on findings about the actual structure and function of the human brain (www.uws.edu).

Grammar refers to the logical and structural rules that govern the composition of sentences, phrases, and words within the English language itself.

Improvement is defined by higher post-test scores than pre-test scores, also referred to as learning.

Kinesthetic Movement is the teaching methodology the treatment group in this study receives. The learning takes place by the students actually carrying out a physical activity about the grammar element of the lesson (Kelly, 2009).

Traditional Instruction is the teaching methodology the control group receives. The learning takes place by students sitting in their desks completing a black-and-white worksheet about the grammar element for each lesson.

Organization of Chapters

The basic issues of this study are introduced in Chapter 1, and Chapter 2 will go into more depth regarding the supportive literature, the brain-based learning theory controversy, and the theoretical framework behind this study. Chapter 3 contains the detailed validity of the research design, the procedures, and the basis of teacher organization and student participants. The data-gathering process and a brief analysis of procedures will also be provided. Chapter 4 presents the results of the quantitative and

qualitative procedures of the study and answers the research questions. Chapter 5 is a summary of the study results, discussion of the research implications that can be drawn from the study, and suggestions for further research.

CHAPTER II: THE BACKGROUND TO THE PROBLEM AND VALIDITY OF THE STUDY

This chapter delves deeper into the literature that is at the heart of this study. It reviews the development of brain-based research and investigates kinesthetic experiences that activate the brain. Echoing these claims are additional findings across other disciplines that agree that the incorporation of kinesthetic movement increases student success and learning. Lastly, the investigation of the role of movement in the classroom results in viable ways to improve student understanding of current teaching curricula. A review of participation in general physical movement and the benefits to the brain, therapeutic movement as a metaphor, and the integration of movement in the classroom for academic learning purposes reveal the interconnectedness between the mind and body.

Literature Review

History

The role of neurology has become more intertwined with the daily procedures now that in the past. In 1681, Thomas Willis coined the term *neurology* (Willis, 2007). While the original findings stemmed from brain surgeries on patients from the 1930s forward, the plethora of information resulted from brain images and scans from the innovative technology of the 21st century. Some of these devices are discussed in this chapter. These findings have slowly been accepted and incorporated into educational practice (Goswami, 2004). President G. W. Bush claimed that the 1990s was the "Decade of the Brain." This declaration in July 1999 launched international projects to continue to

investigate the brain and its role in learning. Some of these groups included the Center of Educational Research and Innovation through the Organization for Economic Cooperation and Development, the Education Commission of the States, the National Institute of Neurological Disorders and Stroke, and the Scottish Council for Research in Education (Phillips, 2009). In the past decade, barriers that had separated disciplines have become less rigid. Now cognitive neuroscientists have begun to investigate how neural hardware and mental software interact in order to hypothesize about educational theory. In the past, neuroscientists, cognitive psychologists, and educational leaders had not worked together so intimately (Bruer J. T., 1999).

Brain Study Devices

Technology has evolved since the first brain surgeries of the 1930s and allows many options for studying the brain. Current popular tools of neuroscience include Positron Emission Topography (PET), Functional Magnetic Resonance Imaging (fMRI), and Quantitative Encephalography (qEEG). PET scans measure glucose and oxygen demands of the brain; fMRIs focus on the hemoglobin that brings oxygen to the body tissues and assess metabolic activity; and qEEG tests identify the brain waves of active locations during engagement. Brain Electrical Activity (BEAM), Event-Related Potentials (ERP), and Transcranial Magnetic Stimulation (TMS) also study brain activation based on function. Optical Topography (OT) studies blood flow. These tests create images of the brain and can show pronounced activation of anatomical structures due to the metabolism of glucose, oxygen, or amount of blood flow. Although these tests are not infallible, this technology still contributes to an overall understanding of brain

tendencies (Talay-Ongan, 2000; Willis, 2007; Bergen, 2002). The link from neuroscience to education is due to the brain images produced by these types of tests (Jensen, 2000).

General Brain Anatomy and Learning

Knowledge of brain activation could be used to inform educational practice. Willingham (2008) found that brain research has indicated that several similar educational theories may be separated by neural processes to make them distinct. For example, those with dyslexia have shown lower activation in the brain region dealing with phonological coding. Another finding demonstrated that learning is a complex process including the whole brain, instead of being limited to specific anatomical regions for learning, attention, or other cognitive processes. Each process is served by a network of regions including the hippocampus, entorhinal cortex, thalamus, and frontal cortex. Thirdly, neurological research may assist in diagnosis of some learning disabilities due to the direct visual differences in specific brain regions in images from these tests.

Several studies have shown how people's brains show specific variation according to the demands of their daily lives. Willis (2007) has stated that never before have neuroscience and classroom instruction been so closely linked because evidence based on neuroimaging can help determine the most effective ways to teach. The levels of activation in the regions of the brain determine how factual knowledge will be remembered. Learning increases long-term memory retention because it requires that students learn something using multiple pathways of the brain (Willis, 2007).

The brain's ability to parallel process means that it acquires information through multiple senses and organizes information with multiple activations across the brain, not in a single linear fashion. Movement induces learning due to increased sensory awareness

(Hannaford, 1995). The use of multiple senses requires multiple areas of the brain to activate, process, and create multiple paths of circuitry. The human brain is ever-changing and responsive to stimuli, which are deeply rooted in experience and individual stimulation, and the physical experiences of the individual contribute to the brain formation. Some neural connections are active from early life, but some neural systems are not circuited together until an experience activates them (Goswami, 2004; Talay-Ongan, 2000; Caine & Caine, 1990, pp. 66-71). An active learning experience, rather than a passive activity, allows for the body to incorporate more sensory memory pathways (Caine & Caine, 2007). The more areas of the brain are activated during learning, the more connection and more long-term memory possibilities exist. This supports the idea that active student learning impacts the prefrontal cortex and the hippocampus (Willis, 2007; Phillips, 2009).

Therapists have also been able to use this knowledge to assist their clients. Beaulieu (2006) also suggested similar findings in her therapy techniques—called Impact Techniques. She utilized tactile objects to create visible, symbolic representations of abstract concepts. She claimed that numerous sensory input systems were neglected when one was confined to only using speech or written expression. She claimed that by including additional tactile and kinesthetic opportunities for expression that patients accessed more neuron memories, learned and had stronger memory imprints in multiple pathways. This sense of play was applicable to all ages and showed the continued value of movement and play.

The movement element of play may be a part of why is it so valuable. Fahey and de los Santos (2002) have shared that scientists have located multiple loci in the brain for

memory storage and neuron activity. They stated that movement assists in making learning connections. Recent use of music and movement has demonstrated new ways to increase memory. These authors proposed that movement be used as a metaphor to assist students in the learning process. Real models and objects provide visuals and kinetic hooks for learners. Activity increases attention span, and movement during play makes visual, kinesthetic and verbal learning less difficult (Schilling, McOmber, Mabe, Beasley, Funkhouser, & Martinez, 2006).

Brain Anatomy and Movement

Movement is critical to the thought process. People, especially children, love to interact, play, and move. This movement is part of the development of the thought process. (Strick, 2009) has also suggested that the cerebellum is part of the cognitive processes: memory, attention, and organization of information. Not only does the cerebellum help organize the movement of thought, it helps coordinate physical movement. Even the most elementary movement (such as walking) causes neural firing to activate in the deepest, most foundational areas of the cerebellum. Several researchers claimed that the cerebellum, which processes movement, also processes thought and pertains to memory (Katz & Steinmetz, 2002; Middleton & Strick, 2001; Weiss, 2001). In brain images, the cerebellum activates, or it shows an increase of glucose and oxygen metabolism, as a result of motion. Brain activation due to movement has caused brain-based researchers to link the incorporation of movement to increased activation, which, in turn, may have an effect on student learning (Jensen, 2008; Corbin, 2008).

During movement, cells in the cerebellum form circuitry that works together to maintain control over future movement. Movement directly correlates to one's

cerebellum formation through plasticity (Corbin, 2008; Leppo, Davis, & Crim, 2000). Plasticity is the ever-changing nature and fluidity of the brain that allows for one to adapt to the environment. For example, infants whose left cortical hemisphere is damaged should experience loss of function as adults do; however, children show only slight delays from this injury, and those problems lessen as physical activity increases. The recovery of these children shows the plasticity of the brain and supports the connection, no matter how enigmatic, between the body and brain. Even skeptics of brain-based learning can agree with this principle (Phillips, 2009; Bergen, 2002; Talay-Ongan, 2000).

Other examples of plasticity include people changing their brains by altering their external environment by direct action and interaction (Ratey, 2001). For example, musicians who use their fingers over abundantly have increased development in their somatosensory regions. This region is the body's sensory system, and it changes in correlation to the amount of touch, body position, movement, and other sensory modalities. Due to repetition, myelination occurs in the areas of the brain that are used most often. Myelination is another aspect of the brain's capacity to adapt to environment and the experiences of the individual. Myelin is an electric insulation that forms over axons of the brain cells when the actions or thoughts are done in repetition. The more an experience occurs, the more myelin is created. Likewise, someone who is blind and must rely on reading Braille will exhibit the same increase in the somatosensory regions. Also, a juggler increases gray matter in the occipital lobes, which are linked to refining vision (Willis, 2007; Hannaford, 1995). These are several examples of how brain anatomy changes as a result of an individual's precise movements and activities.

Simple movements that do not require expertise have also shown postive results due to movement. Sorokin (2002) has shown that chewing gum improves short- and long-term memory. In tests, the treatment group showed better word recall. There are two theories: one is that the motion increases oxygen to the brain, stimulating it; the other is that the motion causes a release in insulin. Insulin is a chemical that stimulates parts of brain processing involved in memory. A comparison between gum chewers and those only making a gum chewing motion, with no gum, still showed a 30% increase in achievement over those with no motion. Either way, both suggestions correlated with claims of brain-based research—that the physical stimulation of the body enhances brain function.

Utilizing Movement to Increase Overall Ability

Vygotsky (1978), founder of the social cognition theory, which encouraged play, considered play as the most important learning activity for children. Jensen (2008) and Konish (2007) agreed that play was more than simple, childish fun: it provided the opportunity for cognitive development, and it was a vital learning component. Movement is more than a simple activity of the physical body. Movement is vital to physical and mental development and due to the innate mind-body connection (Hannaford, 1995).

Even at birth, kinesthetic movement influences the child's wellbeing. According to Field et al. (1986), doctors working in a neonatal unit found that kinesthetic stimulation and passive movement for only ten days increased weight, alertness, and more mature habits in infants and enabled them to go home six days sooner than other neonates, which saved about $18,000 in hospital bills. The need for kinesthetic stimulation continues as the child ages and is part of maturation. Researchers claimed that

understanding sensory integration due to movement is a foundational part of readiness and preparation for the future. For example, Weggelar (2006) stated that kinesthetic feedback is the foundation of all play, imagination, and symbolic behavior, which Beaulieu (2006) also suggested in her therapy -- Impact Techniques.

As children learn and experience through play, often times they move as they learn--whether they realize they do or not. Church (2006) noted that, when sharing stories, children become so involved in the text and characters that she often observed them actively moving and participating in the story without realizing it. Their spontaneous sounds and movements added to their understanding of the story. The lack of movement and touch had the opposite effect. Children who did not play much often had brains 20 percent to 30 percent smaller than their healthy counterparts (Nash, 1997). These types of games and communication through movement serve as the foundation of future learning progress. Reynolds (1995) stated that optimal learning occurred when (children's modified) sign language and other kinesthetic challenges were introduced in coordination with auditory and visual modalities. Some parents have taught their children sign language along with the sight and sound of the word to purposefully incorporate movement and play into the learning process.

Expression through Movement

Not only do childrem move as they experience their surrounds, but so do adults. Bodily movement and the interpretation of it are part of human expression. Weggelar (2006) noted that, during communication, the speakers draw an abstraction from movements and experiences that may be non-verbal in nature. Sounds and written words are actually continuous motions of the mouth and fingers. While this kinesthetic feedback

may be overlooked as less important than quick, audible responses people without reliable kinesthetic feedback (the ability to sense and control motor functions) have a significantly more difficult experience processing reading and writing. Dyslexic students often exhibit these characteristics. The students' command of kinesthetic feedback influences how they will learn and reveals the inseparable connection between the mind and body. This is an example of the body and brain connection. Weggelar suggested that increased training in the sensory awareness will improve the overall reading and writing ability of the dyslexic student. The lack of movement is symptomatic of a lack of understanding and learning and creates a downward spiral for the special needs student.

Movement also helps one maintain focus and concentration. Slater, Steed, McCarthy, and Maringelli (1998) measured body movement in order to determine physical presence, or the attention span, of a person situated in the physical world but interacting with virtual surroundings. Their goal was to find the best whole-body movements and gestures that maximized a person's mental awareness or presence. Presence was determined by the individual's more pronounced responses to either the physical or virtual environment. The findings supported the theory that physical movement greatly influences the phenomenon of presence and showed that whole-body gestures are useful and appropriate to increase interaction and presence, no matter what the specific task is. Bereiter (2002) noted that the brain functions, rather than the psychological mind, hunger for action, and kinesthetic sensations of motions and movement. If these things do not appear, the brain begins to create new structures or images on its own. This showed that sensory experiences are part of the natural order of

how brains function and process their surroundings, as well as the desire of the body and brain for physical activity (Hannaford, 1995).

In cases of lower achieving students needing assistance, Beaulieu (2006) recreated the learning process through Impact Techniques. Impact Techniques are used by psychotherapists for therapeutic exercises, and the teaching methods include multisensory vehicles that parallel brain-based techniques as a foundation. Beaulieu claimed that people are all multisensory learners and that having lessons, or sessions, built completely on words neglects the majority of sensory input systems. Research has supported the idea that cortical and visual responses in the brain increase as the subject experiences bimodal sensory simulation. The more kinesthetic, visual, auditory, and tactile hooks are incorporated into a session, the more impact on the recipient. For example, giving a client a concrete object to represent an abstract idea involves the client in an active movement, or sensory experience, which allows access to his or her thoughts beyond the singular avenue of language. These circumstances are strengthened as the use of sensory vehicles concurrently induces memories from the past, which adds to the client's experience. Beaulieu attributed her clients' success to the active involvement of developing the concrete image of a metaphor (Beaulieu, 2007; Fahey & de los Santos, 2002).

Outside of a therapeutic senario, athletes also benefit from becoming aware of their kinesthetic experiences. Enghauser (2007), professor of dance, found her students needed additional kinesthetic awareness, apart from rote drills in a typical practice. She observed kinesthetic improvisation helped energize and refocus students for learning, especially for students who had previously been restless or unengaged. She proposed that

the primary reason to heighten one's kinesthetic awareness through sensory integration and movement was to prepare the body for learning. Better command of these experiences is reflected in the physical and cognitive abilities. She noted the visual, auditory, vestibular, and muscular systems all "make the body and mind more flexible, open and ready to learn" (p.34).

By acknowledging the role of the physical body in learning, one may be able to have more success than when only appealing to the logical mind. Mills and Daniluk (2002) performed a phenomenological study that analyzed the body-mind duality and suggested that the physical body has an independent sense of knowing and experience that cannot be overlooked. Since the 1930s, dance has been used as a therapeutic tool for various injuries, disorders, and learning difficulties. In this study, five participants were interviewed to discuss feelings of disconnection with their bodies due to negative experiences. Emergent themes revealed that, through dance, the participants had positive feelings of "freedom and confidence" that were inaccessible through traditional talk sessions (p.80). The therapeutic use of movement gave the participants a way to communicate beyond language and enhanced the cognitive, emotional, and physical integration of the individual. Participants shared that movement was a powerful vehicle by which to gain self awareness and confidence and make progress.

General Brain Benefits from Physical Activity

Beyond using movement as expression and a way to learn, movement is neccesary to induce optimal learning conditions in the body. Jensen (2008), one of the most well-known brain-based researchers, supported that quality physical activity positively impacts student performance on test scores. In addition, Dwyer, Sallis,

Blizzard, Lazarus, and Dean (2001) agreed that exercise improved student classroom behavior and academic performance. According to researchers, the level of physical activity that students experienced directly related to the ability of the brain to function. Furthermore, in 2005, the California Department of Education determined a significant relationship between students who were able to pass at least three areas of the FITNESSGRAM physical fitness test and math and reading scores on standardized tests (Hall, 2007). Physical activity and fitness have been shown to be significant indicators of higher test achievment.

The improvement of academic performance may be due to the changes that occur in the brain during physical activity. For instance, BDNF (a brain-dervived neurtrophic factor) helps neurons communicate with one another, and there is an increase of this chemical during exercise. Another general benefit of physical activity is the increase of blood flow to the brain, which increase the nutrients, glucose and oxygen flow to the brain. More blood flow on a consistent exercise schedule results in more blood capillaries to better brain functioning in and outside of the classroom due to increased oxygen. Jensen (2008) agreed that quality air results in better cognitive ability. While stress decreases student learning, exercise has the capacity to reduce stress from the body and to increase concentration and learning.

Physical activity is one of the most encompassing whole-brain activators for learning and memory. Corbin (2008) claimed movement should be a part of the learning environment no matter the age of the participants. Exercise keeps the brain activated, and research has shown that physical movement affects thought and creates optimal learning states (Weiss, 2001; Corbin, 2008). Since the brain requires 20 percent of the body's

intake of nutrition, oxygen, and blood flow, one must be cognizant of the influence of these components. Exercise is a key to maintaining one's cognitive abilities throughout a lifetime. Movement also regulates energy cycles, which affect attention span. Physical activity incorporates both hemispheres of the brain, so it can serve as an activation tool for learners. Exercise causes a release of endorphins, a mood stabilizer, and allows optimal conditions for learning. Continually challenging the body for positive results also parallels an improved brain capacity. The positive physical benefits from exercise likewise benefit the interworking of brain anatomy. Both the body and mind can decline or improve with proper usage (Corbin, 2008; Jensen, 2008). According to Prigge (2002), due to these facts, classroom management should include movement. Physical activity should be promoted in class to increase oxygen flow and circulation to the brain, as well as to improve student attention span. A lack of attention results in a lack of learning.

Examples of Movement in Academic Education

Literacy Examples

Several teachers employed movment techiniques to teach literacy. Peebles (2007) discussed two fluency strategies that purposefully involved movement to engage the brain: Reader's Theatre and Rhythm Walks. In both of these activities, students rehearsed a passage, incorporated motion (movements, gesture, facial expressions, etc.), and performed in front of others. Peebles observed that motivation increased when students had the opportunity to get out of their seats and move, and comprehension increased when students used interpretation to become the character. The success of these exercises supported brain-based claims that movement contributes significantly to learning. As a teacher, she has witnessed that "movement holds the key to connecting struggling readers

to the art of reading fluency" (p. 583). While she did not include statistical analysis, Peebles' work is significant to the field of education because it allows students a practical way to activate the occipitotemporal region of the brain that encourages brain activation and reorganization to resemble the patterns of more typical readers (Shaywitz & Shaywitz, 2004).

In regards to older students, Minton (2003) is a professional dance instructor and workshop conductor for teachers in public schools on incorporation of movement into academic classes to improve learning. She supported the active participation and involvement that caused movement literacy to be successful. Movement literacy is defined as the translation of the environment and sensory information into movement, and the ability to understand the conscious movements of others. Movement literacy is helpful educationally because it requires active learning, which is a main component of brain-based research. Movement techniques can be used to teach academic lessons by translating a concept into a motion. Minton explained that this is best done by working with the basic elements of movement: quality, type, direction, level, shape, size, pathway, position, duration, and rhythm. Students may use a literal or abstract approach to translate a thought of the mind into a movement of the body. A literal example of this could be a lesson about earthquakes. During earthquakes, tectonic plates move back and forth over one another, or they collide. Students could nonverbally communicate this concept various ways; however, one solution would be for students to move their palms over one another to represent the tectonic plate movement and clap their hands to show collision. While she appeared to support this methodology wholeheartedly, there is no statistical evidence of student improvement. However, her observations and teaching

methodologies agree with the findings of the brain-based researchers previously mentioned.

Asher, a founder of Total Learning Response (TLR) has taught second languages as a kinesthetic experience rather than as a concept to be learned by listening to tapes, reading, or writing translations. His review of evidence of experimental studies with various languages including Spanish, Japanese and Russian showed the success of TLR. All of his results revealed that one exposure to his kinesthetic methodology was more effective than multiple exposures to traditional translation practice. An example of TRP is when students were given a command in another language, they would perform that command, rather than simply translate the written command into their own language. When comparing groups based on those who acted and those who observed others acting, Asher (2009) noted that the act-act and the act-observe groups both performed significantly better than the traditionally instructed group. They also demonstrated improved long-term retention and required less learning time for students to excel in several areas of assessment. MRI testing showed that first-hand experience activates different brain cells than the reconstruction of experience that occurs in most school settings. Neurological evidence also revealed when students physically responded to language, they activated primary visual perception, rather than secondary visual perception (which was activated in traditional language construction).

In the subject of literacy of younger students, Rule, Dockstader, and Stewart (2006) investigated third grade students by separating them into three groups: kinesthetic, tactile, and control. After 18 hours of instruction and practice, students were tested on phonological awareness using the same test as before they started. Kinesthetically

instructed students improved by 18.9 points, the tactile group by 18.6 points, and the control group by 8.2 points. A limitation of the study was that the student groups were small (three students) and the control group that showed the least improvement actually scored higher than the previous groups originally, which may account for their smaller point improvement. The lack of statistical evidence does not allow for a true qualitative comparison between groups; however, one cannot ignore that kinesthetic learning improved the reading development scores. In another study,

Dunn (2000) used a counterbalance design to determine if the use of kinesthetic tools affect student learning. Fourth graders were alternatively taught using kinesthetic and traditional instruction. A MANOVA (multivariant analysis of variance) showed a significant interaction between the kinesthetic instruction and achievement. Simple main effects also supported the analysis. In addition, students also rated the kinesthetic instruction as more enjoyable than the traditional teaching methodology.

Movement was also studied in coordination with music to teach. Keinanen, Hetland, and Winner (2000) researched the effects of dance on the reading ability of first graders in two different ways. The first way incorporated reading and dance movements that allowed the students to make alphabet letters with their bodies. In the second way, dance was taught independently of reading. Empirical evidence was not provided in the article, but the authors stated that, because of the dance activities, the children recognized letters and sound relationships better. Also, one cannot determine if the success was due to increased motivation or to the newness of the activity. Whether or not the dance was directly related, the scores improved.

The use of music was also analyzed in coordination with story reading. Cole and Boykin (2008) studied the impact of music-linked movement on learning conditions involving story recall. Research revealed that African American students with music and high-movement opportunities experienced enhanced story recall. The experiment included 128 students, but only fourth graders showed any improvement due to type of music and movement. The lowest recall scores were in the fourth and sixth grade, which were devoid of music and movement. Despite contradictory findings across grade levels, positive results about student mood were observed when movement was incorporated.

Another study similarly resulted in positive student affect. Lewis (1988) assessed young children according to their learned musical achievement, according to selected listening skills, and the inclusion of movement. One-hundred thirteen students were taught 12 lessons around general concepts of music. Each lesson lasted approximately 30 minutes. The experimental group included additional psychomotor activities. After five subtests on each concept, an analysis of variance and an analysis of covariance were run. There was a significant improvement for the experimental groups in only some areas. The experimental first graders improved on one of the five tests and the experimental third grades improved on three of the five tests. One could say that the inclusion of the movement instruction was beneficial; however, the results were not consistent across each test, nor for both grades. The sample size of only 113 may be a constraint, and teacher experience with a particular grade, class size, or the students' advanced cognitive development may be factors to consider.

Mathematical Examples

Mathematical examples were incorporated into the literature reivew in an effort to learn more about kinesthetic approaches in the classroom. Goral and Wiest (2007) posed a movement methodology for teaching students the basic principle of fractions through teacher research. As previously noted, brain-based research has suggested that sensory input and movement assist the brain in learning more productively. Furthermore, the authors claimed that an active physical body induced a more creative brain. The teachers planned three fraction lessons that incorporated poetry, music and movement. The kinesthetic activities included having the students read a poem about fractions, having them jump fractional distances on a measuring line, and having them beat the fractional rhythm of a song. On the last day, even those watching the activities (and not actively participating) were able to understand the fraction concepts. After each lesson, sample student responses to conceptual questions, such as: "Is one-half larger or smaller than one whole?" or "How many eighths does it take to make one-half?" The student responses were graded and analyzed to determine their understanding and the effectiveness of the lesson. The kinesthetic lens by which the teachers designed the lesson served the students well because the students dealt with real-life situations, and the concrete activities facilitated the understanding of abstract concepts. The instructors claimed that the activities had a positive effect because students stayed on task, needed little redirection, "clearly enjoyed the activities" and met the learning standards (p.77). Also, the following year in mathematics class, students recalled these lessons in fraction discussion with their new teacher. This is significant because "the concept was not only clear, but did not

require reteaching" (p.80). Despite the difficulty in measuring correlation in this study, educators were encouraged to include kinesthetic arts into instruction for all age groups.

In the subject area of math, Fife (2003) used movement to improve rote memory math facts; this study compared two groups and their ability to learn addition facts. The control group was instructed with traditional flash card repetition; the experimental group study bounced a small, hand-sized ball while repeating the same math facts. The Mad Minute test has face validity and was given twice over a three-week period. The students were given their treatment twice a week for twenty minutes each. After analyzing the *t*-test results, the researcher concluded that the active method of learning made no statistical improvements. Some of the limitations of this study include the small population—only 16 students. However, Fife still noted the increase in motivation of the experimental group.

Analysis and Implications

While neurological findings are still in process and offer much conjecture with little solid empirical evidence, one must admit that key educational theories and principles have not contradicted familiar methodologies that teachers accept (Hruby, 1999). Some scientists have resisted brain-based research due to the lack of unequivocal evidence, but they may never get the results they request. In fact, many studies claiming the status of being unequivocally sound have been corrected throughout history. In the meantime, brain-based research should be tried and tested, as no students will be harmed by this increasingly more accurate teaching methodology (Jensen, 2008).

Many times in classrooms, learning is solitary, and classroom procedures do not include the dual processing that activates the brain through novelty, interaction, playing

games, or other active concepts. For numerous reasons, the traditional lecture, rote memory, and recitation have remained the mainstays of the classroom experience. Admittedly, thought patterns are quite complex rather than sterile and simple (Corrie, 2000), so brain-based curricula are somewhat more appealing than traditional practices. Interconnectedness between the mind, body, and the world are best represented in the classroom through multi-disciplined assignments and activities (Hall, 2005; Geist & King, 2008). The link between cognitive neuroscience, psychology, and disciplines across education can strengthen educational experiences in the classroom to go beyond typical settings (Phillips, 2009). The best use of neurological studies is to determine how the brain works in order to combine the art of teaching with the scientific findings of how the brain responds to stimuli (Willis, 2007).

Implications for the Study Design

The underpinnings of brain-based research that rely on the body and brain connection show a need for movement incorporation for learning to occur. Multiple sensory details must be included for optimal incorporation of neural networking. Hannaford (1995), a neurobiologist and pioneer in the field, stated that this best occurs during movement. Many sensory fibers are included during the movement process, which proportionately creates a direct link to the number of impulses that are carried to the brain. As previously stated, Strick (2009) has supported the theory that the cerebellum is the same location for thought and movement processes. Prigge (2002) has stated that the integration of movement and learning are neccesary because it increases student attention. She has advised that movement be incorportated into lesson plans.

After much research and despite much excitement about the need for multi-sensory lesson plans, very few of examples of movement-based activities with statistical analysis surfaced. The majority of the previous studies focused on younger children, so, application to the high school student is unclear. Other examples combined more than one treatment—such as music and movement—so that the findings were unclear about the use of movement. The inclusion of math examples was primarily due to the lack of evidence directly related to English, so math was included solely because it was about the educational incorporation of movement.

Despite the growing popularity of brain-based research, much of the evidence is not a result of educational measures. The focus of this study was on the incorporation of movement in the English classroom through the evaluation of grammar acquisition.The need for this study exists due to brain-based claims that movement increases learning, yet information about that application in an educational setting, particularly for the high school English student, is lacking. A basic understanding of grammar is fundamental for higher levels of communication, for standardized tests such as high school graduation tests, or for national tests, such as the SAT. Also, unlike the interpretation and subjectivity that often arise in the literature class, grammar is an objective aspect of the language, which lends itself well to this research purpose. A basic understanding of the framework of the English language is an important aspect of classroom instruction, so it became the vehicle by which to research the use of movement in the classroom.

CHAPTER III: METHODOLOGY: DELINEATION OF THE STUDY CONDUCTION

Background

In the previous chapter, the literature review showed the reoccurring theme of body-mind connections as it has manifested throughout basic neurological functions, a variety of disciplines, and attempts of application to education. The following methodology is the research design previously mentioned in Chapter 1. The purpose of the design was to determine the result, if any, of the application of movement on high school students' grammar-learning ability.

Research Design

The quasi-experimental design included 277 participants assigned to homogenously grouped College Preparatory English classes through a computerized random database. The instruments designed to teach grammar during this research study were as follows: Holt, Rinehart, and Winston's *Elements of Writing: Language Skills* and kinesthetic activities, assessment through pre- and post-tests, and survey administration. As a qualitative measure, teachers kept a daily log of their experiences as they taught the grammar units.

The traditional group completed handouts from Holt, Rinehart, and Winston's *Elements of Writing: Language Skills*. This is a traditional grammar text, which provides student handouts for each element of grammar study. The kinesthetic tools were not from one specific book or program but were researcher created. The kinesthetic activities were thoughtfully created by the researcher through personal experience in the classroom, other educators, and online resources. The validity of the kinesthetic activities was

determined by the experts in the field who are listed with their area of expertise in the Appendix D.

Two similar tests from Holt, Rinehart, and Winston's *Elements of Writing: Language Skills* were used as bases for the pre-tests and post-tests. The researcher made minor adjustments to purposefully make similar the sentence structure, level of difficulty, and equal representation for each grammar element. Aside from the researcher gathering testing data as a result grammar instruction, students also completed a forty-question survey to show the different attitudes and perceptions that various subpopulations had. The questionnaire also determined how outlying demographics factors and other kinesthetic preferences and interests significantly correlated to achievement and instruction style. The data from this survey were used to analyze any correlation between the outside factors and their possible contribution to the grammar post-test scores. Seven experts in the field determined the validity of the pre- and post-tests, the traditional and kinesthetic activities, and the student survey.

Brief Procedures

Instructor selection was evaluated by the teachers' current class sizes, grade level, and grammar instruction experience. However, the researcher taught the control (traditional) group in order to avoid bias. In addition, all instructors kept a brief log of each grammar lesson as they taught it. This included the date, the lesson, a brief description, and the time length of the lesson to allow for qualitative data collection. Also, the kinesthetic instructors received a training seminar on how to model the activities.

A pre-test was given before the introduction of the methodologies. Then, the control group received the traditional instruction, while the treatment group received the kinesthetic instruction. The fifteen grammar lessons lasted approximately 15 minutes each. Each participant had the same total grammar instruction time available. Each class received 15 lessons, either traditional or kinesthetic, and all were completed within five weeks. After participation in all lessons, students took a post-test and completed the surveys. The surveys were taken after all components of instruction were complete so that the results did not influence student perception. The teacher kept the logs throughout the duration of the study.

Data Gathering Methodology

Preliminary Design of Control and Treatment Materials

Holt, Rinehart, and Winston's Elements of Writing: Language Skills

Grammar instruments were necessary to distinguish the control and treatment groups. The traditional group completed handouts from the *Elements of Writing: Language Skills* workbook. County has used this traditional grammar textbook for many years. Holt's origins traced back to 1866 and have been a mainstay for English teachers throughout the years, even after two mergers (http://holtmcdougal.hmhco.com/hm/home.htm). Although it is one of the oldest publishers for school systems, the validity and reliability of the resources were unavailable. Therefore, the researcher relied on the recommendations of the experts in the field for these qualifications, which will be discussed at length later in the chapter.

The student handouts for each element of grammar in the study were created by the publishers of Holt McDougal. The students in the traditional group completed a

fifteen-minute lesson using a handout for each of the fifteen lessons, while the kinesthetic group completed a kinesthetic activity over the same grammar element during the same fifteen-minute timeframe.

The Kinesthetic Grammar Activities

The kinesthetic tools were not from a specific book or program but were created by the researcher. With appropriate permission, ideas have been gleaned, modified, and spontaneously created from various internet sites, from educators, and personal experiences in the classroom. The creation of the grammar kinesthetic activities was necessary due to the overall lack of a kinesthetic grammar curriculum, particularly for the high school student. In addition, modifications had to be made in order to present the same grammar element to each group and within the allotted amount of time. Grammar activities also had to provide a movement opportunity for all the participants in the class, in an organized and productive manner. The creation of these materials for this study was validated by the group of experts in the field.

Overview of Control and Treatment Lesson Plans

This section provides an overview of the control and treatment lesson plans.

Figure 1.1 Lesson Plan Overview

Lesson Number	Traditional Handout (control)	Kinesthetic Activity (treatment)
1	Interjections	Performance: Student-generated ad-lib in groups.
2	Action Verbs	"What are You Doing?" Game: Humorous imaginary game based on improvisation.
3	Linking Verbs	Acting: Students act out the same verb as either a linking verb or an action verb.
4	Adverbs	Notecard Charades: Students define adverb components on each corner of the notecards and act for the class to guess the notecard contents.
5	Adjectives	Jadantics Flower: Students walk to the board and fill in the petals to allow their team to guess the correct noun, as described by the adjectives.

6	Direct Objects/ Indirect Objects	Matching Game: Students get a card with a subject, indirect object, or direct object. They move around the room to create the type of sentence the teacher requests.
7	Subject Complements	Trashball Game: The teacher reads the sentence. Students raise their hands to answer with the correct complement. The winner shoots for points.
8	Prepositions	Human Bingo: Students in their desks are the "bingo board" and stand up when they correctly use prepositions to win "bingo" with their peers in formation.
9	Participles	Jadantics Flower: This is the same format as the adjective, exercise, but focusing on participles.

10	Infinitives	Simon Says: Students act out Simon's directions only if they include infinitives.
11	Appositives	Appositives Freeze Frames: Students showcase their sentences by separating them into four sections in front of the class. The spotlight is only on the noun and its appositive.
12	Gerunds	MadLib Adlib: Students create profiles and act them out in front of the class as the teacher reads them.
13	Conjunctions	Presentation: Students create 1-2 minute educational skits with a script and perform for the class.
14	Independent and Subordinate Clauses	Notecard Scramble: Students write either an independent or subordinate clause on their notecards. Students move around the room to create sentences that make sense.

15	Classifying Sentences by Structure	Butcher Paper Activity: Using the notecards from yesterday, students work in groups to create the four different sentence types. They look through all of their cards and tape their sentences on the paper.

The Pre- and Post-Tests

Two similar tests from Holt, Rinehart and Winston's *Elements of Writing: Language Skills* were used as a basis for the pre-tests and post-tests. Minor adjustments were made to these pre-constructed tests to purposefully make the sentence structure, level of difficulty, and equal representation similar for each grammar element on each test. Both tests were fifty questions in length and were made up of four sections: (1) Parts of Speech, (2) Complements, (3) Verbal Phrases, and (4) Sentence Types. As with the other research components of the study, validity of the pre- and post-tests was attained through experts in the field. These resources are located in Appendix B.

Student Survey Design

Survey Format

Aside from gathering pre- and post-test data from students, the researcher also gathered demographic and personal preference information from the students through a 45-question survey. The questionnaire was used to gather data, such as gender, ethnic group, athletic involvement, musical inclination, or any other highly kinesthetic activities

to compare to overall grammar achievement. The format of the survey included five demographic questions, four questions about involvement in the musical inclination, and five questions about student involvement in athletics and physical activity level. In addition, there were nine questions pertaining specifically to Academic Preference, and 13 questions pertaining to the students' General Preference. Preference responses determined how students prefer to learn academically, and General Preference responses showed how students prefer to find solutions to daily life situations outside of school. The addition of the General Preference category was necessary, as many students did not have an understanding of their academic preferences, and some handwrote "I don't study" and failed to answer some questions from that area.

Rationale for Survey

The student survey was designed to gain demographic information about the population, as well as to gather additional kinesthetic data about the subjects. The focus of the study is kinesthetic movement and how its incorporation affects student learning. In order to gain clear access to the significance of movement and student kinesthetic preference, the researcher needed to determine the other factors movement influenced in the students' lives. According to the brain-based research as explained in Chapter 2, student activity levels influence brain plasticity and development and therefore learning capacity. In addition, the following research adds support to the connection between these specific areas and academic achievement.

Survey Elements: The Inclusion of Music

Numerous explanations regarding the potential link between music and language learning surface through brain-based research. Experts find that the right hemisphere, widely known for its music control, can be trained to use language areas that are normally dominated by the left hemisphere. More recently, neuroscientists have begun to gain a better understanding of how and where music is processed within brain anatomy. Brown, Martinez, and Parsons (2006) have explained that, due to PET studies, neurologists now have even more specific details about parallel neural tasks between language and music. Core areas for generating melodic phrases and core areas for generating sentences result in nearly identical functional brain areas. There were differences in the tendencies of each process, but many of the tasks were bilateral and significant overlapping occurred. Contrary to past belief, the biological foundations of music in the brain are not limited to one particular hemisphere; but, like language, involve different regions throughout the brain.

In fact, a person's brain anatomy reflects the activities of that individual. According to Begley (2000), the corpus callosum is much denser at the prefrontal cortex and premotor cortex in experienced musicians. These areas of the brain function as centers of planning and foresight and coordinating quick movements. The combination of music and movement again shows the possibility of an increase of learning. This is why the incorporation of music on the survey was necessary, along with the fact that musical inclination may result in overall learning enhancement.

Furthermore, Bower (1992) has observed that the brain structures predominately used for language and for music lie adjacent to one another. This is significant because brain areas involved in word processing brush against cerebral nodes used in musical

networking. Hodges (2000) determined that music, like language, is a species-specific trait of mankind. Notably, music is not only in one center, but it engages areas throughout the brain, not exclusive to other cognition tasks. Music has a close connection to language development because of the close proximity of anatomical brain function. For this reason, the instructors surveyed students with strong music inclinations in order to distinctly categorize them as such.

Educationally, rather than neurologically, speaking, the inclusion of elements of musical inclination and arts in the survey was determined due to the numerous studies that expressed that music played role in academic achievement. Observably, the role of music in educational settings is popular, but the specific connection between brain functions and learning is limited. More significantly, music paired with gestures was more effective on children learning vocabulary than music alone. The movement with the music was more helpful to the students. Student experience with music, whether it be playing, practicing, listening, or singing, increased intelligence and cognitive ability (Cassity, H.D.;Henley, T.B.; Markley, R.P. 2007; Kreeft, A., 2006; Sousa, D.A. 2006;Weinberger, 2006; Altenmuller, 2004; De Los Santos, 2000; Hodges, 2000).

Not only is hearing music effectual, but singing was helpful in improving student memorization. Kouri and Winn (2006) examined how singing affected children's vocabulary learning. Sixteen children with language and developmental delays were presented with spoken and sung story scripts containing eight novel words over two experimental sessions. Results showed a significant increase in the number of children's unsolicited vocabulary in speech from Session 1 to Session 2 in the Sung Condition, which indicated that sung input may enhance particular aspects of word

learning. Even though the study was with a small population, the similarities between music and learning cannot be ignored.

Survey Elements: The Inclusion of Physical Activity

In addition to musical inclination, the students' physicality was also surveyed. Jensen (2008), one of the most well-known brain-based researchers, has supported that quality physical activity positively impacts student performance on test scores. In addition, Dwyer, Sallis, Blizzard, Lazarus, and Dean (2001) agreed that exercise improves student classroom behavior and academic performance. According to researchers, the level of physical activity that students experience directly relates to the ability of the brain to function. Furthermore, in 2005, the California Department of Education determined a significant relationship between students who were able to pass at least three areas of the FITNESSGRAM physical fitness test and math and reading scores on standardized tests (Hall, 2007). Physical activity and fitness have been shown to be significant indicators of higher test achievment. While this is a general statement, it echos brain-based research on positive effects on brain function.

The improvement of academic performance may be due to the changes that occur in the brain during physical activity. For instance, BDNF (a brain-dervived neurtrophic factor) helps neurons communicate with one another, and there is an increase of this chemical during exercise. Another general benefit of physical activity is the increase of blood flow to the brain, which increased the nutrients, glucose and oxygen flow to the brain. More blood flow on a consistent exercise schedule results in more blood capillaries to better brain functioning in and outside of the classroom due to increased oxygen. Jensen (2008) has agreed that quality air results in better cognitive ability. While stress

decreases student learning, exercise has the capacity to reduce stress from the body and to increase concentration and learning.

This research shows the connection between research on brain function and the capacity for learning due to participation in performing arts and physical activity. The ability to differentiate the data based on student kinesthetic interests and abilities, or the lack thereof, was necessary to analyze the results accurately. Defining and categorizing students by their kinesthetic perspective was done through several components of the student survey.

Determining Factors for Categories

Primary demographic information was coded and categorized to separate students by gender, grade, and ethnicity. Students who answered "yes" to any of the Musically Inclined questions were categorized as Musically Inclined participants. Students who answered "yes" to any of the Physically Active questions were categorized as Physically Active. Only one "yes" answer was enough to label each student because many times at the high school level, many students focus primarily on one activity year round, not a myriad of different sports within each semester. If students answered "yes" to more than one question, they were equally categorized either Musically Inclined or Physically Active so that these categories are not mutually exclusive.

Student Academic Preference was categorized as Kinesthetic Learners if the student selected five or more of the nine questions with a kinesthetic response. Students were also categorized as Kinesthetic Learners if the students selected seven out of the 13 questions with a kinesthetic response. Beyond extracurricular activities, the second half of the survey was to determine the students' natural learning tendencies. When

movement is the key to brain activation, students may prefer other sensory means. Students who specifically classified themselves as kinesthetic learners were noted.

Rationale for Survey Validity and Reliability

The VARK learning style questionnaire was used as a springboard to design the Student Academic and General Preference Sections. While no published validity or reliability yet exists for the VARK survey, Dr. Walter Leite, at the University of Florida, has completed a major statistical study evaluating its reliability and validity. This has been submitted to *Educational and Psychological Measurement,* and researchers await acceptance and publication in that journal (www.vark-learn.com/english/page.asp?p=research). Reliability for the kinesthetic portion was 0.77. As previously mentioned, verification of the validity and reliability of the survey tool was signified by experts in the field who were asked to evaluate this material using a Likert scale.

Validity of Research Components by the Experts in the Field

Seven experts were presented with all the research materials used for the study: the pre-and post-tests, the traditional and kinesthetic teaching materials, a student survey, and a teacher log. The experts assessed these materials using a Likert scale. The same experts evaluated all articles because the materials were used in coordination with one another. The following summaries introduce the experts in the field, their level of expertise, and their years of experience. Even more outstanding than their accolades is the strong reputation and commitment to students and learning that each of these experts possesses. Their brief introductions reveal knowledge of teaching and experience with the English language at various age groups and points of contact. Also listed is any advice or

adjustments that these experts requested. After full compliance with their suggestions, the researcher resubmitted all research materials to each expert for final approval. The complete list of experts in the field, their detailed qualifications and their initial responses are listed in Appendix D.

Teacher Training for Research

The traditional materials and the answer keys were issued with verbal and written instruction. Teachers have a plethora of experience teaching basic grammar knowledge from a handout or textbook, so they did not specifically need instruction on how to complete each student handout. To facilitate the traditional instruction, a key was provided to each instructor.

All kinesthetic instructors met after school for a mini-seminar to receive training on how to model and to teach the kinesthetic activities. The group of teachers looked over the compilation of the kinesthetic materials together after individually looking through the packet. After studying the first lesson, the researcher modeled how to explain the lesson as an instructor and what to expect as the student result. The teacher volunteers continued to work through each of the kinesthetic activities in similar fashion. Instructors directed questions to the researcher and one another as they skimmed through the packet. At each question, the group all stopped and addressed the concerns together. Pleasantly surprising, teachers were also able to give advice to one another due to experience with other various kinesthetic encounters. Other teachers began to model how they imagined the lesson would go. The researcher offered advice and gave credibility to their understanding. The instructor practiced using the kinesthetic tools for the kinesthetic activities. Each instructor was given a bucket holding all the kinesthetic props she would

need during the duration of the research. These props included a ball, numerous note cards sorted and labeled for each activity, butcher paper, cue cards, and tape.

The practice seminar concluded after approximately one hour, with the understanding that the researcher would be available throughout the research if they needed any additional assistance. The seminar went very well because the overall goals of the lessons were established—to have all students participate and to integrate movement during the lesson in a meaningful way.

Teacher Logs

In addition, the seven teachers in this study agreed to keep a teacher log to make notes of their teaching experiences. They recorded the date, start and stop times, the class period, absent students, the brief assignment, and their personal observations. The dates were recorded to ensure that the entire study did not exceed a five-week time frame. The start and stop times verified that the lessons were approximately fifteen minutes each day. Both the dates and times of the lessons served to protect the integrity of the study because they ensured that students received the same materials in the same increments of time. The other categories were for basic organization; however, the teacher observation section was used as a qualitative measure. The observations were charted and coded in order to glean more detail about the kinesthetic methodologies in the classroom. This will be discussed more with the results in chapter 4.

Reliability of Research Components by the Experts in the Field

The two assessment instruments (the pre- and post-tests) were developed from two similar tests from Holt, Rinehart, and Winston's *Elements of Writing: Language Skills.* Holt's origins traced back to 1866 and have been a mainstay for English teachers. The

researcher made minor adjustments to purposefully make similar the sentence structure and level of difficulty. The assessments were also reliable because each grammar element answer had equal representation in each section. Both tests were fifty questions in length and were made up of four sections: (1) Parts of Speech, (2) Complements, (3) Verbal Phrases, and (4) Sentence Types. There is a consistency between instruments because of the grouping of questions that measure the same concepts, as well as the multiple questions formed for each grammar element. As with the other research components of the study, reliability of the pre- and post-tests was attained through experts in the field. These resources are located in Appendix B. In addition, a split-half reliability test (Cronbach's Alpha) was used to assess the reliability of the pre- and post-tests. The pre-test result was .715 and the post-test result was .739. The results were favorable and showed that the questions contributed to the overall score in a significant manner.

Again, Holt, Rinehart, and Winston's *Elements of Writing: Language Skills* was used for the traditional handouts. While these resources are widely used, reliability was assessed through experts in the field. The creation of the kinesthetic tools was necessary due to the overall lack of a kinesthetic grammar curriculum and these materials for this study was validated by the group of experts in the field. The kinesthetic instructors received a teaching packet, and attended a training seminar on how to model the activities. The training was provided to ensure instructors understood the activities and would use them the same way with each class.

Instructor logs were also used for data collection. Instructors included the date, the lesson, a brief description, and the time length of the lesson to allow for qualitative data collection. These notes ensured the lessons were taught for the same timeframe. The

students also completed a forty-question survey to show the different attitudes and perceptions that various subpopulations had about kinesthetic learning. This was given after the post-tests so it would not influence student perception.

Sample Techniques

Participants

The quasi-experimental design included 277 participants assigned to homogenously grouped College Preparatory English classes through a computerized random database. Demographically, the students averaged from 14-18 years old, and are generally from a middle class economic background. The racial demographics of the students in this study were 10% African American, 66% Caucasian, 16% Hispanic, and 8% of other minorities. As a side note, these percentages represented the school as a whole as well. The number of the sample size was sufficient as determined by Olejnik (1984) from Florida State University, who calculated that the minimum size for a related samples *t*-test used with a .05 level of significance need only a maximum number (N) of 194 participants, no matter the anticipated effect size.

Participant Qualifications

To participate in the study, students must have returned the parent consent form granting permission to participate, taken the pre-test before the grammar lessons began, and made up all missed work due to absenteeism within five school days. They must also have completed the post-test and survey within five days of the unit completion. In regards to make up work, in addition to teachers being available before and after school, the researcher was also available to any student before or after school with the appropriate supplies. A copy of the parent consent is found in Appendix A.

Teacher Researchers

The control (traditional) instructors included teachers A, B, C, and D. The treatment (kinesthetic) teacher group included teachers E, F, and G. The traditional and kinesthetic teacher selection was evaluated by current class sizes, grade level, and overall teaching experience. Since the researcher was also a teacher in the study, she was assigned to the control group in order to avoid bias in results. The following chart shows the teacher qualifications, the group assignment, and the number of students in each class. This chart shows the teacher experience in the control and treatment group, to eliminate as much bias as possible that may have given the treatment group an unfair advantage.

Teacher Equality

Table 2

Control Group

Teacher	Gender	Ethnicity	Years of Experience	Grade Level	Number of Students
A	female	Caucasian	13	9	31
B	female	Caucasian	7	10	73
C	female	Caucasian	32	11	15
D	female	Caucasian	3	11	45

Table 3

Treatment Group

Teacher	Gender	Ethnicity	Years of Experience	Grade Level	Number of Students
E	female	Caucasian	7	9	28
E	female	Caucasian	7	10	57
F	female	Caucasian	3	11	20
G	female	Caucasian	8	11	57

One possible limitation was that each teacher did not have the same amount of influence due to different quantities of students. While the directions and scripts were the same for all of the teachers, the slight differences in interpretation by some teachers may have had a more significant impact than others because their class sizes were larger.

Statistical Procedures

The null hypotheses of this study were: (1) Incorporating movement in grammar instruction will have no effect on learning outcomes. (2) There will be no statistical difference between the pre- and post-scores of short-term grammar learning due to kinesthetic instruction. (3) Students who show a high level of kinesthetic preference did not show significantly higher ability in grammar than those who did not show a high level of kinesthetic preference. (4) There will be no difference between student affect within the control group and the treatment group. To assess these null hypotheses, the following procedures were used. A pre-test was given before the introduction of the methodologies. Then, the control group received the traditional instruction, while the treatment group received the kinesthetic instruction. The 15 grammar lessons lasted

approximately 15 minutes each. Each participant had the same total grammar instruction time available.

Each class received a total of 15 lessons, either traditional or kinesthetic, and all were completed within five weeks. After participation in all lessons, students took a post-test. Scores were analyzed statistically using independent and dependent sample *t*-tests. Students also participated in a survey in order to more accurately interpret the results of the pre- and post-tests and survey results.

Means and standard deviations were calculated for the research variables by group (traditional/control vs. kinesthetic/treatment). To assess the null hypothesis that incorporating movement in grammar instruction will have no effect on learning outcomes, two independent sample *t*-tests were conducted to assess if differences existed on pre-test and post-test by group (traditional/control vs. kinesthetic/treatment). The Levene's test was necessary to test the assumption of equality of variances in the samples. To assess the assumption of normality four Shapiro-Wilk tests were conducted and the assumption of normality.

To assess the null hypothesis that there will be no statistical difference between the pre- and post-scores of short-term grammar learning due to kinesthetic instruction, two dependent samples *t*-tests were conducted to assess if differences existed between the pre-test and post-test for each group (traditional/control and kinesthetic/treatment). Differences were assessed using Cohen's (1988) guidelines. To assess the null hypothesis that students who show a high level of kinesthetic preference did not show significantly higher ability in grammar than those who did not show a high level of kinesthetic preference, an independent sample *t*-test was conducted to assess if differences existed on

the post-test for the treatment group by academic preference, general preference, or sports preference (no vs. yes).

To assess the fourth hypothesis that there will be no difference between student affect within the control group and treatment group, qualitative measures will be used. First the theoretical framework was delineated to avoid researcher bias, and then teacher verbal comments were noted throughout the study. Next, the teacher observations from the logs were used as a qualitative measure. The observations were charted and coded in order to glean more detail about the methodologies in the classroom. First the original text was transferred into an electronic version by listing each grammar element and each teacher's name under the element. This was done for every element and teacher. Teacher comments were coded and recoded (in italics for kinesthetic teachers and regular font for the traditional teachers.) Next, all positive comments for either group were highlighted red, neutral comments were coded black and negative comments were coded blue. After reading the notes several times to code them red, black or blue, the researcher reread the script, recoded the work and then noted emergent patterns. The recounting and recoding prevented as much researcher bias as possible.

CHAPTER IV: DATA RESULTS

The null hypotheses of this study were: (1) Incorporating movement in grammar instruction will have no effect on learning outcomes. (2) There will be no statistical difference between the pre- and post-scores of short-term grammar learning due to kinesthetic instruction. (3) Students who show a high level of kinesthetic preference did not show significantly higher ability in grammar than those who did not show a high level of kinesthetic preference. (4) There will be no difference between student affect within the control group and the treatment group. Despite extensive analysis of demographics, extracurricular movement activities, musical and language abilities, and student preferences through statistical measures, there was no statistical significance found for any of these components. These results showed that incorporation of movement in student learning did not necessarily increase student achievement, specifically in the area of grammar. Chapter 5 discusses the possible reasons for the results.

Quantitative Results

Chapter IV presents the results of the data collection from the control and treatment groups. The tables show the similarity in groups before beginning the experiment and the post treatment outcomes. The results of the student surveys were also used to categorize the participants of each group and determine other possible reasons for student achievement. The descriptive results show the recorded frequencies of participants, gender, and preferences. The statistics also include independent sample t-tests and two sample dependent t-tests. The aspects selected from the student survey for analysis were with the demographic break down, and then the academic, general, and

sports sections were tabled. The overall post-test scores for the control and treatment groups were also compared. The qualitative results from the teacher log responses were coded and the emergent themes were discussed after the qualitative measures at the end of the chapter.

Results

Means and standard deviations were calculated for the research variables by group (traditional/control vs. kinesthetic/treatment). There were 277 participants in the study; 144 (52.0%) participants were in the traditional/control group and 133 (48.0%) were in the kinesthetic/treatment group. Results are presented in Table 1.

Of the traditional/control group, there were 66 females (45.8%) and 78 males (54.2%); results are presented in Table 2. For ethnicity, the majority of participants were Caucasian (N = 92, 63.9%), followed by Hispanic (N = 32, 22.2%), African American (N = 14, 9.7%), and other (N = 6, 4.2%); results are presented in Table 3. The researcher categorized survey data by the student preferences. Academic Preference responses revealed how students preferred to learn academically, and General Preference responses showed how students preferred to find solutions to daily life situations outside of school. Students who answered five or more of the nine questions with a "yes" (rather than a "no") in the Academic Preference section were categorized "yes." Students who answered seven or more of the 13 questions pertaining to the students' General Preference were categorized "yes" (rather than a "no"). Students who answered "yes" to any of the five athletic or physical activity questions were also categorized "yes." For academic preference, 110 (76.4%) participants chose "no", and 34 (23.6%) chose "yes." For general preference, 102 (70.8%) participants chose "no", and 42 (29.2%) chose

"yes." For sports preference, 15 (10.4%) participants chose "no", and 129 (89.6%) chose "yes," Results on preference are presented in Table 4.

Of the kinesthetic/treatment group, there were 63 females (47.4%) and 70 males (52.6%); results are presented in Table 2. For ethnicity, the majority of participants were Caucasian (N = 84, 63.2%), followed by Hispanic (N = 21, 15.8%), African American (N = 14, 10.5%), and other (N = 14, 10.5%); results are presented in Table 3. For academic preference, 112(84.2) participants chose "no" and 21 (15.8%) chose "yes." For the general preference, 99 (74.4) participants chose "no" and 34 (25.6%) chose "yes." For sports preference, 23 (17.3) participants chose "no" and 110 (82.7%) chose "yes." Results on preference are presented in Table 4.

Table 1

Frequencies and Percents on Group

Group	N	Percent
Traditional/control	144	52.0
Kinesthetic/treatment	133	48.0
Total	277	100.0

Figure 1. Frequencies for Group

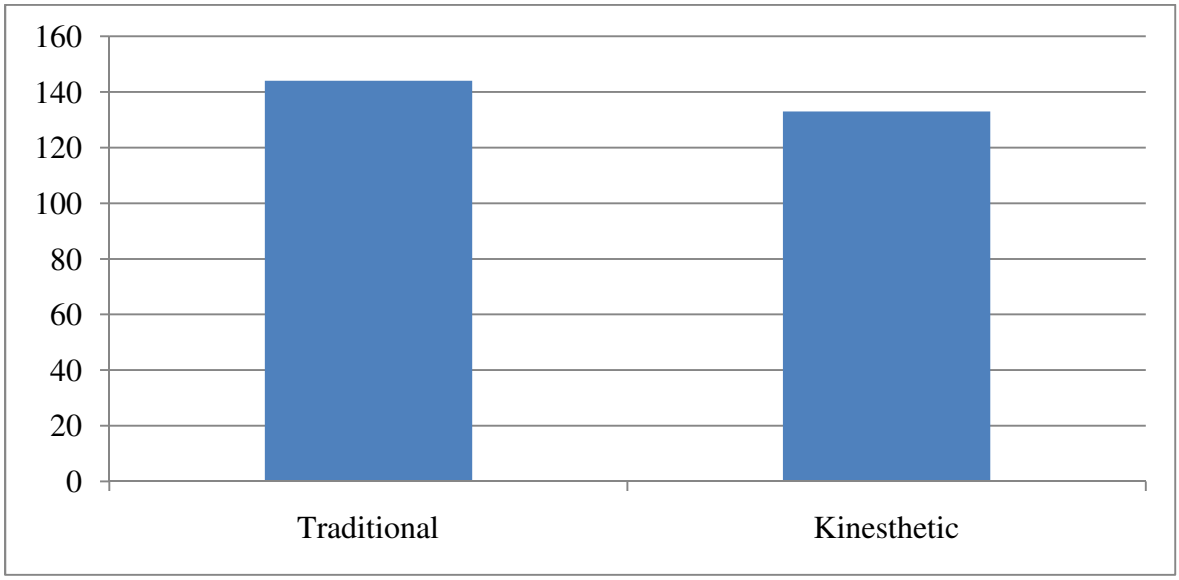


Table 2

Frequencies and Percents on Gender and Group

Group	Gender	N	Percent
Traditional/control	Female	66	45.8
	Male	78	54.2
	Total	144	100.0
Kinesthetic/treatment	Female	63	47.4
	Male	70	52.6
	Total	133	100.0

Figure 2. Frequencies for Group by Gender

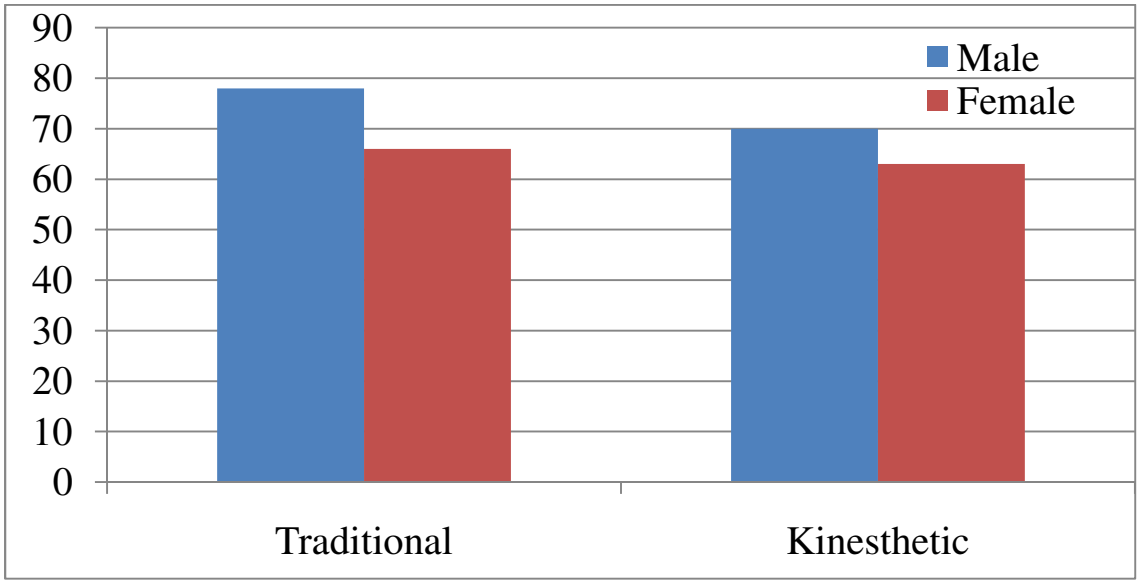


Table 3

Frequencies and Percents on Ethnicity and Group

Group	Ethnicity	N	Percent
Traditional/control	African American	14	9.7
	Caucasian	92	63.9
	Hispanic	32	22.2
	Other	6	4.2
	Total	144	100.0
Kinesthetic/treatment	African American	14	10.5
	Caucasian	84	63.2
	Hispanic	21	15.8
	Other	14	10.5
	Total	133	100.0

Figure 3. Frequencies for Group by Ethnicity

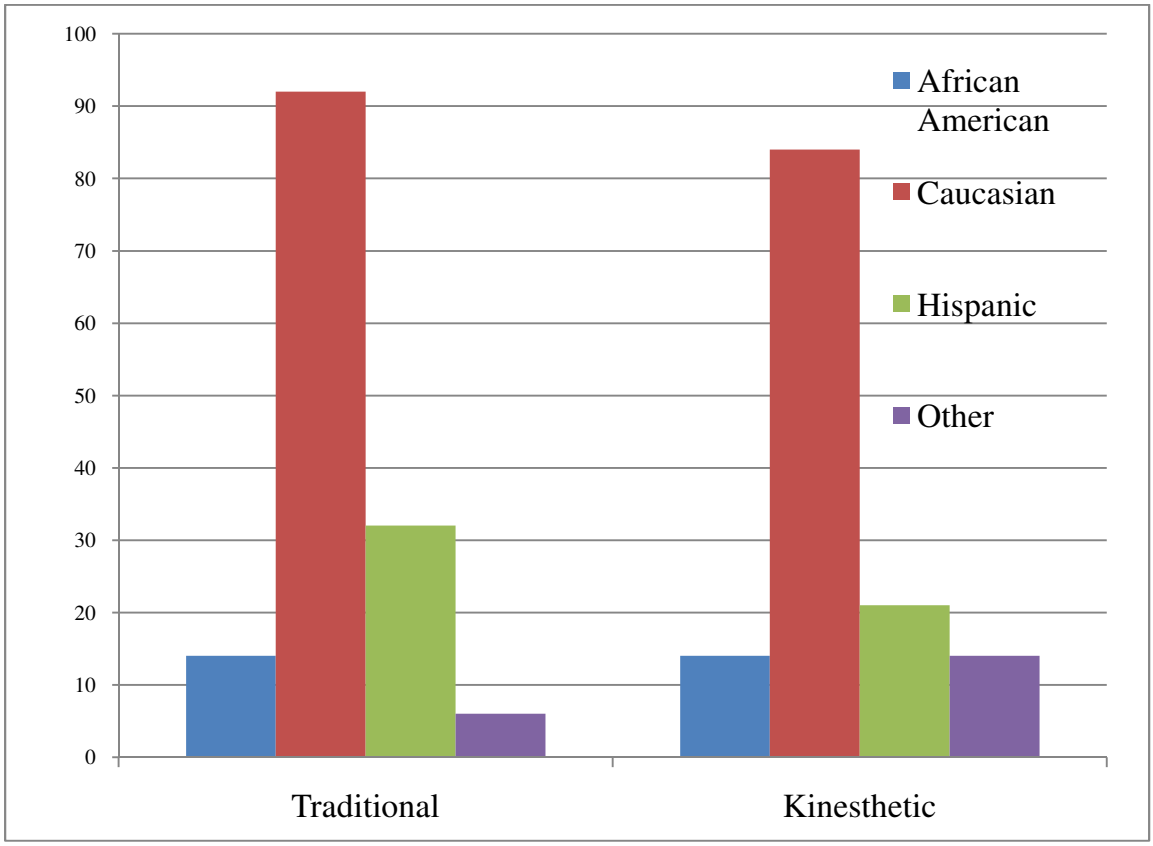
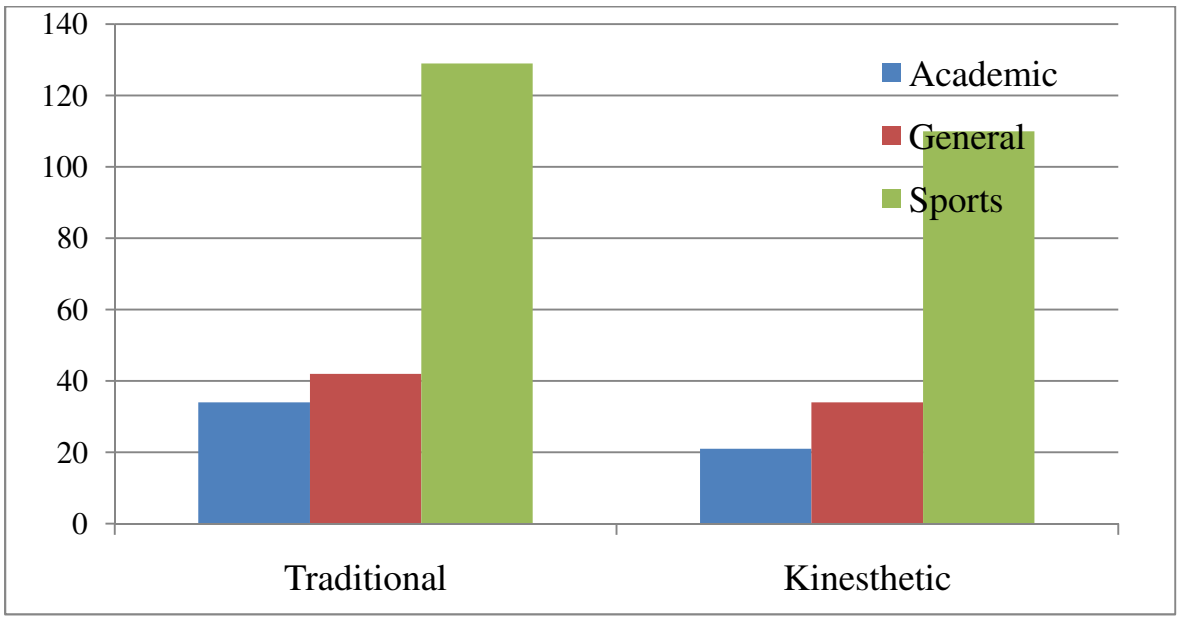


Table 4

Frequencies and Percents on Academic, General and Sports Preference and Group

Group	Type	Preference	N	Percent
Traditional/control	Academic	No	110	76.4
		Yes	34	23.6
		Total	144	100.0
	General	No	102	70.8
		Yes	42	29.2
		Total	144	100.0
	Sports	No	15	10.4
		Yes	129	89.6
		Total	144	100.0
Kinesthetic/treatment	Academic	No	112	84.2
		Yes	21	15.8
		Total	133	100.0
	General	No	99	74.4
		Yes	34	25.6
		Total	133	100.0
	Sports	No	23	17.3
		Yes	110	82.7
		Total	133	100.0

Figure 4. Frequencies for Group by Total "Yes" Academic, General and Sports Preference



To assess the null hypothesis that incorporating movement in grammar instruction will have no effect on learning outcomes, two independent sample *t*-tests were conducted to assess if differences existed on pre-test and post-test by group (traditional/control vs. kinesthetic/treatment). For the pre-test, the results of the *t*-test were not significant, $t(266) = 0.45$, $p = .656$, suggesting no statistical mean differences exist for the traditional/control group ($M = 41.0$, $SD = 12.6$) on the pre-test compared to the kinesthetic/treatment group ($M = 40.3$, $SD = 13.9$). The Levene's test was necessary to test the assumption of equality of variances in the samples. The results were significant, and equal variances could not be assumed; however, degrees of freedom for unequal error variances corrected for the violation. Since the results were not significant, the post-test results were viable tools to assess for changes. For the post-test, the results of the *t*-test were not significant, $t(275) = 0.58$, $p = .560$, suggesting no statistical mean differences existed for the traditional/control group ($M = 41.1$, $SD = 12.4$) on the post-tests compared

to the kinesthetic/treatment group (M = 40.1, SD = 15.1). The results of the Levene's test were not significant, and equal variances were assumed. To assess the assumption of normality four Shapiro-Wilk tests were conducted and the assumption of normality was not met for the kinesthetic/treatment group for the pre-test condition, but was met for the other group and conditions; however, Stevens (2002) stated that samples with $N > 50$ may assume normality. The researcher failed to reject the null hypothesis: Incorporating movement in grammar instruction had no effect on learning outcomes. The results of the t-test are summarized in Table 5.

Table 5

Independent Sample t-test on Pre-test and Post-test by Group (Traditional/control vs. Kinesthetic/treatment)

				Traditional/control		Kinesthetic/treatment	
Dependent Variable	*t*	*df*	*p*	*M*	*SD*	*M*	*SD*
Pre-test	0.45	266	.656	41.0	12.6	40.3	13.9
Post-test	0.58	275	.560	41.1	12.4	40.1	15.1

To assess the null hypothesis that there will be no statistical difference between the pre- and post-scores of short-term grammar learning due to kinesthetic instruction, Two dependent samples *t*-tests were conducted to assess if differences existed between the pre-test and post-test for each group (traditional/control and kinesthetic/treatment). For the traditional/control group, results of the *t*-test were not significant, t (143) = -0.086, p =.932, d = -0.007. The difference was much smaller than typical according to Cohen's (1988) guidelines. For the traditional/control group, no statistical mean differences existed for the pre-test (M = 41.0, SD = 12.5) compared with the post-test (M = 41.1, SD = 12.3). The results of the *t*-test are summarized in Table 6. For the kinesthetic/treatment group, results of the *t*-test were not significant, t (132) = 0.206, p =.837, d = 0.02. The difference was much smaller than typical according to Cohen's (1988) guidelines. For the traditional/control group, no statistical mean differences existed for the pre-test (M = 41.0, SD = 12.5) compared to the post-test (M = 41.1, SD = 12.3). The assumption of normality was not met for the kinesthetic/treatment group for

the pre-test condition but was met for the other group and conditions; however, Stevens (2002) stated that samples with $N > 50$ may assume normality. The researcher failed to reject the null hypothesis: There was no statistical difference between the pre- and post-scores of short-term grammar learning due to kinesthetic instruction. The results of the *t*-test are summarized in Table 6.

Table 6

Dependent Sample t-test for Group by Pre-test vs. Post-test

				Pre-test		Post-test	
Group	*t*	*df*	*p*	*M*	*SD*	*M*	*SD*
Traditional/control	-0.09	143	.932	41.0	12.6	41.1	12.4
Kinesthetic/treatment	0.21	132	.837	40.3	13.9	40.1	15.1

To assess the null hypothesis that students who show a high level of academic kinesthetic preference will not show a significantly higher ability in grammar than those who did not show a high level of kinesthetic preference, an independent sample *t*-test was conducted to assess if differences existed on the post-test for the treatment group by academic preference (yes vs. no). The results of the *t*-test were not significant, $t(131) = 1.72$, $p = .088$, suggesting no statistical mean differences existed for the academic preference no ($M = 41.1$, $SD = 14.6$) on the post-test compared with the academic preference yes ($M = 35.0$, $SD = 17.2$). The result of the Levene's test was not significant, and equal variances were assumed. The assumption of normality was met for each condition. The researcher failed to reject the null hypothesis: Students who showed a

high level of kinesthetic preference did not increase their grammar post-test scores more significantly than their less-active counterparts. The results of the *t*-test are summarized in Table 7.

Table 7

Independent Sample t-test on Post-test by Academic Preference (No vs. Yes)

				Academic Preference			
				No		Yes	
Dependent Variable	*t*	*df*	*p*	*M*	*SD*	*M*	*SD*
Post-test	1.72	131	.088	41.1	14.6	35.0	17.2

Only post-test scores were used in assessment of the following hypothesis because there was no difference between pre-test scores, nor were there any "net gain" scores determined by the post-test minus the pre-test . To assess the null hypothesis that students who show a high level of academic kinesthetic preference will not show a significantly higher ability in grammar than those who did not show a high level of kinesthetic preference, an independent sample *t*-test was conducted to assess if differences existed on the post-test for the treatment group by academic preference (yes vs. no). The results of the *t*-test were not significant, $t\ (131) = 0.52$, $p = .604$, suggesting no statistical mean differences existed for the general preference no ($M = 40.5$, $SD = 15.0$) on post-test compared to the general preference yes ($M = 38.9$, $SD = 15.4$). The result of the Levene's test was not significant, and equal variances can be assumed. The assumption of normality was met for each condition. The researcher failed to reject the

null hypothesis: Students who showed a high level of kinesthetic preference did not increase their grammar post-test scores more significantly than their less-active counterparts. The results of the *t*-test are summarized in Table 8.

Table 8

Independent Sample t-test on Post-test by General Preference (No vs. Yes)

				General Preference			
				No		Yes	
Dependent Variable	*t*	*df*	*p*	*M*	*SD*	*M*	*SD*
Post-test	0.52	131	.604	40.5	15.0	38.9	15.4

To assess the null hypothesis that students who show a high level of academic kinesthetic preference will not show a significantly higher ability in grammar than those who did not show a high level of kinesthetic preference, an independent sample *t*-test was conducted to assess if differences existed on the post-test for the treatment group by academic preference (yes vs. no). The results of the *t*-test were not significant, $t\ (131) = 0.75$, $p = .454$, suggesting no statistical mean differences existed for sports preference no ($M = 47.2$, $SD = 15.2$) on the post-tests compared sports preference yes ($M = 40.4$, $SD = 11.8$). The result of the Levene's test was not significant, and equal variances can be assumed. The assumption of normality was met for each condition. The researcher failed to reject the null hypothesis: Students who showed a high level of kinesthetic preference did not increase their grammar post-test scores more significantly than their less-active counterparts. The results of the *t*-test are summarized in Table 9.

Table 9

Independent Sample t-test on Post-test by Sports Preference (No vs. Yes)

				Sports Preference			
				No		Yes	
Dependent Variable	*t*	*df*	*p*	*M*	*SD*	*M*	*SD*
Post-test	0.75	131	.454	47.2	15.2	40.4	11.8

Qualitative Results

To assess the fourth hypothesis that there will be no difference between student affect within the control group and treatment group, qualitative measures will be used. As part of the research gathering process, the seven teachers in this study agreed to keep a teacher log and made notes of their teaching experiences. They recorded: the date, start and stop times, the class period, absentee students, the brief assignment, and their personal observations. The dates were recorded to ensure that the entire study did not exceed a five-week time frame. The start and stop times verify that the lessons were approximately fifteen minutes each day. Both the dates and times of the lessons served to protect the integrity of the study because they ensured that students received the same grammar element in the same incremental time for both groups. The other categories were for basic organization; however, the teacher observations were used as a qualitative measure. The observations were charted and coded in order to glean more detail about the methodologies in the classroom.

First the original text was transferred into an electronic version by listing each grammar element and each teacher's name under the element. This was done for every element and teacher. Teacher comments were coded (in italics for kinesthetic teachers and regular font for the traditional teachers.) Next, all positive comments for either group were highlighted red, neutral comments were coded black and negative comments were coded blue. After reading the notes several times to code them red, black or blue, the researcher reread the script, recoded the work and then noted emergent patterns. The recounting and recoding prevented as much researcher bias as possible.

Discussion and Analysis of Instructor Logs

The instructor responses showed that the grammar lessons were taught in accordance with the teaching directions. According to the log comments and the interaction with these teachers on a weekly basis, one can say with high confidence that the teachers taught the appropriate grammar instruction for their control or treatment group.

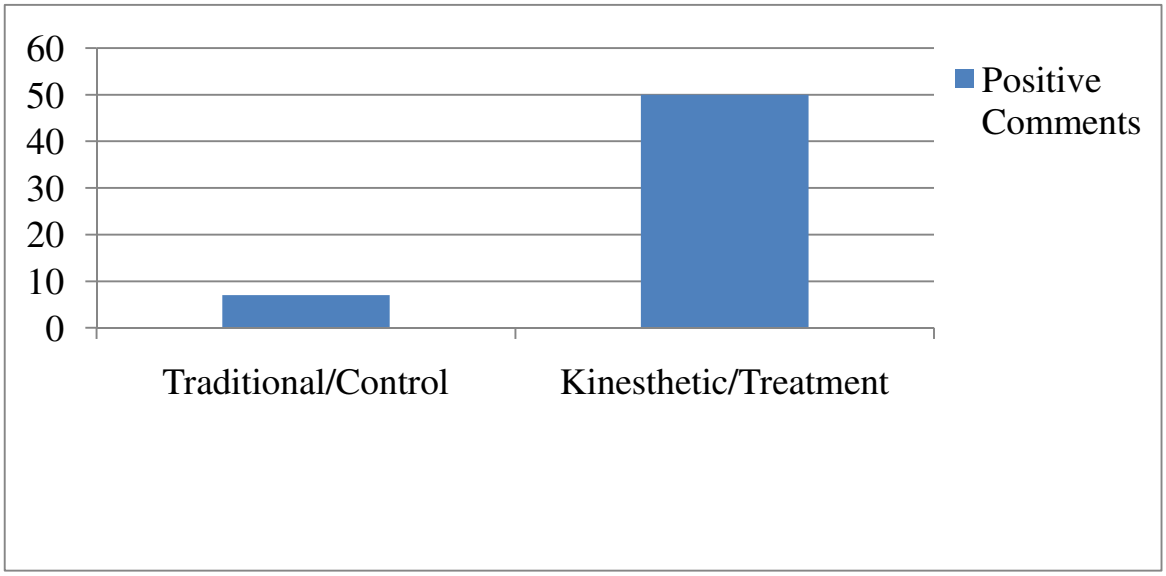
According to instructor log notes and comments, lack of student motivation at the end of the school year played a reoccurring role in the success of the lesson plans. Two kinesthetic teachers noted: "the students were sluggish and slow to move" or that the "students were tired of school." Others jointly noted that "the end of school year" and the overall tiredness of students may have an influence on the students' behavior. There were two questions from students who wanted to know if the assignment would be graded, which revealed more concern about grades than focus on comprehension.

Beyond these comments, a rich base of data emerged into four main areas. These areas were used to assess the null hypothesis that there will be no difference between

student affect within the control group and the treatment group. These groupings were initially established after reading the color coded data and counting the results. The resultant numbers were counted and recounted a total of three times to ensure accuracy and fully establish the terminology that defined each group. The groups were analyzed according to comments that revealed: overall positive results, evidence of learning, overall negative results, and positive student affect.

Comments that specified an overall positive classroom experience included phrases such as: "The students volunteered well." "Great activity!" During the kinesthetic lesson, there were fifty positive comments, and the traditional instruction gained seven positive comments.

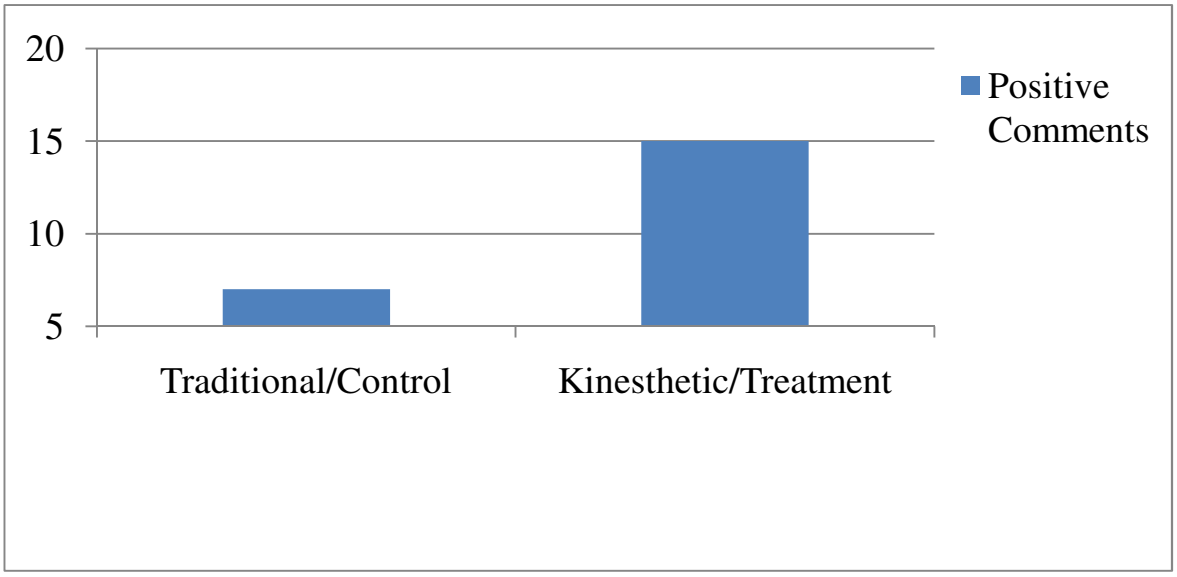
Figure 5. Frequencies for Group for Positive Classroom Experience



While student affect and the classroom atmosphere are significant factors in a lesson, the most important aspect is to verify that students are learning. Comments that suggested evidence of learning include such as: students "profited from this activity"…"were engaged"… and "caught on." During the kinesthetic lesson, there were

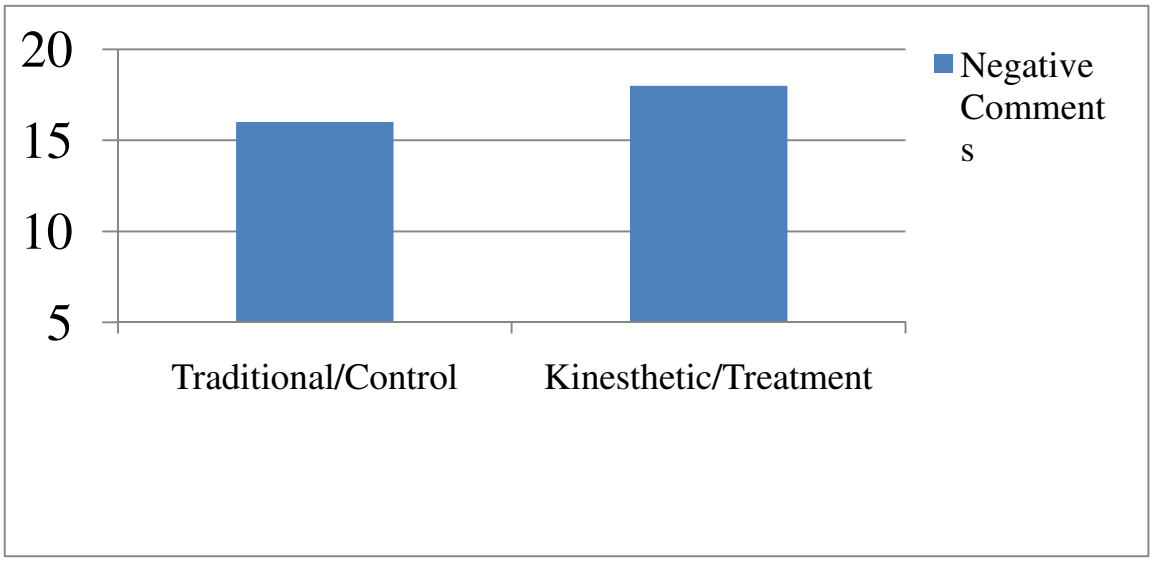
fifteen positive comments overall and the traditional instruction gained seven positive comments about the learning process.

Figure 6. Frequencies for Group for Evidence of Student Learning



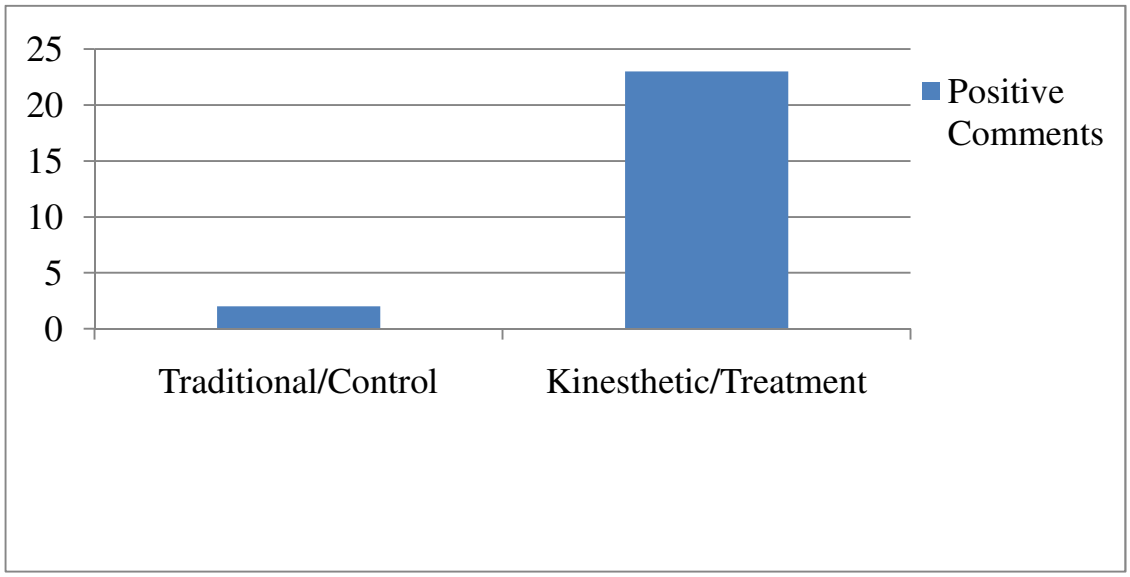
As is common with most any educational experience, there were also moments of uncertainty and lack of enthusiasm among the students. These experiences were coded as having a negative student affect. Some examples of these are: "Students worked quietly and sullenly." "One student asks to do a kinesthetic activity- she has heard about it from another class. Only two students seem completely lost. One student slept." These comments were classified as overall negative comments. They were evident in both the traditional and control groups throughout the study. During the kinesthetic lesson, there were eighteen comments and sixteen comments during traditional instruction. Of the four criteria, this one is the only instance that the kinesthetic approach did not receive the most positive results.

Figure 7. Frequencies for Group for Negative Classroom Experience



One large set of kinesthetic data revealed positive student affect. These include key phrases that focus on student behavior during the grammar lesson. Some examples of positive results are: “Students had fun”… “liked”… “wanted to do more”...or “enjoyed the activity.” During the kinesthetic lesson, there were twenty-three positive comments, while the traditional instruction only gained two positive comments. Due to these results, the researcher rejected the null hypothesis: There will be no difference between student affect within the control group and the treatment group. While the results on the post test were not statistically significant, the kinesthetic instruction appeared to be the most popular and was more enjoyable for the student as evidenced in log notes.

Figure 8. Frequencies for Group for Positive Student Affect



CHAPTER V: DISCUSSION OF THE RESULTS AND FUTURE IMPLICATIONS

Why Was the Treatment in This Study Ineffective in Increasing Scores on Grammar Tests?

Outside of the teacher log results, statistical significance did not exist. There were several possibilities as to why treatment was ineffective. The length of the study was only five weeks, and more significant increases may have been apparent if the students had received more time with each of the grammar elements. Berger (2006) has suggested working with a grammar model that allows more time, at least two years, for student understanding and practice longitudinally. Another limitation of the study was make-up work and absenteeism. Students in the kinesthetic group could not simply collect the makeup work and take it with them as easily as the control group. The missed kinesthetic activities could be explained, but the kinesthetic experience could not be as easily recreated as the traditional exercises. Also, there were multiple teachers involved in this study. Even though instructions and training were provided, each teacher had a unique method for teaching and interacting with students. Not only were the teacher researchers aware of the research, but the students were also aware of the study due to permission forms. Ideally, the study would be double blind in nature. Unknown factors about the brain and the degree of movement necessary for significant learning may also be causes for the lack of statistical significance.

Minority Student Affect During Grammar Instruction

Some students may subconsciously resist Standard American English (SAE) as it is expressed in grammar instruction because it contradicts their own dialect. Fox (1997)

has stated that SAE may appear to be elitist because it privileges the academically, socially, or politically powerful. The teacher focus on error correction when teaching grammar may create a negative effect on less skilled students. Particularly the students who use non-mainstream dialects, because of the rejection of speech and writing patterns that differ too widely from the standard. To add further agitation, Chomsky (1957), as well as other psychologists, have concurred that language patterns begin to develop in children before they are five years old through interaction with the people around them. Since initial language development is learned from one's homelife, caregivers, siblings, and other childhood encounters, the rejection of this primary dialect may threaten or offend learners. Learning SAE spotlights negative connotations due to the rejection of the home langauge of a student. Error correction of SAE grammar may create negative reactions for this reason. Fox (1997) noted that, up until this disconnect between home and school, students have seen their parents as the most reliable models. Heshusius (1998) termed the steady lack of student progress "resistance theory." He argued that students actively resist situations that "they find threatening, boring, or otherwise intolerable" (p.409). Clearly, the juxtaposition between a student's innate home language and the rigidity of SAE associated with grammar drills can create a sense of threat, shape an attitude of resistance, and act as a constraint on improvement.

The Unknown Factors about Movement and the Brain

While technological advances allow neurologists to view images of the brain and to observe specific times and causes of activation, Willis (2007) stated that brain activiation may not translate into learning. Simply noting how the brain responds, activates, or metabolizes oxygen or glucose in brain scans does not directly translate into

the educational terminology of learning. Furthermore, activation does not prove causation of learning. One reason for this, as previously stated, is the disconnect between the neurological and educational vocabularies.

The direct incorporation of movement into the grammar exercises determined if and how movement affects learning. Previous studies have been done using repeated movements, such as bouncing a ball. The movement was constant, but it was not necessarily related to the mathematical problems the students were solving (Fife, 2003). However, this present study was designed to incorporate movement into what the students were already doing, rather than adding an outside, unrelated motion. Neither study was proven to be significant, even though student motivation increased in both. While the results were not significant, a closer definition of movement and its incorporation into the lesson plan should continue to evolve in new studies.

Strick, Dum, and Fiez (2009) have shown that the cerebellum is activated during movement and during the movement of thought. However, parallel activation (as seen in brain images from neurological tests for both processes) does not produce evidence in itself that movement increases learning though they both rely on the same neurological hardware. The word “learning” is an educational term and cannot be proven just because dendrites are increasing or anatomical structures are shown as activated on brain scans (Verma, McCandless, & Schwartz, 2008). The fact that the cerebellum has the ability to dually process thought and movement does not directly correlate brain activation and learning, even though numerous people from across disciplines have presented the same reoccurring trends. For instance, Calvin and Ojemann (1994) have shared that, when patients cannot use their bodies due to impairment, in similar fashion, the cerebellum and

its circuitry throughout the brain are less effective and reflect the lack of movement in the rest of the body. However, one still cannot delineate how this example of mind-body connection directly shows that the movement of the body and movement of the mental process work in unity.

Necessary Clarification of the Term "Movement"

Another concern is the origin of the student movement, or the lack thereof. When student movement is a result of teacher direction rather than spontaneous in origin, the brain process may differ significantly enough to influence student retention. The movement may be more significant if it were student motivated and generated. Kelly (2009) has argued that kinesthetic learning may depend on the movement being from natural discovery, rather than being coerced. The learners have kinesthetic realizations through doing, as opposed to having thought first before initiating action. Spontaneous movement would seemingly draw on regions of the brain different than those movements commanded or required by the teacher.

The number and intensity of repetitions, length of time, and the frequency of student activity should also be considered alongside the type of movement chosen for the activity. Many times, educators are encouraged to incorporate multiple learning styles, such as kinesthetic, into lesson plans, but the type, frequency, and length of the activity and the ties with the overall unit of study are left unspecified. Believers in brain-based education have stated that the repetition of an activity led to the growth of brain cells, axons, dendrites, and connecting neurons and the myelination of all of the above (Corbin, 2008; Jensen, 2008; Feinstein, 2007; Goswani, 2004). The proper number of repetitions is vague and most likely changes for subject matter and age groups, but a generalization

should be determined in future brain-based research, as it pertains to the way the brain forms. Jensen (2008) has suggested multiple, short, (even two-minute) activities throughout the lesson to increase oxygen to the brain, which is neccesary for learning.

Not only is the incorporation of movement important for all age groups, but the movement's origin, frequency and type are parts of the optimal outcome puzzle. Hannaford (1995), neurobiologist, educator and Brain Gym practioner, has also stated that the movement should occur in short breaks throughout the class time, and should be composed of crosslateral movements and in conjunction with a high volume of water intake. She explained that the vestibular system induces the reticular activating system which coordinates and refines movements, helps one keep balance, and is the crux of the attentional system. She warned that, when students do not move and activate the vestibular system, they were not gathering information from their direct surroundings. She recommended that the best movements incorporate cross lateral patterns across the body to activate the corpus callosum (p. 81). The repetition of the cross-over pattern, which causes the student to reach from one side to another, also activates all four lobes and both hemispheres and increases overall cognitive function. Overall, movement makes the most substantial impact when it is student generated, repeated for short amounts of time throughout the lesson, and involves the limbic system and corpus callosum.

General Limitations in Application of Brain-based Principles and Educational Theory

With the popularity of neurological findings and the application to education increasing, skeptics have concluded that neurological findings had been oversimplified and used inappropriately. Hung (2003) has stated that, though he is a supporter of neuroscience, "one must be careful drawing implications from neuroscience into

pedagogy; however, it would suggest that some of these pedagogical approaches are seemingly in the appropriate direction" (p. 40). Neuroscientists have admitted that their findings do not have a resounding affect on educational practices, even though more progressive and process-oriented teachers are moving in that direction. In short, brain-based research not the same as educational research based on goals, learning schema, or theory. The main contention is that theories of neuroscience cannot be confidently incorporated into education without empirical data for support (Bruer, 1997; Bergen, 2002; *A Challenge to Brain-based Educators*, 1999). Verma, McCandless, and Schwartz (2008) have stated that education is not neuroscience. They expounded on the scientific and pragmatic concerns about connecting neuroscience and education. Scientific concerns include contextual problems; the fact that localizing brain function does not neccesarily inform educational design; the reductionism and fine details of neuroscience are inappropriate for educational instruction; and the incapatibilities between the mental terms in education, such as *understanding,* and the material words in neuroscience, such as *white matter*. Pragmatic concerns include the fact that cost-benefit analysis does not support the highly technical procedures and costs of using neuroscientific equipment; the lack of procedures designed especially for educational purposes or their interpretation; and the reoccurance of neuroscientific facts later being revealed as neuromyths and then, unfortunately, into neuromarketing.

Additionally, while the process of synapotogenisis is valid, there is no evidence that the increase in synaptic density is empirically linked to improved learning. Bruer (1997) also claimed that there are significant gaps between research and application. Solid peer review of brain research is valuable, but it must be applied to the realm of

education with caution. The findings of neuroscience can determine how the brain metabolizes oxygen and glucose, but they cannot empirically link the metabolism to learning (Willis, 2007).

Other concerns have involved that fact that extensive brain studies are usually only conducted on people with neurological problems or concerns. Past findings have been limited to animal studies and therefore cannot be assumed true for humans. Animals are less complex and are less flexible in their behavior choices, and their actions cannot be directly interpreted to be human-like in response. Educational studies that have included children are often summarized in regards to the whole population, whereas the actual number of students was very small, or the same children have been used in multiple tests. This type of research may be valid, but it must be used with caution (Byrnes & Fox, 1999; Corrie, 2000; Willingham, 2008).

While these concerns arise, the call for the collaboration between these two disciplines is further defined. While educators and neuroscientists must be cautious in optimism, they must also recognize their role in collaboration. Verma (2008) has stated that educators should take a leading role in providing guidance on future brain-based research. Years of curriculum study and practice have influenced the understanding of the learning process. The same caution should be exercised in the study of neuroscience as well. Without the cooperation of teacher findings and experience, neuroscientists may run experiments of little value to academia. These researchers also warn that "the payoff of educational neuroscience will likely be modest for the first generation of collaborators" (p. 150). The results of truly multidisciplinary success likely awaits those of the next generation.

The Importance of Positive Instructor Feedback

In this study, teacher log notes revealed a positive effect on student attitude during the kinesthetic instruction. However, the crux of this research was to determine, via empirical evidence, the results of applying direct incorporation of movement into an academic subject, rather than to simply trust what appears to work well. Numerous studies already allude to the sense of success that the incorporation of brain-based research induces. The effort behind the specifics of this research was to quantitatively assess a brain-based principle by student assessment, not merely echo claims of heightened student morale. However, the qualitative research showed that students enjoyed learning more through the incorporation of movement and cannot be overlooked.

Grammar Instruction Conflict

As discussed in previous chapters, past critics attempted to set a standard against all grammar instruction. However, the need for a basic understanding of the essential element still persisted. The lack of increase of improvement in both the traditional and kinesthetic groups may not have been a result of the grammar study, but of the isolated nature by which it was employed. Even though the movement may have been helpful, the isolated nature of the activity may have overridden the postive effects of the movement incorporation. It is possible some principles in brain-based theory have more strength or power than others. One neccesary improvement for the future is an evaluation of the strength of the principles at work, rather than a generalized list, such as the one provided by Caine (2007).

Constraints

Student Population

Due to the school system requirements, students had to gain permission from their parents to participate in the study. A total of fifteen students could not complete the study due to lack of parental permission, change of location, out of school suspension, failure to make up work in a timely manner, or an accident resulting in homebound instruction. One teacher in the study was unable to complete the study, and his classes (serving in the control group) had to be withdrawn from the results. Therefore, the accompanying treatment group data were also compromised. While the twelfth grade was not included in this study, the results of the 9-11 grade levels were consistently inconclusive. Also, 277 students were included in the study, and the satisfaction of this number for statistical analysis has already been discussed.

Research Timing

As teachers were turning in their post-tests, several mentioned that they did not think their students had done well due to increased anticipation at the end of the school year. Even though they assured students that the test was for a grade, they noticed a lack of student effort and focus in general toward the end of the year. This is a common concern expressed among teachers after students return from spring break and leave for summer.

The Kinesthetic Activities

While the kinesthetic activities were validated by the experts in the field and produced positive qualitative results, the design of the activities may have affected the end result. If a more formal, evidence-based approach had been available, the researcher

would have used it. The creation of the kinesthetic activities by the researcher was a purposeful attempt to analyze as aspect of brain-based learning theory in relatively new area.

Survey Results

The Survey

Students completed the survey and were categorized according to those results. Students may or may not have possessed the ability to complete the survey objectively, particularly due to the lack of prefrontal cortex development. A bias may have existed due to the subjective nature of the survey. Students were asked to assess themselves and may have been inaccurate. In addition, resultant categories may not have been sufficient, particularly the Academic Preference, as many students admitted that they do not study or had no preference. Possible student unawareness of personal tendencies may not have allowed for fully accurate analysis in this area.

Survey Results: Interpretation of Gaps in Lack of Achievement of the Musically Inclined Students

Students who were categorized as musically inclined due to the survey results did not have higher achievement on the research assessment. Researchers such as Demorest and Morrison (2000) and Wilcox (2000) have concluded that, since 1919, educators have claimed that there is a strong connection between music instruction and academic success across the school curricula. However, one recurring limitation is the type of person who is naturally musically inclined. One cannot determine if this success speaks of the music experience or the type of students who are drawn to music. Again, correlation between activities cannot be drawn without first assessing the dispositions of the students who are

involved. Perhaps one could separate the two by determining if the length of artistic experience had a direct link to the outcome of test scores. Viadero (1998) has stated that various research results still contradict one another in basic findings. For example, studies have shown an achievement increase; however, the increase was not permanent, but rather faded after an hour. Wilcox (2000) also agreed, after a longitudinal study, that improvement lasts only as long as musical instruction consistently continues. Even after a year of training, long-term benefits continued to decline if instruction ceased. Due to the varied results of how long the benefits of music participation last, a gap exists in the role music plays in achievement of the students.

Neurological findings may accent what educators have found—inconsistency. One reason why student grammar post-test scores did not significantly increase for those who are musically inclined may be due to a recent discovery by researchers at Georgetown University Medical Center. They have determined that the memories of music and of language have similarities, as well as anatomical proximity, but the underlying rules of music and language do not overlap, but are two separate processes. Separating familiar songs and sentences from deviant (unfamiliar or incorrect examples) caused this inconsistency to surface (Georgetown University Medical Center, 2007). While a plethora of information exists about the neurological workings of music and its connection to other cognitive processes, one may have to agree with Reimer (2004) who claimed that brain research today is at best a “hodgepodge- as provocative, puzzling, astute, clever, courageous, and easily misinterpreted” as popularizations are witnessed and advocacy attempts are unwarranted and unestablished.

Survey Results: Interpretation of Lack of Achievement of the Athletically Inclined (Sports) Students

The lack of improvement on the grammar post-test scores was in contrast to the previous findings. The physically active participants in this study did not show a significant increase in grammar learning. The lack of relationship between physical activity and academics may be a result of several things.

Dollman, Boshoff, and Dodd (2006) investigated the relationship between physical education time and its relationship to literacy and numeracy scores in over 100 primary schools in southern Australia. Using a regression model and assessing various demographics such as background of speaking English, geographic location, and staff age and ability, there was no significance between physical education class time and student achievement. They were determined to be unrelated; however, there was neither any conclusive evidence that physical education caused a disadvantage to academic achievement.

However, more pertinent, perhaps the students who always were physically active were indeed working more toward academic excellence. Perhaps the survey results would have correlated more if a student only began being physically active due to the study. Since they were already physically active, they may have already achieved a high score due to participation. The high score did not necessarily increase due to the same level of activity; it merely maintained the previous ability. Scores did not show statistical significance.

Research Instructors and Participants

As stated earlier, the study would ideally be double blind in nature; however, teachers agreed to participate in the study. While the teachers did not know everything about the study, they were aware of the nature of it. While teacher neutrality was emphasized, it could not be quantified and may be considered a constraint. The various instructors, their teaching experiences, and their perception of the grammar lessons may have influenced the success of the instruction. Also, the researcher was involved in the study, but only as an instructor in the control group. At the end of the study, the students were given a post-test, which was similar in nature to the pre-test. However, unlike the control group, the treatment group received instruction kinesthetically. The major difference was that, after the varied instruction, both groups received the same type of post-test. The treatment group was asked to perform on a written post-test, not a kinesthetic one.

A hierarchy of the brain-based principles is arranged by increasing potential for student success. Even while the guiding principles may not be proven, they are not harmful for students, and the recurring theme is an increase in student motivation, regardless of age or subject matter.

Grammar Instruction in Coordination with Brain-Based Principles

Due to the lack of improvement by both the control and treatment group of the isolated grammar drills, perhaps the lense of grammar instruction should be altogether transformed. Considering Chomsky's findings (1957) about the innate nature of the human ability to create and understand grammatical structures from early childhood, a better means of grammar instruction may be more appropriate. One may not need to

know all of the prescribed grammar rules to increase in complexity of thought, dialogue, or writing. The recognition that students acquire language naturally, with little to no education in grammar structure, leads one to believe that students may thrive more in a language-rich environment. The following examples represent some of the most popular teaching methodologies outside of the rote memorization of the grammar elements, since the the previous methodology was unsuccessful. In light of these results, other methods of grammar instruction have been included. These models are based on writing, and the application of mobility annd other brain-based tendencies are explained.The format of instruction is explained first, followed by the the alignment with brain-based tendencies, and finally the differentiation for movement inclusion is delineated.

Other Models for Grammar Instruction

Due to the lack of improvement by both the control and treatment group of the isolated grammar drills, other ways of teaching grammar are included and ways to incorporate mobility into the classroom are included, due to the positive student affect results from the study.

Of the grammar instructional practices available, the most popular, current methodologies are discussed through the lens of brain-based application. Noguchi (1991) was one of the first to suggest that grammar be taught in small increments, as need arose in writing. To strengthen his instructional technique, he also allowed flexibility in the operational grammar descriptions, which put less focus on error. The lack of focus on error may take away initial feelings of threat or stress and increase student motivation. Also, the incorporation of grammar instruction into the revision or editing stages allows students to see the relevence of grammar knowledge to their own writing. Hillocks (1986)

agrees that writing practice with different sentence types of complexity is the best way to improve student understanding of grammar through sentence variety. Corbin (2008), Jensen (2008), and Caine and Caine (1990) all agreed with popular brain-based research that states that learning is improved by challenge, but is inhibited by threat. Teaching grammar through writing, rather than in isoloation aligns with other natural tendencies of the brain, beyond the role of cerebellum activation.

Berger (2006) has suggested that working with a grammar model allows more for student understanding and practice longitudinally. The grammar study focuses on one complex grammar element per month, for two years. Again, she suggests this study within the context of writing- not isolated grammar element identification. As some grammar terminology surfaces during the writing process, students grow familiar with it due to the two-year immersion. Shoudong and Powers (2005), in agreement with Berger and others, found an increase in grammar understanding in both the short-term and long-term assessment of their students' writing due to teaching "mini-lessons" throughout the writing process. Additionally, they recommended a model of student writing, analysis by the teacher of predominate errors, and a mini-lesson, followed by rewriting, revision, and editing by the student. Smith (2000) agreed, but termed the most productive ideas as scaffolding and getting students to do what real writers do—write and rewrite. The writing process allows students to internalize the rules of the language through repetitive use of the language.

These previous methods were not based solely on brain-based theory, but they incorporate it nontheless. Hutchinson, McCavitt, Rude, and Vallow (2002) have stated that the learning process should also be engaging. They used a grammar program called

The Shurley Method that covered introductory grammar and composition. Again, grammar is taught within the scope of composition. The combination of visual, verbal, and written activity incorporated different learning styles to help students, due to different modes of delivery. Nunan (2005) used her experience with brain research and grammar to support this type of instruction. She also stressed the use of other tendencies that align with brain-based research such as using novel techniques, incorporating laughter, repetition, and the use of multiple contexts to learn the same material. The repetition is said to myliniate brain pathways, and repetiton through multiple contexts creates an opportunity for several different complete memory pathways to solidify. While the students in the treatment group did not empiricially learn more than the control group, the treatment group did respond to the grammar exercises with a more positive attitude and motivation. These teaching methods that rely on multiple vehicles of explaination, analysis and revision capitalize on repetition and the formation of multiple pathways of learning and memory in the neural system.

Current Alignment with Brain-Based Tendencies and Movement

The longitudinal process previously discussed should be instituted to increase exposure. Instead of a short window of time, the students should have more time to learn and apply essential elements of grammar. The mini-lessons are also beneficial as they align with the theory that the brain adheres to attention span cycles and that the students' best span of focus is approximately 20-30 minutes (Jensen 2008). By adding a movement component here, after each mini-lesson, the motion may refresh the brain hardware, somewhat similarly to how people stretch their muscles after a physical workout. Incorporation of breaks may improve efficiency of the instruction and practice

time, rather than waste time as seems to be a predominate belief. Even from this study, student affect increased due to the incorporation of movement into the lessons.

Another way to employ movements that are specific to brain activation is to practice those explained in the Brain Gym. Dennison and Dennison (1994) explained these movements as including a sampling of drills such as brain buttons, cross crawls, hook ups and lazy 8s, etc. Many of these are geared toward corpus callosum and hemisphere activation. They are designed to stimulate carotid arteries to the brain to increase blood flow, stimulate tactile awareness, improve eye movement and coordination, and require the occipital and temporal lobes to engage, among other brain-related system activations throughout the body. Hannaford (1995) has stated that this is a fine-tuned mind/body system that assists in global learning and is also simple, inexpensive, drug free, and highly effective (p. 131). Taking a short time to incorporate this type of activity before, during, or after a mini-lesson may improve brain functioning and memory and increase morale simultaneously.

Another simple way to easier incorporate movement throughout the grammar lesson plan is to create sporadic opportunities to move throughout the class time. One example is to use stations for each component. Rather than having students sit the entire period and copy modeling notes from the overhead, then write, then have a mini lesson, and then edit, each component could be isolated to a station. Allowing student groups to move between stations to gather the information allows for a movement break. This concept need not be limited to grammar instruction, for it is applicable to various situations. Any activity that requires students to break away from their daily eight-hour desk confinement would be welcome in the mind of the recipients. Whether the activity

includes stations, performance, or using tactile objects to perform a task (such as a spelling competition with actual cards to be identified in the air by participants in competition), there are simple ways to incorporate movement into the classroom. While the most productive method has not been found, recurring student response has been positive, and teachers owe them a continual refining of this application.

The movement principle aligns with brain-based theory, multiple intelligences, Vygotsky's theory of plan, and, lastly, common sense. Teachers do not spend the entire day at their desks—they are moving throughout the classroom teaching. If teachers were confined to their desks, could they be as effective? However, students are expected to be productive learners but are offered few opportunities to do something. Without the ability to move, they are asked to learn within the confines of a desk for years. Even while the specific movement in this study was inconclusive, the need to find the most productive application of this opportunity still exists.

Contributions to Existing Knowledge

Historically, John Dewey stated that learning was active and that students learned as a result of direct activities. The theory that one learns through interaction, action, and reflection is prominent (Dewey, 1938). Piaget and Inhelder (1969) likewise determined that knowledge was built on the experience of the learner and is best as a direct experience. The previous theories increased momentum with Vygotsky's illustrations of learning not rooted in the subject or an outside object,but the interaction of the two. Vygotsky's activity theory assumed that learners used both cognitive processes in coordination with their bodies and within the context of the world, and the world's symbolic representations (1978). The idea of learning through doing agrees with to the

neurological theory about movement. In accordance with Verma (2008), this research contributes to the first generation of knowledge that bridges education and neuroscience.

In this dissertation research, the researcher built on foundational educational theories through the lens of its contemporary offshoot—brain-based education. This research has shown that grammar instruction is an essential component of study; however, the model of instruction still needs improvement. While the qualitative results supported the incorporation of the brain-based movement due to student affect, a more structured framework is neccesary for fruitful results. Though the research did not produce signficant results regarding movement and learning, the researcher was able to compile a variety of instructional models for teaching grammar and their ties to brain-based findings and possible future applications. Furthermore, the researcher has shown that brain-based research is a process still under construction, rather than to be accepted as fact. A wise start for educators is to read journal articles from neuroscientists, educational psychologists, and cognitive psychologists to get more accurate findings, rather than to purchase brain-based curricula with no working knowledge of the viability of the vendor's claims (Bergen, 2002). Using the previous instructional examples, as well as incorporating of some type of movement opportunity may be a springboard to increase learning. One must note that the students in this study who learned kinesthetically did not do any worse than the traditional learners; however, the kinesthetic learners did enjoy the learning experience better. Due to the positive student affect and neurological findings, one should still incorporate movement into the classroom lesson plans (Emand & Fraser, 2000).

Further Research

Further research includes a deeper analysis of the incorporation of movement to learn. In this study, and in others cited in the literature review, one must note the reoccurrence of the increased student motivation due to movement. In future studies, more specific student feedback through interviews and transcriptions may show even more meaningful findings than simply the teachers' observation of the students.

While rote memory did not increase significantly in this study or in others from the literature review, perhaps activities that require higher level thought processing would increase. One may argue that perhaps the lack of significant increase of learning may be a result of the linear nature of the facts, which is not the natural tendency that the brain acquires information. This premise may outweigh the fact that the brain was activated through movement. Further research would not only include truths about how the brain functions in general, but should result in a hierarchy of the most effective premises in order of importance.

As a result of the study, further research is needed in the area of grammar instruction. There was no statistical difference between the pre- or post-test scores at the beginning or end of the study. Clearly, classroom time should be used more effectively. Some researchers suggested using a writing model to assess grammar; however, an efficient way to do this has not been delineated. One main drawback is the sheer workload teachers face when grading multiple essays from several classes, many of which are at full student capacity. Clearly, the effort to simply grade the grammar facts is an ineffective solution, no matter how efficient it may be. So, the lingering question

remains, “How should one effectively teach grammar?” One area for future analysis is the inclusion of grammar instruction through writing and productive assessment.

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APPENDIX A: Permissions Forms

Consent Form

Dear Parent(s)/Guardian(s) of _____,

As you may be aware, I am currently pursuing my doctoral degree from Liberty University. One requirement of this objective is to complete my dissertation on the topic of the use of kinesthetic movement in the classroom in the learning of grammar. This four week study will be conducted across the English department in order to gather information at each grade level.

I am asking parents and students for permission to gather data from class pre and post scores on a grammar skills assessment. I am also asking that students participate in a brief learning style survey that helps identify preferred learning methodology. The data I gather will have no undue effect on your student, our school, or class instructional time. The identity of our school and students will be protected and all information will be anonymous in the final research report, or additional presentations in the future.

Only data from students who are present for the entire length of the study and who, along with their parents, give consent will be eligible for evaluation. There will be no negative consequences for students whose parents choose not to allow them to participate. Furthermore, students may opt out of the study at any time without negative consequences. Please discuss this with your student and check the appropriate line below. Please sign and date the bottom of the form. Thank you for your consideration of this matter.

Sincerely,

Patrice Pennington, English Teacher

____ My student and I give permission for his/her data to be used in Mrs. Patrice Pennington's dissertation research. My student and I understand that the data will remain confidential. My student is eligible to participate in a learning style survey. I understand that this data may be used at conferences and in presentations without the use of my student's name or the name of the school that he/she attends.

____ I prefer not to give permission for my student's data to be used in research. My child and I understand that he/she will not be penalized in any way because of this choice.

Student Signature_____ Parent Signature_____

Please feel free to contact me at patrice.pennington@xxxxxxx.com with any questions. Also, you may contact my committee chair, Dr. Carol Mowen (cmowen@liberty.edu), at Liberty University if you any questions or concerns about this.

Research Proposal Approval/Denial Form
County School System

February 17, 2009

Your research proposal entitled ***"BRAIN-BASED CLAIMS AND THE USE OF MOVEMENT TO LEARN: A COMPARISON OF KINESTHETIC/TACTILE AND TRADITIONAL INSTRUCTION ON GRAMMAR SHORT TERM MEMORIZATION IN SECONDARY EDUCATION"*** has been reviewed by a committee of County administrators. The committee has agreed on the decision as indicted below. Please contact Dr. Assistant Superintendent at the County Central Office if you have any questions about this decision.

___X___ Proposal Approved

_____ Proposal Denied

_____ Proposal Approved with Stipulations

Comments/Explanations:

County Permission

Internal Review Board (IRB) Permission

IRB Approval 659.012209: Brain-bases Claims and the Use of Movement to Learn: A Comparison of Kinesthetic/Tactile ad Traditional Instruction on Grammar Short-term Memorization in Secondary Education

Dear Patrice,

We are pleased to inform you that your above study has been approved by the Liberty IRB. This approval is extended to you for one year. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. Attached you'll find the forms for those cases.

Thank you for your cooperation with the IRB and we wish you well with your research project. We will be glad to send you a written memo from the Liberty IRB, as needed, upon request.

Sincerely,

Fernando Garzon, Psy.D.

IRB Chair, Liberty University

Center for Counseling and Family Studies Liberty University

Holt McDougal

Dear Mrs. Pennington,

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This is the acknowledgement I prefer:

To purchase any of these resources (above) you can use a personal check/cheque, an institutional Purchase Order or buy from our secure website with your credit card.

Best wishes for your work.

Neil

Neil Fleming

Designer of the VARK Questionnaire

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New Zealand

www.vark-learn.com

phone: (64) 3 3517798

Jadantics

From: angela malicki [mailto:amalicki@foreverlearning.com]

Sent: Friday, February 13, 2009 11:44 AM

To: Pennington, Patrice

Subject: RE: permission

Patrice,

I would be pleased if used Jadantics in your dissertation work. I thought I might explain the name. The character icons in our parts of speech series each represent a part of speech and have shapes associated with them. The ADJective is JAD, and the shape of adjectives is rectangular like his petals.

If you don't mind my asking, how did you hear about GrammarActive?

Best of luck with your work,

Angela

APPENDIX B: Assessment Instruments

Grammar Pre-test

The following pre-test is modified from *Elements of Writing: Language Skill: Practice and Assessment.*

Part I: The following sentences contain italicized words. On the lines provided, identify the part of speech of each word. Use the following abbreviations: **N** for noun, **P** for pronoun, **A** for adjective, **V** for verb, **AD** for adverb, **PR** for preposition, **C** for conjunction, and **I** for interjection.

While yet an obscure young [1] _____ *writer*, Robert Louis Stevenson traveled the world. His [2] _____ *account* of his trip was his [3] _____ *first* book, *An Inland Voyage*. Although Stevenson wrote a number of things, he is probably best remembered [4] _____ *for* the works that children love. *Treasure Island, Kidnapped*, and *A Child's Garden of Verses* have been [5] _____ *popular* since they were first published. Stevenson, who [6] _____*became* a writer after studying engineering and law, suffered [7] _____*from* ill health all his life. He searched for a healthful climate. [8] _____*Eventually*, [9] _____ *he* settled in the South Seas, on the island of Samoa. [10] _____ *There* the natives [11] _____ *revered* him; they called him *Tusitala*, which means "teller of tales." Stevenson died in Samoa [12] _____ *at* the age of forty-four.

At [13] _____ *his* request, he was buried high on a Samoan mountain. His famous poem "Requiem," [14] _____ *which* is inscribed on his tomb, ends: "Home is the sailor, home from the sea, / [15] _____ *And* the hunter, home from the hill. [16] _____ "*Oh*," said the girl, "He is such a wonderful writer that the memory of his work will

never [17] _____ *die*." His [18] _____ *heartfelt* poem will change [19] _____ *lives* [20] _____ *indefinitely*.

Part II: In the following sentences, a complement is italicized. On the line provided, indicate what type of compliment it is. Use these abbreviations: **PA** for predicate adjective, **PN** for predicate nominative, **DO** for direct object, and **IO** for indirect object.

_____21. Almost every high school class contains *students* who "can't sing."

_____22. They are *people* who sing off-key or who do not try to sing at all.

_____23. Some of them are *unhappy* about their musical shortcoming; others don't care.

_____24. "Tone-deaf" and "monotone" are *terms* sometimes applied to people.

_____25. Actually, neither one of these terms is quite *correct*.

_____26. People who cannot carry a tune usually have no *trouble* hearing or speaking.

_____27. They can hear differences in tone, and they can produce *sounds*.

_____28. All that they lack is the *ability* to sense the musical relationship between tones.

_____29. They gave *them* the gift of music.

_____30. A music teacher can teach almost any *nonsinger* the art of singing.

Part III: Each of the following sentences contains a verbal phrase. On the line provided, write what kind of phrase it is. Use of the following abbreviations: **P** for prepositional phrase, **PT** for participle phrase, **G** for gerund phrase, **I** for infinitive phrase and **A** for appositive phrase.

_____31. Frankie enjoyed *rewarding her dog* with a treat after the obedience class.

_____32. We listened to one *of the adventures* of the mysterious, deep-sea scuba diver.

_____33. The city crew trimmed the trees *over the street sign*.

_____34. We felt sad and lonely upon *giving away our family pet*.

_____35. *Dressing for her date*, Gwen listened to her favorite radio station.

_____36. Mrs. Smith, *the teacher*, was kind and compassionate toward others.

_____37. The medical technician came *to draw blood for the tests*.

_____38. I have borrowed some tools *belonging to Mr. Krusell.*

_____39. Ella and Elise asked us *to buy six tickets for the show*.

_____40. The boys, *John, Tom and Chris*, all received football scholarships.

Part IV: Label each of the following sentences as **S** for simple, **CD** for compound, **CX** for complex, or **CDCX** for compound complex.

_____41. After his play received reviews, the director invited the cast to join him.

_____42. The tree obstructed our view of the river, so my parents may cut it down.

_____43. Although the weather was overcast, I refused to cancel the plans that I had made weeks before.

_____44. My cousin, a private investigator, has many exciting stories to tell us at family reunions.

_____45. I understand the premise of your argument, but I cannot agree with your decision.

_____46. After an hour, the children grew restless and asked for permission to leave, one by one.

_____47. Those who try often succeed.

_____48. Not only were the banks closed when I got there, but none of the stores would cash the check that I got from my aunt.

_____49. Unfortunately, I cannot attend the party, but thank you very much for the invitation.

_____50. A major festival in India is the Festival of Lights.

Grammar Post-test

The following pre-test is modified from *Elements of Writing: Language Skill: Practice and Assessment.*

The following sentences contain italicized words. On the lines provided, identify the part of speech of each word. Use the following abbreviations: **N** for noun, **P** for pronoun, **A** for adjective, **V** for verb, **AD** for adverb, **PR** for preposition, **C** for conjunction, and **I** for interjection.

Modern eye-testing devices have been developed [1] _____ *only* [2] _____ *recently*. Ever since we first gazed at night sky, however, [3] _____ *we* have been able to test our vision by looking at a group of [4] _____ *seven* stars called the [5] _____ *Pleiade*s. [6] _____ *On* a clear night, a person with average vision can see five or six of [7] _____ *these* stars. The seventh is visible only to a very keen [8] _____ *pair* of eyes. To [9] _____ *those* of us with poor eyesight, all seven stars are invisible [10] _____ *or* [11] _____ *blur* into luminous patch. My brother was recently out with a friend and was impressed when she pointed at the sky and said, "Look the Pleiades! I can see [12] _____ *six* of [13] _____ *them*." My nearsighted brother admitted that he couldn't see a single star [14] _____ *in* the constellation, and he complimented her on her excellent vision.

[15] _____"*Oh*," said the girl, "I do have good eyes, but I have also spent some time studying astronomy." Ever since [16] _____ *that* night, he [17] _____ *has* become more and more interested in stars. He has [18] _____ *recently* [19]_____*invested* in a new telescope to help him see more constellations. It was a very nice telescope, but [20] _____ *it* was not very expensive.

Part II: In the following sentences, a complement is italicized. On the line provided, indicate what type of complement it is. Use these abbreviations: **PA** for predicate adjective, **PN** for predicate nominative, **DO** for direct object, and **IO** for indirect object.

_____21. At the meeting, Mr. Franklin nominated *Mrs. Franklin* for the position.

_____22. The president almost sold my *father* one of her sketches.

_____23. Andrew was the only *person* out of step in the marching band.

_____24. Do you taste the curry *seasoning* in the chicken salad?

_____25. Before the election, Seri seemed *optimistic* about the debate.

_____26. The captain told us some *tall tales* about his adventures.

_____27. The audience grew *restless* as they waited for the Secretary of State.

_____28. The headquarters for the organization is an office *building*.

_____29. Every summer my grandparents grow *tomatoes* for the neighbors.

_____30. The first prize was a *trip* to Hawaii and a new car.

Part III: Each of the following sentences contains a verbal phrase. On the line provided, write what kind of phrase it is. Use of the following abbreviations: **P** for prepositional phrase, **PT** for participle phrase, **G** for gerund phrase, **I** for infinitive phrase and **A** for appositive phrase.

_____31. We know that *practicing musical instruments* increases one's ability.

_____32. The Strauss family produced four composers *during the nineteenth century*.

_____33. The Bachs, *the best-known musical family of all time*, loved music.

_____34. Johann Sebastian Bach*, the famous composer*, died at an early age.

_____35. Scientists believe that these traits may be inherited *from one's parents*.

_____36. Soon, however, others began *to question this conclusion*.

_____37. Scientists believed that children *born in musical families* are often musical.

_____38. They pointed out that *growing up in a musical environment* influences children.

_____39. A child who was not exposed to music could not learn *to play an instrument.*

_____40. A child *growing up among professional musicians* may learn these skills.

Part IV: Label each of the following sentences as **S** for simple, **CD** for compound, **CX** for complex, or **CDCX** for compound complex.

_____41. Two authors whose works I admire are Maya Angelou and William Least-Heat Moon.

_____42. Tired of studying, Diego closed his book and turned on his stereo.

_____43. After the storm had uprooted the tree, some of the clean-up crew trimmed the branches, and others loaded them.

_____44. Without saying another word, Kari collected her belongings, jammed them in a bag, and marched out of the room.

_____45. I waited patiently as the postal worker approached my mailbox with the long awaited package.

_____46. Take your jacket or your sweater.

_____47. Jason wished that he could go camping, but he couldn't convince his parents to let him go because he had gotten in trouble at school.

_____48. The flowers that create the beautiful scene outside the house window are cared for by the professional gardener.

_____49. The arrival of the candidates had been anticipated for months; the city officials were waiting for them at the reception.

_____50. The only person with a key was Mr. Loggins, the owner and operator.

Student Survey

Name_____(Please Print) Teacher_____

Background Information (circle the appropriate response):

1. I am taking a Freshman Sophomore Junior Senior **English course.**

2. Gender: Male Female

3. Age: 13 14 15 16 17 18 19

4. Ethnicity: African American Asian Caucasian Hispanic Multiracial Other (specify):

5. This is my first second third **attempt at taking this course.**

Interests and Extracurricular Activities (circle the appropriate response):

6. Do you speak more than one language? Yes No

7. Do you play a musical instrument? Yes No

If so, which one(s):_____

8. Do you participate in any singing groups? Yes No

If so, which ones?_____

9. From the following choices, my favorite class is: math English science social studies

10. Do you study grammar outside of this class? Yes No

If Yes, then: once a day several times a week once a week a few times a month

11. Do you have job during the school year? Yes No

If Yes, then how many hours a week do you work? _____

12. Do you participate in drama? Yes Sometimes No

13. Do you participate in dance? Yes Sometimes No

14. Do you participate in organized sports? Yes Sometimes No

If so, which one(s):_____

15. I workout or exercise: Yes Sometimes No

16. Do you enjoy participating in physical education classes at school? Yes No

17. Do you have a gym membership outside of school? Yes No

Academic Preference (circle the most appropriate response):

18. I learn best when I: see information hear information have hands-on experience

19. I like to learn by: working with people tapes/listening to stories pictures/illustrations

20. As a student, I tend to be: a thinker a talker a doer

21. To remember a fact, I: say it aloud write it several times doodle/draw it

22. In a classroom, I learn best when I like the: instructor textbooks activities

23. When I study for a test, I: make models and charts review aloud write a summary

24. I am good at: fashion building things telling jokes/stories

25. When at school, I often remember: faces names events

26. I remember things best when I: listen to directions experience read the directions

General Preference (circle the appropriate response):

28. When I need directions, I usually: use a map ask for directions guess the direction

29. When I cook a new dish, I like to: call a friend follow my instincts follow a recipe

30. If I am teaching someone something, I: write instructions talk to them demonstrate

31. I tend to say: Watch how I do it Listen to me explain You have turn, or a try

32. During my free time I most enjoy: visiting a museum listening to music playing a sport

33. Before I buy new clothes, I: imagine how they look talk to the clothing staff try them on

34. If I were buying a new car, I would: read about it discuss it with friends test drive it

35. When I learn a new skill, I: watch the teacher talk to the teacher try to do it myself

36. When I listen to a band, I: watch the band/others listen to the beat move with the beat

37. When I concentrate, I: focus quietly discuss with others move around I

38. During an anxious situation, I: can't sit still talk it over in my head talk to someone

39. I feel connected to other people because of: how they look what they say how I feel

40. I decorate my bedroom because I like: the colors the textures what others say about it

Teacher Logs

Date	Start Time	Stop Time	Instructor Name	Class Period	Absentees	Brief Activity Description/Assignment	Teacher Observations

APPENDIX C: Validation Surveys for Experts in the Field

Validity Survey

Name_____

Background Information of Expert in the Field

1. How many of years of experience do you have in the field of education?
2. Describe the various positions and teaching opportunities you have held during this time, including your current position.

Please compare the 50 question pre and post tests in order to determine their validity as assessments individually and as a pair. Circle the comment that best describes your response to the following statements.

1. The pre and post tests are equal in length.

strongly disagree disagree neutral agree strongly agree

2. The pre and post tests have matching section representation.

strongly disagree disagree neutral agree strongly agree

3. The pre and post test section questions are equal in difficulty.

strongly disagree disagree neutral agree strongly agree

4. The pre and post test questions give equal representation to each answer selection.

strongly disagree disagree neutral agree strongly agree

5. The pre and post tests present questions that are appropriate for high school students.

strongly disagree disagree neutral agree strongly agree

6. The pre-test and post-tests are appropriate assessments to use together.

strongly disagree disagree neutral agree strongly agree

Please judge the following traditional grammar handouts that the control group will use during the study. Circle the comment that best describes your response to the following statements.

7. The selection of grammar handouts represents the topics on the post test assessment.

strongly disagree disagree neutral agree strongly agree

8. Each grammar handout and lesson should take approximately twenty minutes for the teacher to explain, the student to complete, and the class to review.

strongly disagree disagree neutral agree strongly agree

9. The grammar handouts are distinctly traditional in style and format and are common represent traditional practice of grammar instruction.

strongly disagree disagree neutral agree strongly agree

Please judge the following kinesthetic activities that the treatment group will use during the four week study. Also, determine their validity as teaching tools for the pre and post test assessments. Circle the comment that best describes your response to the following statements.

10. The selection of kinesthetic activities represents the topics on the post test assessment.

strongly disagree disagree neutral agree strongly agree

11. Each grammar activity and lesson should take approximately twenty minutes for the teacher to explain, the student to complete, and the class to experience.

strongly disagree disagree neutral agree strongly agree

12. The grammar kinesthetic activities are distinctly unlike traditional instruction because they cannot be completed without the inclusion of movement.

strongly disagree disagree agree strongly agree

Please judge the equality of the traditional handouts and the kinesthetic activities as teaching tools. Circle the comment that best describes your response to the following statements.

13. The traditional handouts and kinesthetic activities focus on the same grammar elements.

strongly disagree disagree neutral agree strongly agree

14. The traditional handouts and kinesthetic activities are comparable in level of difficulty.

strongly disagree disagree neutral agree strongly agree

15. The use of these traditional handouts or kinesthetic activities for three times a week for four weeks is sufficient time for high school students to increase their understanding of grammar.

strongly disagree disagree neutral agree strongly agree

Free response/Comments:

Student Survey Validity Survey

Name_____

Background Information of Expert in the Field

1. How many of years of experience do you have in the field of education?
2. Describe the various positions you have held during this time, including your current position.

Background Questions

1. The background questions ask general information to gather demographic data.

strongly disagree disagree neutral agree strongly agree

Student Interest and Extracurricular

2. The student interests and extracurricular activities section adequately represents activities that students may or may not be involved in outside of class that are predominately kinesthetic in nature.

strongly disagree disagree neutral agree strongly agree

3. The student interests and extracurricular activities section specifically identifies purposefully kinesthetic opportunities.

strongly disagree disagree neutral agree strongly agree

4. This survey asks appropriate questions to determine if students are highly kinesthetic in lifestyle choices.

strongly disagree disagree neutral agree strongly agree

Student Academic Preference

5. The student preference section offers a variety of topics, rather than one single focus.

strongly disagree disagree neutral agree strongly agree

6. The student preference section offers a variety of topics with which students should have previous experience.

strongly disagree disagree neutral agree strongly agree

7. The student preference section offers an adequate number of response choices to best represent the students' viable responses.

strongly disagree disagree neutral agree strongly agree

8. The student preference section provides equal representation of each learning preference as a selection.

strongly disagree disagree neutral agree strongly agree

9. The student preference section offers selection options that are distinctly kinesthetic in nature.

strongly disagree disagree neutral agree strongly agree

10. This survey asks appropriate questions to determine if students are highly kinesthetic learners.

strongly disagree disagree neutral agree strongly agree

Student General Preference

11. The student preference section offers a variety of topics, rather than one single focus.

strongly disagree disagree neutral agree strongly agree

12. The student preference section offers a variety of topics with which students should have previous experience.

strongly disagree disagree neutral agree strongly agree

13. The student preference section offers an adequate number of response choices to best represent the students' viable responses.

strongly disagree disagree neutral agree strongly agree

14. The student preference section provides equal representation of each learning preference as a selection.

strongly disagree disagree neutral agree strongly agree

15. The student preference section offers selection options that are distinctly kinesthetic in nature.

strongly disagree disagree neutral agree strongly agree

16. This survey asks appropriate questions to determine if students are highly kinesthetic learners.

strongly disagree disagree neutral agree strongly agree

Free Response/Comments:

APPENDIX D: Experts in the Field

Teacher A has 32 years of teaching experience and has served as a Department Chair, SAT Prep teacher, a Georgia High School Graduation test evaluator and question writer, and a Career Tech and Agricultural Educator presenter and teacher. She currently teaches and is currently writing the curriculum for Teaching Teachers and is a Work-based Learning Evaluator. She agreed with the content and style of the Pre- and Post-Tests, Validity Survey, and the Student Survey Validation Survey, she agreed with the content as well.

Teacher B has been teaching for over 33 years. She has taught secondary English classes (grades 9-12) for 22 years and post-secondary classes for 19 years. She has experience teaching Remedial, College Prep, and Honors classes at both levels. She is currently teaching Juniors and Advanced Placement Seniors. She agreed with the content and style of the Pre- and Post- Tests, Validity Survey, and the Student Survey Validation Survey.

Teacher C has 18 years of teaching experience. She has been teaching high school English for nine years and has been a Reading Specialist for over nine years. She agreed with the content and style of the Pre- and Post- Tests, Validity Survey, and the Student Survey Validation Survey.

Teacher D has earned her doctorate and has 15 years of experience in the field of education. She is currently is a college professor at Gainesville State College and is a Content Review Specialist for Georgia Professional Standards Commission. Additionally, she has taught Kindergarten, Second grade, English as a Second Language grades K-5 and 9-12, served as a co-teacher, and Department Chair. She agreed with the content and

style of the Pre- and Post- Tests, Validity Survey, and the Student Survey Validation Survey.

Teacher E has earned her doctorate and has 26 years of teaching experience in public schools, plus three years of private work in the field of education. She has worked as a private tutor for five years, taught in psycho-educational classes at the Regional Youth Detention Center, and in postsecondary education, including the supervision of student teachers. She is currently working in self contained classroom. She agreed with the content and style of the Pre- and Post- Tests, Validity Survey, and the Student Survey Validation Survey.

Teacher F has 29 years of experience in the field of education. She has been a classroom teacher and is currently a high school administrator. She is the Student Support Team coordinator, test coordinator and curriculum specialist at Flowery Branch High School. She agreed with the content and style of the Pre- and Post- Tests, Validity Survey and the Student Survey Validation Survey.

Teacher G has 27 years in the field of education. She has served as a media specialist for ten years for different age groups, an elementary teacher for 15 years and a special education teacher for two years. She has been committed to the education of students throughout her lifetime. She agreed with the content and style of the Pre- and Post- Tests, Validity Survey, and the Student Survey Validation Survey.