DETERMINING THE EFFECTIVENESS OF A MULTISENSORY APPROACH TO TEACH THE ALPHABET AND PHONEMIC AWARENESS MASTERY IN KINDERGARTEN CHILDREN

A Dissertation

Submitted to the
Faculty of Argosy University Campus
College of Education

In Partial Fulfillment of
The Requirements for the Degree of

Doctor of Education

by

Charlene Alexandra Wrighton

October 2010

DETERMINING THE EFFECTIVENESS OF A MULTISENSORY APPROACH TO TEACH THE ALPHABET AND PHONEMIC AWARENESS MASTERY IN KINDERGARTEN CHILDREN

DETERMINING THE EFFECTIVENESS OF A MULTISENSORY APPROACH TO TEACH THE ALPHABET AND PHONEMIC AWARENESS MASTERY IN KINDERGARTEN CHILDREN

A Dissertation

Submitted to the
Faculty of Argosy University Campus
in Partial Fulfillment of
the Requirements for the Degree of
Doctor of Education

by

Charlene Alexandra Wrighton

Argosy University

October 2010

Dissertation Committee Approval:

_____	_____
Dissertation Chair: Dr. Scott Griffith	Date
_____	
Committee Member: Dr. Aniello Malvetti	
_____	_____
Committee Member: Dr. Barbara Cole	Program Chair: Ardella Dailey

DETERMINING THE EFFECTIVENESS OF A MULTISENSORY APPROACH TO TEACH THE ALPHABET AND PHONEMIC AWARENESS MASTERY IN KINDERGARTEN CHILDREN

Abstract of Dissertation

Submitted to the
Faculty of Argosy University Campus
College of Education

in Partial Fulfillment of
the Requirements for the Degree of
Doctor of Education

by

Charlene Alexandra Wrighton

Argosy University

October 2010

_____
Dissertation Chair: Dr. Scott Griffith

_____
Committee Member: Dr. Aniello Malvetti

_____
Committee Member: Dr. Barbara Cole

Department: College of Education

Abstract

DETERMINING THE EFFECTIVENESS OF A MULTISENSORY APPROACH TO TEACH THE ALPHABET AND PHONEMIC AWARENESS MASTERY IN KINDERGARTEN CHILDREN

Limited growth has been seen last 5 decades in the reading ability of the youth in the United States, regardless of legislation, funding, federal mandates, and agencies established to improve reading instruction. Over the last 3 decades research studies have informed education what children need to learn to read, spell, and write. How to deliver the instruction is still not resolved.

The purpose of this study was to determine the effectiveness of a multisensory approach to teaching the alphabet and phonemic awareness to kindergarten children, in comparison to a more abstract and traditional language arts methodology. The SRA/Open Court Reading Series and the Zoo-Phonics Language Arts Program were the vehicles for this study.

A quantitative, quasi-experimental research design was used in this study to assess Kindergarten students in 1 school district, in 6 kindergarten classes within 3 schools, having the same economic and ethnic demographics to find the effect.

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

TABLE OF APPENDICES

ACKNOWLEDGMENTS

It takes a village to write a dissertation. Those who stay quietly in their offices and write a dissertation are much to be commended. But then, they would miss out on the kindness of friends, colleagues, and those who have gone before them to help you through the process. It is much like giving birth. I feel as if I have pushed and pulled at every word, thought, and fact in this dissertation . . . over and over.

There are so many people to thank. Where would I have been without the superintendant who accepted my study into his school district; the principal who allowed the two kindergarten teachers to participate in this study. To the two teachers, who at the last minute agreed to teach Zoo-Phonics, leaving the comfort of a well-known program to learn something new. Learning curves are always challenging for hard-working teachers. Thank you. Appreciation goes to the beautiful children who played with Zoo-Phonics all through the year and to their parents who had the faith to allow their children to learn through a lesser-known program.

I appreciate Dr. Cole for listening to my sad, yet funny tale of woe during this long doctorial process and said, “Let’s get this done!” and for her willingness to be on my committee at the last minute. She suggested both Dr. Griffith and Dr. Malvetti to me and said they would “hold my feet to the fire” throughout this process. They have.

An enormous “thank you” goes to Dr. Griffith who—through his talent, funny sense of humor, and encouraging manner—kept me believing I could do this, when so often I felt that I could not. He taught me to use five words instead of 10 (except in this acknowledgement). When you see his name in so many dissertation acknowledgements you realize that here is a man who actually enjoys helping others, often at much sacrifice

to himself. Thank you Dr. Malvetti for your gift in statistics—a complete unknown to me. Thank you for helping me to better understand data analysis.

There are not enough words to thank Anca, one of my statisticians and friends, who gave up family weekends, more than once, to get the data ready for my second statistician, Jeffry. Jeffry deserves thanks for sticking with me, completing my stats on his birthday, and answering my every question, often late at night. Thank you, Colleen, for taking on my dissertation at the last minute and making it APA pretty. Chuck and Tania, as always, you have been there to help and support me.

I thank my husband, Bill, who waited patiently and lovingly by, bringing me beverages to keep me awake, food for sustenance, and flowers to lift my spirits. I thank my daughter, Katie, who was willing to take on my role at work as well as her own so I could get this dissertation completed. Thanks to friends and family for all your constant prayers that carried me through sleepless nights and long days!

I have to thank my sissy, Gigi, for helping me to be me. She has influenced me since childhood more than any other individual. In the field of education, she taught me how to see the whole child and to be an advocate for them when no one else would.

Last, but never least, I must recognize the Lord for giving me the strength, the will, the interest, the ability and the joy to start this project and complete it. How many times have I prayed throughout this process? Daily. He gave strength when there was no strength.

CHAPTER 1: THE RESEARCH PROBLEM

Statement of the Problem

Despite billions of dollars spent for the improvement of reading instruction for our nation's children over the last five decades, limited growth in reading ability has been seen in the nation's fourth and eighth grade students over the course of 17 years (NAEP, 2010, online). Compared to international students, results from the Progress in International Reading Literacy Study (PIRLS) assessment, there was little growth seen between test scores in 2001 to 2006. The report shows factors that may be associated with reading proficiency (PIRLS, 2006).

The National Assessment of Educational Progress (NAEP) reported in March of 2010 that the 2009 reading scores from the nation's fourth graders stayed flat from the previous testing in 2007, with eighth graders making a one-point growth in 2 years, a two- point growth since 2002, and a seven point spread over 8 years (NAEP, 2010, online). Although the differences in reading scores from eighth grade to 12th grade improved as students aged, 12th graders from all ethnic groups scored lower than they did in 1992 by three to seven points (NAEP, 2010).

Reading test scores also determine if a student is considered Below Basic, At or Beyond Basic, At or Above Proficient, or Advanced in reading. Test scores for all fourth grade students, regardless of ethnicity and gender, showed that in 2009 33% of students tested were considered Below Basic proficiency; 67% were At or Above Basic Proficiency; and 33% were At or Above Proficiency; only 8% were considered Advanced. 25% of all eighth grade students were considered Below Basic Proficiency;

75% were At or Above Basic Proficiency; 32% were At or Above Proficiency; and only 3% were considered Advanced.

Achievement gaps are found between students living in middle to upper economic strata compared to those in the lower economic strata; between White and Asian student populations and Black, Hispanic, and American Indian/Alaskan Native student populations. White males outscored their ethnic male counterparts consistently across the 1992 to 2009 test cycles with few exceptions. White and Asian female students score considerably higher than females in Black, Hispanic or American Indian/Alaskan Native ethnic groups in the same grade. Hispanics outscored Black students, with a small margin, consistently. This is noteworthy considering many Hispanic students speak English as their second language. Asian students' score either a little higher or are on parity with White students with the exception that Asian students consistently have more students testing at the advanced level.

These scores also found that fourth and eighth grade White females outscored White males by a wide margin across the 1992 to 2009 test cycles, with few exceptions. In 2008, there was a 12 point difference between fourth grade White female students and male Black students. For Hispanic students, there was a five-point spread between fourth-grade females and males (NAEP, 2010).

These statistics give analysts a comparison of students' reading ability but they do not sufficiently explain why so few students are not proficient in reading. One might be tempted to draw the conclusion that poverty hinders student growth in the various ethnic groups. This does not explain why so few middle and upper class students, regardless of ethnic heritage, have not reached proficient or advanced levels of reading or why females

outscore males consistently in reading. “What drags the U.S. average down is that there are lots of kids in the country doing poorly” (McGraw as cited in Reading Rockets, 2010, p. 1).

Background

After assessing fourth and eighth grade students every 2 years for 17 years, the NAEP shows little growth in the area of reading. In a combined average of reading scores, regardless of ethnicity and gender, 29% of fourth and eighth grade students were considered Below Basic Proficiency; 71% were At or Above Basic Proficiency; 32.5% were At or Above Proficiency; and only 5.5% were considered Advanced (NAEP, 2010).

Concerns over the literacy rates of America’s youth have troubled educators since the mid-1800s. American educators and researchers have argued for 160 years over how best to teach reading to young children (Adams, 1994). This contention has persisted until present time (Krashen, 2010). “Do children learn to read better with a beginning method that stresses reading for meaning or with one that concentrates on teaching them how to break the code? The research on this question is copious and varied” (Chall, 1996, p. 79). Reading scores provided for public viewing over the last two decades demonstrate that regardless of reading pedagogy, whole language or direct and systematic alphabetic and phonics instruction (the “Alphabetic Principles”), students have not made significant progress in two decades (NAEP, 2010).

As a corrective measure against low student test scores in reading, the *No Child Left Behind Act* was legislated in Congress in 2001 (NCLB, 2010). Regardless of the fact that $200 billion in Federal funds have been spent on education since the passage of the Elementary and Secondary Education Act of 1965 (ESEA), President Bush coined the

phrase, “No child will be left behind” because too many of the children in this country are being left behind, even 10 years after the No Child Left Behind Act was mandated in 2010 (NCLB, 2010). The purpose of the NCLB legislation was to improve teacher training, classroom instruction, mandate research-based curricula, allow for more student and parental choice, and provide for “unprecedented flexibility in the use of Federal education funds in exchange for strong accountability for results” (NCLB, 2010).

The *Reading First Initiative,* part of the NCLB legislation was launched nationwide based on the research by the National Reading Panel (2000) to help improve teacher instruction in the language arts process based on scientific evidence researched for over more than three decades. From this study, the alphabet, phonemic awareness, and the phonological process were found to be essential to the early acquisition of alphabet skills for pre-school and kindergarten children, with a focus on those students from low-income families (Bush, 2010). State Departments of Education and individual school districts, throughout the United States, changed from a whole language approach to a direct, systematic approach to reading instruction. New guidelines were created for teachers; new curricula were created for students. The International Reading Association and its state satellites, which, at the time supported the whole language approach to reading, began to allow experts in phonemic awareness and phonics to present workshops. Direct and systematic alphabet, phonemic awareness, and phonics instruction became the educational pedagogy throughout the nation. Ten years later, after the No Child Left Behind Act was mandated by legislature, only 38% of the students in this nation are considered proficient and advanced (NAEP, 2010). When analyzing state and

national tests scores, little change has taken place regardless of pedagogy, billions of dollars spent and legislation (NAEP, 2010).

Too many children in this nation, whether they come from poor or middle income families are not making the gains necessary in public schools to reach their full potential or to become productive citizens (Lynch, reporting in *Economic Policy Institute*, 2007). "Differences in the amount of reading practice children get are enormous, and they are exacerbated by certain societal and school practices that serve to create rich-get-richer and poor-get-poorer situations" (Stanovich, 1986, p. 178). Living at the poverty level is acknowledged as a factor in low test scores (NAEP, 2010) as parents often do not have the time, finances, or awareness to enrich their children.

> Now, for years, we've recognized that education is a prerequisite for prosperity. And yet, we've tolerated a status quo where America lags behind other nations. Just last week, we learned that in a single generation, America went from number one to 12th in college completion rates for young adults. . . . At the same time, our 8th graders trail about eight—10 other nations…in science and math. Meanwhile, when it comes to Black students, African American students trail not only almost every other developed nation abroad, but they badly trail their White classmates here at home—an achievement gap that is widening the income gap between Black and White, between rich and poor. (Obama, 2010, p. 1)

Research from PET Imaging and fMRI's demonstrates that there is a difference in the neuronic structure of the brain between a stimulated and enriched young brain and an under-stimulated, un-enriched one (Jensen, 2006).

> Animal studies have found that enriched environments can induce important changes in the brain, including enhanced functioning and development in areas related to cognitive capacity, learning, memory, and resilience. Depending on the design of the study, the results might include more neurons, longer dendrites, more connections, heavier brains, greater brain mass, more intra-and inter-cortex connectivity, and enlarged capillaries. (Jensen, 2006, p. 56)

Just because children are from low income homes, literacy is not promoted, that books are not in the home, or that parents are not enriching their children. It should not be

assumed that all illiterate parents create illiterate children (Erickson, 1990). The statistics, according to state test results, do demonstrate that as a norm, low income, multi-ethnic groups score lower on reading tests than White and Asian students in middle and upper incomes and that, across the board, females consistently outscore males (NAEP, 2010).

There are few tasks in life that do not require proficiency in reading, whether at school or on the job (Mannix, 2010). When word recognition and comprehension is not fluent, students are not able to understand the meaning of the words in context, cannot remember the gist of the text; are not able to gain either the humor or pathos that the author has intended. Reading for information, knowledge or enjoyment is limited. For many, reading the newspaper, a recipe, map directions, or the information on a prescription bottle is difficult. "This starts a cycle of interacting negative consequences" (Nathan & Stanovich, 1991, p. 177) with non-fluent readers participating less and less in the reading process as they age, because of the level of difficulty and emotional stress placed on the student. The less students practice, the less automaticity of word recognition develops, the less confidence the student has in reading (Nathan & Stanovich, 1991).

Educational researchers and neuroscientists (Ratey et al., 2008) provide evidence that suggests that multisensory input is pivotal to develop understanding of the concepts taught. With meaning and understanding, comes memory (Kagan & Kagan, 1998). Few classrooms structures and curricula allow children opportunities for sensory exploration and physical movement during pre-reading and reading instruction (Medina, 2008). The structure of traditional classrooms constrains children, either on a spot on the carpet or at a desk or table. Traditional curricula, even those used to teach the alphabet to early

learners in preschool and kindergarten, primarily use the child's eyes and ears, but not the rest of their bodies (Medina, 2009; Sprenger, 2008). The child's access to print is limited to hearing what the teacher reads aloud, or writes on the board, or is shown in a big book (Lengel, 2010; Sprenger, 2008). Feedback given by children during the learning experience is critical to learning and memory, but is not fostered often enough (Kagan & Kagan, 1998). Only occasionally is the child's voice heard during instruction time (Spenger, 2008).

In the various research-based alphabet curricula developed for preschool, kindergarten and first grade children, there is little evidence where lessons and activities require the child's sensory input or physical movement during instruction. Most all traditional teaching primarily requires the child's eyes and ears. Learning the alphabet stays in the realm of the abstract as the teacher teaches children to match sounds to symbols either shown in a book or on the whiteboard. To compound the difficulty, there is an uppercase alphabet and a lowercase alphabet. There are many letters that have similar shapes and sounds, making learning even more difficult to for understand, memorize and use (Adams, 1994). "Both the immediate and long-term impact of reading depends critically on the speed as well as the accuracy with which readers can identify the individual letters and words of the text" (Adams, 1994, p. 159). If the abstract nature of the alphabetic sound/symbol relationship is not understood and mastered by preschoolers and kindergartners in an automatic and recognizable fashion, children have little hope for learning how to read in the near future.

Children must not only gain necessary skills to learn to read, but also must feel able and comfortable to enjoy the learning experience at the same time. Any threats to

learning creates stress in the student and the affective filter from the amygdala in the limbic system (known as the visceral or emotional brain) shuts down and does not allow learning to occur (Diamond et al., 1985; Krashan as cited in Willis, 2008).

The limbic area of the brain involved with memory and constantly receives information from the senses, affecting visceral motor (internal organs), endocrine (hormonal release into system) and somatic motor effectors (muscle movement) (Diamond et al., 1985). If a child feels a "fight or flight" urge, the endocrine system may release hormones into the bloodstream causing physical discomfort from headaches, to a pounding heart, to tightening muscles. Students cannot learn in such an environment (Willis, 2008). In looking at the poor test scores in America's youth, students are anything but comfortable with their ability to read successfully (NAEP, 2010).

In order for children to learn effectively, they need "brain-friendly instruction" which includes nutrition, sleep, safety, positive emotions, social interaction, novelty, meaningful learning, feedback, multiple neural pathways for inputting new information, and the stimulation of multiple intelligences at one time (Kagan & Kagan, 1998). When teachers teach children in the way that engages their various intelligences, different parts of the brain is developed (Kagan & Kagan, 1998).

The evidence from *American's Kindergartners* (ECLS-K, 1998), a longitudinal study on the nation's kindergarten children, demonstrates that it is not just one thing that affects a kindergartner's fluency or future literacy potential, such as phonological awareness, however crucial, but many things. You do not educate one part of the kindergarten child but all of him or her (West, Denton, & Germino-Hausken, 1998).

The Purpose for the Study

The purpose of this study is to determine the effectiveness of a multisensory approach to teaching alphabet and phonemic awareness skill development to kindergarten children. This study examines the differences in retention, transfer and usage of the alphabet and phonemic awareness skills when taught directly through children's senses (eyes, mouth, ears, smell, and tactile and body movement) and those learning the alphabet and phonemic awareness skills through use of only their eyes, mouth, and ears.

Theoretical Foundations

This study will examine a multisensory approach to teaching the alphabet and phonemic awareness and mastery for kindergarten children. Theories that guide this study are based in neuroscience and psychology. These fields present new ways of thinking about the brain and learning, raising implications for the instruction of young children in the area of reading.

The Cognitive Learning Theory, the Constructivist Theory, a branch of Cognitive Learning Theory, and Sensory Integration Theory will be the underlying theoretical foundations that support this study. Cognitive psychology involves the study of how humans gain access to information in our environment. How the brain stores it, reflects on it, retrieves it, utilizes it, transfers it to other information, solves problems, and develops and uses language will be studied (Solso et al., 2005). Cognitive Theory, through studies in both psychology and neuroscience, focuses on internal processes of the brain and how the various parts of the brain work in harmony to synthesize and assimilate learning for memory.

No theory develops in a vacuum. Theories long held are, in time, modified and adapted to address new technology, research, or changes in society. For example, the deficits of Behaviorism (not acknowledging the diversity of individual responses in human beings) led to a broader scope of cognitive science, opening doors to many new theories of learning, which became the foundation of the Cognitive Learning Theory. These theories include: Constructivism (Piaget, Vygotsky, Dewey, etc.), Social Development Theory (Vygotsky), Discovery Learning (Bruner), Stage Theory of Cognitive Development (Piaget, Vygotsky), Distributed Cognition (Hutchins), Activity Theory (Vygotsky, Luria, etc.), Elaboration Theory (Reigeluth), Models of Motivation Design (Keller), Hierarchy of Needs (Maslow), Experimental Learning (Kolb), and Social Learning Theory (Bandura). Each one of these theories, in part, could guide this study.

The Constructivist Theory of Child Development believes that learning is based on the scaffolding of relevant information as the parent or teacher teaches. Children are not blank pages when they come to the classroom. They have had years of listening, observing and doing that gives them a foundation for learning more complex concepts. What the child already knows becomes the foundation for new learning. Learning is sequential in nature. Teachers are to teach through concrete and simple concepts first, help the child to achieve mastery, and then move on to more abstract, difficult concepts as the child is ready (Piaget, 1923/2004).

Maria Montessori (1912) believed that the child was the “man” in development and that the role of the parents and teachers is to provide learning experiences for the child in order for him to reach his full potential. From birth, the child learns about his

environment through his senses first and then the intellect. Schools fail children because they do not teach to the whole child. “The essential thing is for the task to arouse such an interest that it engages the child’s whole personality” (Montessori,1912, p. 206).

Piaget’s (1923/2004) Theory of Child Development brought to the fields of psychology and education an understanding of child development from birth to adulthood, dividing the child’s life into four stages: Stage 1: The sensory-motor period (birth to 2 years old); Stage 2: The Preoperational period (2 to 7 years old); Stage 3: The Concrete-operational period (7 to 11 years old); and Stage 4: The Formal-operational period (adolescence to adulthood), (Solso et al., 2009). The child is only ready for more abstract learning if the child has been understood and taught through his stages of development. Running does not occur before crawling and walking. This theory has helped psychologists, educators, and parents understand that based on the average, children follow these stages closely as they develop, giving children room to develop naturally and at their own pace rather than the expectation to perform beyond their present stage or ability. Guidelines and foundations for preschool children as well as state-wide academic standards for school-aged children are based on Piaget’s (1923/2004) theory as it protects children from being required to do more educationally and physically than they are able to when instructed in the classroom.

As an extension of Piaget’s (1896 to 1980) Theory of Child Development, Lev Vygotski (1896 to 1934) saw the interaction between parent, child and siblings to be underpinnings for early thought, speech and learning. Early speech development is social in nature and directly tied to the child’s cognitive development. Whereas Piaget believed

that development preceded learning, Vygotsky believed that learning preceded development (Solso, 2009).

Human beings are social. The development of language from the earliest stages of the child's development is "social in origin and purpose" (Solso, 2005, p. 390). Speech and thought are two separate entities that develop at different developmental stages. Crucial to Vygotski's theory, and this study, is that children think before they have language. This is in evidence when you ask a toddler, who has a limited speaking vocabulary, to fetch a diaper or put an object in the box. The child responds appropriately, because he has thinking language (Solso, 2005).

These theorists believe that children internalize behavior because they model after adult behavior and with the interaction with siblings and peers. Daily experience through direct interaction with adults and peers, independent discovery, and social interaction eventually leads to independent action and thought. This is important to the development of human consciousness, which consists of the "internalization of social, interpersonal relationships," which is an essential part of learning (Solso, 2009, p. 391).

The Sensory Integration Theory, designed by Ayres (1972a) **"**defined sensory integration as "the neurological processes that organizes sensation from one's own body and from the environment and makes is possible to use the body effectively within the environment relationships" (Bundy et al., 2002, p. 4). Sensory integration theory has three major postulates:

1. Learning is dependent on the ability to take in and process sensation from movement and the environment and use it to plan and organize behavior.
2. Individuals who have a decreased ability to process sensation also may have

difficulty producing appropriate actions, which, in turn, may interfere with learning and behavior.

3. Enhanced sensation, as a part of meaningful activity that yields an adaptive interaction, improves the ability to process sensation, thereby enhancing learning and behavior (Bundy et al., 2002, p. 5).

Ayres believed the brain to be plastic and malleable; that it functions as an integrated whole; and that lower ordered (sub-cortical) integrative functions develop first, through the senses, which informs higher ordered structures (cortical), as the child takes in information from instruction, self-discovery, and interaction with the environment. Ayes, like Piaget and Montessori, incorporated hierarchical concepts into her theory. "Sensory Integration Theory was designed to describe the difficulties of a particular group of individuals . . . to explain mild to moderate problems in learning and behavior" (Bundy et al., 2002, p. 12). Sensory integration activities are designed to strengthen weak modalities (visual, auditory, aural, motoric, touch) in order to stimulate the brain to learn.

Hypotheses

The hypotheses for this study are as follows:

H1: A multisensory approach to teach the alphabet and phonemic awareness skills to kindergarten students is more effective than a non-multisensory teaching method.

$H1_0$: A multisensory approach to teach the alphabet and phonemic awareness skills to kindergarten students is not more effective than a non-multisensory teaching method.

Research Questions

The following research questions guided this study:

1. R Q 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?
2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?
3. R Q 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

Definitions of Terms

Alphabetic principal: The understanding that each speech sound or phoneme of a language should have its own distinctive graphic representation; that letters and sounds can be manipulated to form and segment words (Moats, 1999).

Content and Achievement Standards: Benchmarks for assessment results based on what is appropriate for a given age and grade to know or learn (No Child Left Behind, 2010).

Instructional interventions: A broad range of help as a remedial intervention to improve student skills when weaknesses are observed (Torgesen as cited in McCardle & Chhabra, 2004, p. 357).

Mnemonic Instruction as a Memory Aid: Memory-enhancing strategy involving "Mnemonics use the pattern-seeking brain action that looks for association between the

information it is receiving and the information that is already stored" (Willis, 2008, p. 151)

Multisensory approach to learning: Continual use of the five senses, including the use of body movement, to teach abstract concepts, making them concrete and accessible for memory, usage, and transference. Using several modalities at one time to strengthen neural pathways (Sprenger, 2008).

Phonemic Awareness: The ability to manipulate individual sounds within words and the conscious awareness and sensitivity to sound and structure in language (Lane, Pullen, Eisele, & Jordan, 2002; Pullen & Lane, 2007).

Play-based curriculum: A curriculum that is based on playful games and activities that bring novelty and fun to learning; that uses play itself as an innate rehearsal for real life.

Procedural Learning: Sequence of learning enabling children to learn in an organized fashion (Mastroprieri & Scruggs, 2004, p. 160).

Limitations

This study used a small sample of students from which to extract data making generalizations to a greater population of students limited. Deleted small samples comment. References to various ethnic groups was used only to determine the similarity of the samples demographically. Because the test sample was small, it was not possible to make comparisons by ethnic groups, economic strata or gender when looking at student test scores. The subjects of this study were not picked randomly. This may provide threats to the internal validity of study.

Threats to the reliability of the data may arise because teachers have different levels of teaching expertise, experience, and knowledge in general. If the teachers' understanding and experience is limited it can delay student academic growth. Every teacher has a different educational philosophy or bias that slants his or her perception of how skills are to be taught. Outcomes may vary from teacher to teacher, class to class. When asking teachers to participate in a research project in the classroom, it is impossible control how the teachers teach the lessons or use the curriculum.

Another threat to the reliability of this study is that required testing by teachers is not always completed. The district requires teachers to give specific tests to students at specific times of the year. They often do not comply.

The researcher is also author of the Zoo-Phonics Language Arts Program used as the treatment for the experimental group. Other than providing a one-day training for the two teachers, and donating Zoo-Phonics materials, the researcher had no part in teaching or assessing kindergarten students in the study.

Delimitations

The study is delimited to kindergarten students, in three schools in one Northern California school district. This study takes place over one school term, September to June. The study was designed to analyze only the variable of alphabetic and phonemic awareness skill mastery. No attempt was made to analyze scores by demographics.

Significance of Study

From this study, teachers may change the way they teach children of all ages. Instruction can actually be accelerated for kindergarten students if children master both concrete and abstract concepts more easily and they can approach new learning and

reinforcement through their senses and through the use of sensorial mnemonic devices that trigger and sustain memory.

There is now evidence that demonstrates how children learn most effectively. Through a better understanding of how a child's brain works, educational decision makers will be able to correlate the results of this study to curriculum development and instruction. Studies from neuroscience rarely reach the classroom. This study may help bring the findings in neuroscience that directly relate early reading to the classroom teacher.

The entire way the alphabet, reading, spelling and writing are taught may be viewed differently. There is no physical response in traditional reading programs. The child primarily uses his eyes and ears, with occasional use of his voice to gain abstract, symbolic information. Learning to read and spell are complex tasks, and is not naturally obtained by any other way but direct instruction. However, if presented through a multisensory approach, all students will have immediate access to the reading process for accelerated learning.

Teachers may provide opportunities for physical and playful alphabetic, reading, and spelling activities as a vital part of their daily lessons. More physical play during the learning process should be encouraged. With a better understanding that motion stimulates a chemical release in the brain that saturates the neurons, which strengthens memory, .educators and curriculum designers may approach early learning differently. A better understanding that novelty and fun gets the child's attention and keeps it during the learning process may lead to a new approach to really reading instruction.

This study will advance the educational profession. The findings demonstrate that a multisensory approach to teaching the alphabet to kindergarten students is supported. As a result, pedagogy, teacher training, curriculum criteria and development, and educational frameworks and policy may change as a result.

Preschool and kindergarten males start off their schooling immediately lagging behind young females. Data demonstrates that little boys can learn the alphabet and phonemic awareness skills as quickly and successfully as girls. Children from different ethnics groups and low economic standing learn the alphabetic and phonemic awareness skills as quickly as their White, middle, and upper class counterparts. Multisensory learning provides a strong foundation for future learning, helping all students to reach their academic potential.

Consistent use of the child's senses and body to learn, not just in preschool and kindergarten, but throughout the child's education will impact how the child learns all subjects. A multisensory approach may enhance learning as well as add to the children's ability to cope with abstract information throughout the education process.

CHAPTER 2: LITERATURE REVIEW

The Purpose for the Study

The purpose of this study is to determine the effectiveness of a multisensory approach to teaching alphabet and phonemic awareness skill development to kindergarten children. This study examines the differences in retention, transfer and usage of the alphabet and phonemic awareness skills when taught directly through their senses (eyes, mouth, ears, smell, and tactile and body movement) and those learning the alphabet and phonemic awareness skills through use of only their eyes, mouth and ears.

Overview

Section 1 will present the Theoretical foundations that support this study. Section 2 will review the literature related to student literacy in the United States, past and present. Included in this review is a brief history of the reading pedagogies and research over the last 5 decades that have influenced how children have been taught to read.

Included in this review are the various Federal programs and mandates that have been legislated to help improve reading skills of students in the United States. A study of the brain and how memory and multisensory learning is connected will be the focus of this literature review. A description of the two programs used as the instructional vehicles in this study will be presented.

Section 1: Theoretical Foundations

This study examines the effectiveness of a multisensory approach to teach the alphabet and phonemic awareness to kindergarten children. The theories that guide this study are based in neuroscience and psychology. These fields present new ways of

thinking about the brain and learning, raising implications for the instruction of young children in the area of reading.

The Cognitive Learning Theory is the overarching theory that supports this study. The Constructivist Theory, which emerged from the Cognitive Learning Theory, will provide insight into the child's role in his own education as he brings his own set of perceptions and understanding when learning new information and skills, as his or her participation in the learning process is vital (Wolfe, 2001). The Sensory Integration Theory affirms that with the child's active participation through physical movement and sensory stimulation, learning takes place because several neural pathways are stimulated at one time (Bundy et al., 2002; Willis, 2008).

Theoretical Background

For thousands of years philosophers, mathematicians and scientists sought to understand consciousness; how the mind accepts and understands symbolism; the universality of perception in human beings; how information is accepted, stored and understood in the mind; how thoughts are formed, how language is acquired, and so forth. Each rendered his studied opinion that became the foundation for future thought, whether agreed with or not, as it spurred more reflection and analysis (Solso et al., 2005).

Religious leaders throughout mankind's history believed knowledge to come directly from God, as the Creator. As the church separated from state, empiricism developed the theory that knowledge is based on the senses and experience. Rationalism stated that one reasons knowledge intellectually not necessarily experientially. Plato believed that as man and/or woman gain knowledge he moves away from the senses into the "transcendent forms of reality," with mathematics as the vehicle. In the nineteenth

century, the study of empiricism moved away from psychological reflection as the need to fully understand human behavior developed (Philosophypages, 2010).

The attempt to replicate behavior in the laboratory through scientific methodology created the science of behaviorism (Solso et al., 2005). The 1950s brought a "cognitive revolution," changing how scientists viewed the acquisition of knowledge and how knowledge is represented in the mind (Solso et al., 2005). Scientists, like B. F. Skinner (1974), demonstrated how behavior can be modified if a consistent stimulus and instant reward for a correct response was given. This stimulus-response-reward system was called operant conditioning (Stephens as cited by Feinstein, 2006). It was used extensively in special education classes, prisons and hospitals with success across the United States. It was believed not necessary to study the brain because behavior could be changed regardless. "If the brain is rewarded for an activity it is likely to replicate that behavior" (Stephens as cited by Feinstein, 2006, p. 108). In the classroom where operant conditioning was used, feedback from the teacher was an important part of the process. In order for the student to respond appropriately, the teacher had to give immediate feedback on the child's work or behavior, whether praise or correction. This feedback was called schedules of reinforcement which helped to strengthen, maintain behavior (for appropriate behavior) or extinguish it (for inappropriate behavior) (Stephens as cite by Feinstein, 2006).

Although behaviorism was effective in behavior modification in both animals and humans, and influential in experimental psychology, behaviorism had two major shortcomings. First, it did not take into account the differences in the human personality and its many facets and perceptual variations. Second, it appeared to have no interest in

studying the structure and affects of attention, consciousness, memory and thinking (Solso et al., 2005).

These deficits of behaviorism led to a broader scope of cognitive science, opening doors to many new theories of learning, which became the foundation of the Cognitive Learning Theory. These theories include: Constructivism, Social Development Theory, Discovery Learning, Stage Theory of Cognitive Development, Distributed Cognition, Activity Theory, Elaboration Theory, Models of Motivation Design, Experimental Learning, and Social Learning Theory. Each one of these theories, in part, could guide this study.

Three Foundational Theories

The Cognitive Learning Theory, through studies in both psychology and neuroscience, analyzes how the various parts of the brain work in tandem to synthesize and assimilate learning for memory and usage. Cognitive psychology involves the study of how human beings gain access to information in one's environment: how the brain stores it, reflects on it, retrieves it, utilizes it, transfers it to other information, solves problems, and develops and uses language (Solso et al., 2005). This will be the foundation for in this study.

The Constructivist Theory of Child Development believes that learning is hierarchical. When teaching the child, new learning needs to connect to prior learning. Learning is sequential in nature. Human beings need to link new information to knowledge that is already established in memory (Smilkstein as cited by Feinstein, 2006).

Piaget (1923/2004), a constructivist, believed that learning starts as early as babyhood beginning with things that are innate, such as reflexes and information taken in

through the senses. Children are not blank pages when they come to the classroom (Donovan et al, 1999). They have had years of listening, observing and doing which gives them a foundation for learning more complex concepts. What the child already knows becomes the foundation for new learning (Jacobs, 2010).

"A constructivist model of learning reflects their [scientists] best understanding of the brain's natural way of making sense of the world. Constructivism holds that learning is essentially active" (Jacobs, 2010, p. 224). Teachers are to teach through concrete and simple concepts first, helping the child to achieve mastery, and then move on to more abstract, difficult concepts as the child is ready, laying the foundation for future learning (Piaget, 1923/2004).

Davis (1967) found that dendrites grow and connect as new learning connects to both new and prior learning. It is a "use it or lose it" process. If fostered in interesting and novel ways, stimulated brains grow dendrites which creates neural synaptic connections which enhances memory and utilization (Smilkstein, as edited by Feldstein, 2006). As children learn in the classroom, the teacher layers the instruction, adding new information to prior learning, inviting the child to participate in the learning process with all his or her senses, making his or her own discoveries at the same time (Jacobs, 2010).

The Sensory Integration Theory, designed by Ayres (1972a), defined sensory integration as "the neurological processes that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment relationships" (Bundy et al., 2002, p. 4). Ayres believed that as the child takes in new information through many senses used at one time, greater understanding of new information is gained by the child and memory is strengthened. For sensory

integration theorists, learning is dependent on movement and touch, as well as the eyes and the ears. Children who have academic disabilities often have problems with sensory/motor integration and are limited in what they learn, if the senses are not involved. Direct work on the senses through movement is believed to stimulate the brain (Medina, 2008; Ratey, 2008). Heightening the senses through use in children improves the processing center in the brain, stimulating memory, usage, transfer, and behavior (Bundy et al., 2002)

The brain is malleable and plastic and functions as an integrated whole as the child takes in information from personal interaction with the environment and through direct instruction and modeling from an adult. Ayres, like Piaget, Vygotsky, and Montessori, incorporated hierarchical concepts into her theory. Where Ayres developed theory to help children with sensory and academic deficits, other researchers postulate that all children need sensory stimulation in order to learn at maximum (Medina, 2008; Ratey, 2008; Willis, 2009). Sensory integration activities are designed by researchers and educators to strengthen weak modalities (visual, auditory, aural, motoric, touch) in order to stimulate the brain to learn.

> It . . . appears that this motor center also coordinates thoughts, attention, emotions, and even social skills . . . when we exercise, particularly if the exercise requires complex motor movement, we're also exercising the areas of the brain involved in the full suite of cognitive functions. We're causing the brain to fire signals along the same network of cells, which solidifies their connections. (Ratey, 2008, p. 41)

Section 2: Review of Literature

The Achievement Gaps in Education

Despite educational legislation, billions of dollars spent, and the knowledge of what children need to be literate, America's students are still struggling in the area of reading (NAEP, 2005; NCLB, 2002). According to the Economic Impact of the Achievement Gap in America's Schools (EIAGAS, 2009) America spends more on education than any other country in the world. This study finds that

> on average, Black and Latino students are roughly two to three years of learning behind White students of the same age. This ethnic gap exists regardless of how it is measured, including both achievement (e.g., test score) and attainment (e.g., graduation rate) measures. (2009, p. 9)

However, when students are compared to each other within the United States, there is some evidence of a closing gap:

> Latino students in Ohio outperform White students in 13 other states on the eighth grade NAEP reading test and are seven points ahead of the national average. In Texas, low-income Black students have the same average score on the fourth grade NAEP as low-income White students in Alabama. (2009, p. 10).

In 1999, test scores in the United States showed large achievement gaps, demonstrating that White students from both low and middle class homes are struggling in the area of reading (NAEP, 2009). The Center on Education Policy (CEP) analyzed national test data and found that African American and Hispanic males in first grade scored lower than White males, by an eight point spread even without any signs of learning disabilities (Sousa, 2005). Black and Hispanic females trail behind both female and male White students (NAEP, 2010). African American and Hispanic males in first grade scored lower than White males, by an eight point spread even without any signs of

learning disabilities (Sousa, 2005). Black and Hispanic females trail behind both female and male White students (NAEP, 2010).

African American, Hispanic and American Indian/Alaskan Native males suffer an even greater disadvantage in reading skills than their White female and male counterparts (NAEP, 2010). Most do not catch up in later years, as is evidenced by eighth grade test scores (NAEP, 2010).

Living at the poverty level is acknowledged as a factor in low test scores (NAEP, 2010) as parents often do not have the time, finances, or awareness to enrich their children. One should not assume that just because children are from low-income homes, literacy is not promoted, that books are not in the home, or that parents are not enriching their children.

The statistics, according to state and national test results, do demonstrate that as a norm, low income, multi-ethnic groups score lower on reading tests than White and Asian students in middle and upper incomes, and that across the board, females consistently outscore males (NAEP, 2010). “Differences in the amount of reading practice children get are enormous, and they are exacerbated by certain societal and school practices that serve to create rich-get-richer and poor-get-poorer situations” (Stanovich, 1986, p. 178).

Achievement Gaps Between Genders

Middle-class White females consistently outscore their male counterparts in reading (NAEP, 2007). The Center on Education Policy (CEP) analyzed the 2009 accountability test scores from all 50 states and raised alarm at the percentage of males

not reaching proficiency in reading in comparison to females. Reading assessments in all fifty states demonstrate the same gender gap patterns (CEP, 2010).

Prior to entering and exiting kindergarten, males lag behind females in reading skill development, regardless of economics (CEP, 2010). The Urban Institute (2010) found that girls begin and exit kindergarten with a two-point lead in reading over boys which continues to widen over the next 2 years. By the time students exit third grade, females have a five point lead over males which does not close in later years (Urban Institute, 2010). Hispanic females fare slightly better than their male counterparts in kindergarten. This gap widens by 4.7 points but is significantly smaller than the 13 to 14 point spread between the test scores of Hispanic and White students (Urban Institute, 2010, p. 11).

After assessing girls and boys in forty nations, it was evident that the gender gap is a universal phenomenon. In the International Reading Literacy Study (IRLS), girls outscored boys consistently in 14 out of 24 assessments (NCES, 2003). Beginning in 1981, the United States Department of Education began to track how many more males were failing than females (Gurian, 2001). One factor seen as significant is the differences in structure of female and male brains. Gurian (2005) suggests the need for advocacy for males in school, so severe and unnecessary is the problem seen in gender gaps in both reading and writing.

If females outscore males in the same economic demographics by a wide margin, then White females outscore ethnic, low income males by an even wider margin. The motto “No Child Left Behind” is not matching state and national test scores (NCLB, 2010).

In contrast to reading, males and females start kindergarten with similar scores in mathematics but males begin to slightly outscore females in first grade, and the achievement gap in this area continues to grow minimally over time. Boys' success in this area may be because foundational skills in mathematics are taught through concrete and physical instructional practices. As the child is learning one-to-one correspondence the child will touch and move counters while counting aloud. The child will see the amount of objects (visual); will move the objects (kinesthetic—tactile); will see them move (visual); will call out the numbers (aural); and will instantly hear the words being vocalized (auditory). Mathematics is taught through the child's senses, allowing them to move as they learn in contrast to reading which uses primarily the eyes.

Mathematics often requires complex reading ability, thus males' scores in math are affected as well as reading scores. Although males moderately outscore females in the overall area of mathematics, males score lower than females in mathematic tests that require reading, as males could not as easily read the story problems (Yellard, 1998).

A Note of Optimism

The 2010 Nation's Report Card presents one note of optimism: there was growth seen in the area of those reaching Basic Level or higher in the fourth grade by an eight-point margin. The growth was attributed to newly implemented accountability systems, content standards, improved teacher training, parent support, the requirement for research-based language arts programs, and a more consistent approach to the development of reading skills in early grades.

These support systems were put into place in the last decade by the No Child Left Behind Act of 2002. This legislation requires that students meet established state

standards in language arts and mathematics (etc.) as measured by state and nation-wide testing (NCLB, 2000). This is noteworthy because the gain in test scores by fourth graders demonstrates that improvement can happen, especially if changes are made in the early years. Regardless of the eighth point upswing in the early grades, too many children in the United States are reading below the 50th percentile (NCLB, 2000).

The Reading Wars: The Background

Literacy rates of America's youth have troubled educators since the mid-1800s. The question has been raised continually: should meaning and comprehension be the focus of reading instruction or should the code of the English language (phonics) be the method of choice for instruction? This became a very political and heated argument that has continued off and on until the present time (Krashen, 2002). The debate over phonics versus meaning appears to be irreconcilable (Chall, 1992).

Horace Mann (1850) railed against phonics instruction describing letters as "skeleton-shaped, bloodless, ghostly apparitions . . . it is no wonder children look and feel so death-like when compelled to face them" (Mann as cited in Adams, 1994, p. 22). Mann believed that the meaning of words would never come from alphabet drill. By the 1920s, this philosophy was established because of an ever-growing multi-cultural society. This movement was similar to the whole language movement of the 1980s and 1990s. "Words were introduced through meanings first—to be recognized holistically by sight . . . phonics was relegated to the position of an ancillary tool; to be introduced gradually, invoked sparingly" (Adams, 1990, p. 5).

This whole language-type approach to reading instruction in America prevailed until Rudolph Flesch wrote a controversial book in 1955 called *Why Johnny Can't Read?*

Flesch saw the English language as alphabetic in nature thus phonetic and believed that this was the only appropriate method to teach reading to young children.

> Good readers were good readers because they spontaneously caught on to the alphabetic nature of print. . . . If a child isn't taught the sounds of the letters, then he has absolutely nothing to go by when he tries to read a word. All he can do is guess. (Flesch, 1955, p. 15)

In the 1980s, the philosophic pendulum swung back to a holistic approach to reading (whole language), influenced by a nation that had become more socially aware of the needs the continually growing multicultural society and the poverty levels affecting learning. Progressive education returned with a focus on child-centered curriculum of the 1800's (Chall, 1992).

Observational studies by various researchers in the field (the Goodmans, Smith, Clay, Routman) reestablished this popular child-centered educational approach. Their ideas were based on linguistic theory not empirical data (Chall, 1992). This educational camp viewed reading "as a psycholinguistic guessing game—that meaning and language were the primary components of reading . . . and was a matter of prediction and individual reaction to the text" (Chall, 1992, p. 319). Chall explains the theory, using their own words: "Learning how to recognize print comes naturally from being read to and from practice in reading connected texts. It does not need to be taught" (p. 320). Smith was concerned that if teachers spent time teaching children to break down words into their orthographic parts in order to read (sound blending) the meaning behind the text would be lost (Smith, 2005).

Education departments in most states in the United States redesigned their language arts frameworks and guidelines from the phonics-based methodology to a whole language approach that respected meaning over phonemic structure (Chall, 1992).

Universities and educational organizations, such as the International Reading Association and their state satellite associations, promoted and taught whole language through conferences and literature. Administration and teachers changed their reading instruction to fit the whole language infrastructure. Phonics as a methodology was taught in few universities even though extensive research on phonemic and phonological awareness was being done during this time period (Adams, 1994; Chall, 1992).

Classrooms were restructured to match the whole language philosophy as new curriculum for teaching language arts was created. Phonics textbooks that cost the nation's schools billions of dollars were discarded even though they had been developed and purchased within the same decade. The key "buzz words" for this educational philosophy were, child centered, authentic, and meaning based (Routman, 1991).

The premise behind the movement was simple and straight-forward: children learn to read and write naturally just like they learn how to speak from infancy. Babies do not receive formal speech instruction, so learning how to read, spell and write would naturally follow this rationale (Routman, 1991; Smith, 1983).

During this same time period (1980s to 1990s), research on the reading process, as well as low national reading scores began to surface (NAEP, 2007). Researchers (such as Adams, Chall, Ehri, Snow, Stanovich, and Torgesen) provided empirical data that demonstrated that children needed to first learn through the alphabet and concepts about print as they developed fluency and understanding of the reading process (Adams, 1994).

In 1997, the National Reading Panel (2000), mandated by the U.S. Congress, did a meta-analysis on effective language arts instruction that was presently used in teaching children. One of the studies was on the alphabet and phonemic awareness, the other on

phonics. A meta-analysis on phonemic awareness provided strong correlational evidence that letter knowledge was the best school-entry predictor of how well children will learn to read (Chall, 1996). The tests used to assess students' knowledge were: phoneme isolation, identity, categorization, blending, segmentation, and deletion.

The results of the National Reading Panel gave evidence that sweeping reforms were necessary in order to raise reading abilities in children across the nation, as demonstrated by national and state test scores (NAEP, 2007). It was questioned, "Do children learn to read better with a beginning method that stresses reading for meaning or with one that concentrates on teaching them how to break the code? The research on this question is copious and varied" (Chall,1996, p. 79). Reading scores provided for public viewing over the last two decades demonstrate that regardless of reading pedagogies over the last 20 years, whole language or phonemic awareness and phonics (the "Alphabetic Principals"), students have made little progress in reading (NAEP, 2010).

Federal Legislation Funds Programs Designed to Improve Literacy

In 1965 nearly half the poor in America were young children. Because of this alarming statistic, Head Start was implemented in every state in the nation as a "comprehensive child development program" (NHSA, 2010). It has provided billions of dollars over the last 45 years for educational support services for toddlers and preschoolers in hopes of preparing them for kindergarten, with the intent of overcoming a direct disadvantage against children in White, middle-class neighborhoods.

Also legislated in 1965 was the Title One Program, created by the Elementary and Secondary Education Act, providing funds for disadvantaged children, insuring them a high quality education; providing resources to help close the achievement gap; holding

schools and agencies accountable; coordinating programs to maximize learning; allowing flexibility to provide more decision-making power to schools; providing enriched and accelerated instruction; and helping parents help their children (Ed.gov, 2009). The Title V Developing Hispanic-Serving Institutions Program, or HIS Program, was first legislated in 1965 and reauthorized in 2008. It provided federal funding to improve instruction and resources that directly affect Hispanic students, K-12 in reading and mathematics (NCES, 2008).

In 1975, the federal government passed the Education for All Handicapped Children Act (Public Law 94-142). This act was re-authorized as the Individuals with Disabilities Education Act (IDEA) which insured equal access to education for all special education students. The intent of all this legislation was to help children, toddlers through 12th grade, to receive an education that meets the needs of every handicapped child, regardless of disability.

In 1998, the House of Representatives passed the Reading Excellence Act (H. R. 2614) with this Statement of Administration Policy:

> H.R. 2614 . . . sets a goal of ensuring that all children read well and independently by the end of the third grade. The bill would: (1) improve teachers' ability to teach reading effectively; (2) promote family literacy programs to help parents be their child's first teachers; and (3) improve the quality of tutoring programs by supporting tutor training . . . many children are referred to special education programs because of their reading difficulties. Research shows that many of these reading difficulties could be remediated without special education, if these problems were discovered and addressed early by trained teachers and involved parents, precisely the kind of activities that the rest of the bill would support. (Gov.track, 1997)

Meta-analyses and other correlational studies led the federal government to seek solutions that would positively affect a large body of students learning in America. Concerns over low reading test scores from students in this nation’s public schools in the

1990s motivated the legislation of the No Child Left Behind Act (NCLB) by Congress in 2002 (Ed.gov, 2010).

The NCLB requires that the curriculum developed for reading instruction must be based on scientific research, that each state must develop content and achievement standards for all grades, and demands accountability from all schools. It requires that all schools provide interventions for students that fail to meet benchmarks, and does give sanctions to those schools that do not make adequate yearly progress (AYP). It requires that every state create methods for tracking the academic achievement of marginalized students (seen as *under-served*) such as low-income students, students with disabilities, and African American and Latino students.

The NCLB Act set a goal that all children become readers by the third grade, including at-risk students (Ed.gov, 2010). Despite five decades of funding and legislation, differing pedagogies, empirical data on best reading practices to come out of federal research organization, the NCLB's (2002) mandates for accountability and research-based curricula, little improvement in reading is seen on state or national test scores for the nation's youth.

Best Practices in Reading

As a part of NCLB legislation, the *Reading First Initiative* was launched nationwide based on the research by the National Reading Panel (2000) to help improve teacher instruction in the language arts process based on scientific evidence researched over more than three decades. From this study, teaching phonemic awareness and the phonological process were found to be essential to the early acquisition of alphabet skills, which is the foundation for reading, spelling, and writing. This panel was founded,

according to data, to establish future success in reading, spelling, and writing (Ed.gov, 2010).

There is strong correlational evidence that phonological awareness (i.e., the alphabet principal or letter knowledge) is "the best school-entry predictor of how well children will learn to read during the first 2 years of instruction" (Ehri et al., 2001). So important is alphabetic knowledge to early literacy for children, hundreds of studies have been completed on the subject (Ehri et al., 2001).

Phonemic awareness is the ability to "manipulate phonemes in spoken words" (Liberman as cited in Ehri et al., 2001, p. 253). Children who lack phonological awareness and fail to understand and master the alphabetic principle are likely to be hindered from reading fluency in later years (Ayres, 1995). Reading fluency is the ability to read words on sight, quickly and accurately, as well as remembering and comprehending what was read. Students may be accurate but not fast or automatic. It is speed of word recognition and comprehension that distinguishes a fluent reader from a non-fluent reader (Nathan & Stanovich, 1991; Willis, 2008). Reading ability affects spelling and written skills as they are interrelated. Children develop an understanding of correct spellings through direct and systematic phonics instruction (Adams, 1994; Chall, 1996).

If students do not master the alphabet and phonemic awareness skills in preschool, kindergarten, and first grade, students may remain poor readers year after year (Juel, 1988; NAEP, 2010). Evidence of this is seen in the lack of proficiency in both fourth and eighth grade students' test scores. If the alphabet, the foundation for reading,

is not mastered early, starting in preschool, students will show little growth from kindergarten to eighth grade (NAEP, 2010).

Children who gain alphabet and phonemic awareness skills in the early years of school will learn to read proficiently, developing a speaking and reading vocabulary by-passing their struggling peers (Snow, 1998). It works both ways. Having an alphabetic foundation builds vocabulary. Having new vocabulary provides more alphabetic knowledge.

> We conclude that the alphabetic system provides a mnemonic that helps students secure new vocabulary words in memory, both their pronunciations and their meanings. This constitutes one more reason why beginners need a strong alphabetic foundation when they learn to read. It helps them acquire new vocabulary words. (Ehri, 2005, p. 178)

Outside of organic dysfunction in the brain, the most prevalent cause of reading disabilities in children is a lack of phonemic awareness and phonological skills (Adams, 1994; Torgesen et al., 1998). Reading is foundational but too many children are having difficulty even with the most basic part of the reading process. This early struggle creates "barriers to later reading and learning" (Lane et al., 2002, p. 1). Some phonological skills are easy to learn (e.g., rhyming) but that once sounds and their letter representatives are introduced, even taught through phonemic awareness activities, difficulty in mastery is experienced for some children. "Children destined to be poor readers at the end of elementary school almost invariably have difficulties understanding and applying the alphabetic principle in deciphering unfamiliar words" (Torgesen et al., 1998, p. 2)**.** One finding of the National Reading Panel (2000) is that early intervention, when problems arise, will help children who are at-risk gain phonological and phonemic awareness skills.

Daily instruction must include the Alphabetic Principles: the alphabet, phonemic

awareness, phonological awareness taught through explicit, direct and systematic instruction. The ability to recode (using semantics and syntax to understand words in context), to read with fluency, to comprehend, and the amount the student reads, determines strong readers (Vandervelden & Siegel, 1995). Daily practice in reading helps children to generalize the sounds in words because of prior experience, allowing them to read more complex text. Teaching children the letter combinations that represents sounds in words help children to identify them automatically in words (Ehri, 2005).

Kuhl et al. (1999) found that speech sounds are completely and perceptually mapped and stored in the child's brain by the time he or she is a year old. Children begin to hear these sounds from the day they are born. If this map is not in place, the child cannot develop oral language, or reading, spelling, and writing skills in the future. Infants, upon hearing these sounds begin to generalize to other phonetic categories. This is significant as this demonstrates the importance of family input in the early stages of the child's development. The conversations that happen in the home by parents and other family members including siblings with the infant is crucial to language development in the future. Experience is the critical factor to develop language, not just time (Kuhl et al., 1999).

Liberman's (1999) research on the connection between speech and reading relates that "the non-alphabetic nature of the sounds makes it that much harder to become aware, that they do, nevertheless, convey an alphabetically coded message" (p. 108). Seeing the difficulty that basic phonological processes might pose for children demonstrates the need to fully understand the process and seek ways to help young children, especially those at-risk, to gain access to foundational skills (Lane et al., 2002).

Obstacles to Reading and Strategies to Overcome Them

> Reading is not a natural part of human development. Unlike spoken language, it does not follow from observation and imitation of other people. There are specific regions of the brain developed for speech and processing oral communication, yet there is no specific center of the brain dedicated to reading. (Willis, 2008, pp. 32-33)

The process of reading has no one specific area in the brain responsible for decoding text, many areas in the brain must participate in order for sound-symbol relationships to form, enabling the child to read, spell and write (Sousa, 2005). The alphabet, reading, spelling and writing are such complex and interrelated processes, they require the integration of three separate neural systems: "semantics (meaning), orthography (visual symbols forming words) and phonology (auditory sounds that form words)" (Sousa, 2005, p. 121).

The Alphabet: Symbolic and Abstract

The alphabet is abstract because it is based on orthographic symbols and is often very confusing to children (Adams, 1994). A child has to learn two sets of alphabet letters: the uppercase letters and lowercase letters. They then have to learn that these symbols represent sound and that each letter has a name (which is also a sound). Between the two sets of letters, many letters look alike, but most look dissimilar. Children must learn these two sets of graphemes as well as letter names and letter sounds in a short period of time during kindergarten. Often this information is taught all at one time and not always successfully (Adams, 1994).

Knowing how challenging it is to learn the two alphabets, letter names and letter sounds, teachers usually only teach one letter a week, taking 26 weeks for children to learn the whole alphabet. Attempting to read or spell words makes it impossible if the

children have not been introduced to that particular letter yet. Teaching an emergent learner, “This is an A and it says /a/” makes it difficult because letter names and letter sounds both are sounds. When letter names and letter sounds are taught at the same time, the child hears two different sounds for one letter (Adams, 1994).

“Both the immediate and long-term impact of reading depends critically on the speed as well as the accuracy with which readers can identify the individual letters and words of the text” (Adams, 1994, p. 159). If the abstract nature of the alphabetic sound/symbol relationship is not mastered by preschoolers and kindergartners in an automatic and recognizable fashion, children have little hope for learning how to read in the near future.

Even though Chall (1996) stated that knowing the letter names is the best predictor of future reading success, learning the letter names first may confuse children. We do not read in letter names, we read with sounds (Adams, 1994; Bradshaw et al., 1985). Some letter names are so confusing they actually lead the child to spell incorrectly (e.g., say the letter name for W. The first sound you hear is a /d/) (Ehri et al., 1985). Herein also lies the principle argument against teaching letter names: The names and phonemic translations of letters differ, and sometimes greatly, from one another. Eventually the reader must learn to respond automatically to each letter with its phonemic translation. That being the goal, why confuse the child’s Phonological processor by first teaching it to respond with the letter names? (Adams, 1994, p. 352).

Kindergarten teachers teach capital letters, yet lowercase letters are used in text 95% of the time. Capital letters are used only occasionally and for a specific purpose: to begin a sentence or a name (Bradshaw et al., 1985). When a child is taught to recognize

capital letters first, they learn to write in capital letters, unlike the lowercase text with which they will someday use to read and write. As the child writes in all capital letters, it takes more time to read capital letters back to himself or herself because they are all one size. Breaking the habit of writing in all capital letters also puts the child to disadvantage because he or she now has to unlearn something that the child worked so hard to learn (Bradshaw et al., 1985). Science tells us that it is visually easier to read and write with lowercase letters:

> The fact that lowercase letter are easier to read (due to the unique shapes formed by ascenders and decenders) than uppercase holds true not only in body copy but for headlines as well. Headlines set in all caps are more difficult to read, perhaps 15% slower. The reader is forced to read all uppercase headlines letter by letter, rather than in saccadic jumps as with lowercase characters, where we recognize entire words. (Clair et al., 1999, p. 140)

The United States Federal Government has just mandated that all street signs, usually written in all capital letters, must now be written in lowercase letters with the initial letter capitalized because the driver can read it more quickly. This is a safety issue because as drivers are driving and looking for street signs at the same time, reading signs with capital letters takes the eye too long to read, thus can jeopardize driving safety (Winder, 2010).

Forming capital letters are more difficult for emergent writers because there are more diagonals and intersecting lines. One has to pick up the pencil to find another point to draw an additional line in order to complete the letter. Children can write the lowercase letters with one continuous movement for twenty-one of the letters. Only five letters require one additional stroke or a dot. Most lowercase letters are made of “sticks and balls” (lines and circles) and only four have diagonal lines.

Pictorial Mnemonics to Help Cement Sound to Symbol

Using a pictorial mnemonic can help the child remember the sound and shape of the letter together (Ehri et al., 1985). A pictorial mnemonic, such as a house drawn into the lowercase "h," helps to anchor memory. Ehri et al.'s (1985) seminal research with pictorial mnemonics gave evidence that when a letter is directly integrated with a picture (called paired associations) drawn directly into the letter's shape, the child remembers both the sound and shape of the letter.

> The main reason those used in the present study were successful is that here the visual forms of the letters were built into the pictures thus provided a clear connection between the visual stimulus and the verbal picture name that cued the response sound (Ehri et al., 1985, p. 892)

In the 1960s and 1970s, eidetic imagery in children was studied. Studies showed that both young males and females, regardless of ethnic background, could look at a picture shown briefly and describe the details (Rose, 1992).

Movement and Learning

Adding movement to learning, such as a related hand gesture, full body movement (when arms and legs are used at the same time), or some kind of physical action (tossing a ball while reciting the sounds of the alphabet), adds yet another modality to help put new information into long term memory (Brown et al., 2010). "Gesturing in a meaningful way while you are learning may help you when recalling the concept. The idea is that you are storing up at least two different types of information about something you'll need to recall later" (Brown et al., 2010, p. 1).

Neuroscientists have discovered that when the body moves the brain remembers more clearly, and for longer periods of time (Ratey, 2008). Robust movement causes a a neurochemical to secrete a protein (called neurotransmitter) which pour onto the neurons,

acting like a fertilizer. This chemical is called Brain-Derived Neurotrophic Factor (BDNF) and builds neural circuitry and strengthens the neural connections that bring information into long term memory (Ratey, 2008). Ratey calls this "Miracle-Gro for the brain" (Ratey, 2008, p. 42). BDNF "is a crucial biological link between thought, emotions and movement" (Ratey, 2008, p. 42). When we exercise or do complex types of movement, "we are exercising the areas of the brain involved in the full suite of cognitive functions" (Ratey, 2008, p. 41). The discovery of BDNF was made in the 1990s and yet it has stayed in the field of neuroscience until recently. The concept still has not integrated into mainstream curricula (Medina, 2009).

In 2004, the California State Department of Education completed a study on the relationship between physical fitness and academic achievement. The more children moved in games and fitness activities, the stronger the achievement in academics. The results can be seen in Figure 1.

Children were born to move (Medina, 2008; Ratey, 2008). Adding movement while learning gives the brain yet one more pathway to reach long-term potentiation (LTP) which is a highly complex and integrated process allowing us to remember myriads of details in information (Rudy, 2008). "Movement play lights up the brain and fosters learning, innovation, flexibility, adaptability and resilience" (Brown, 2006, p. 84).

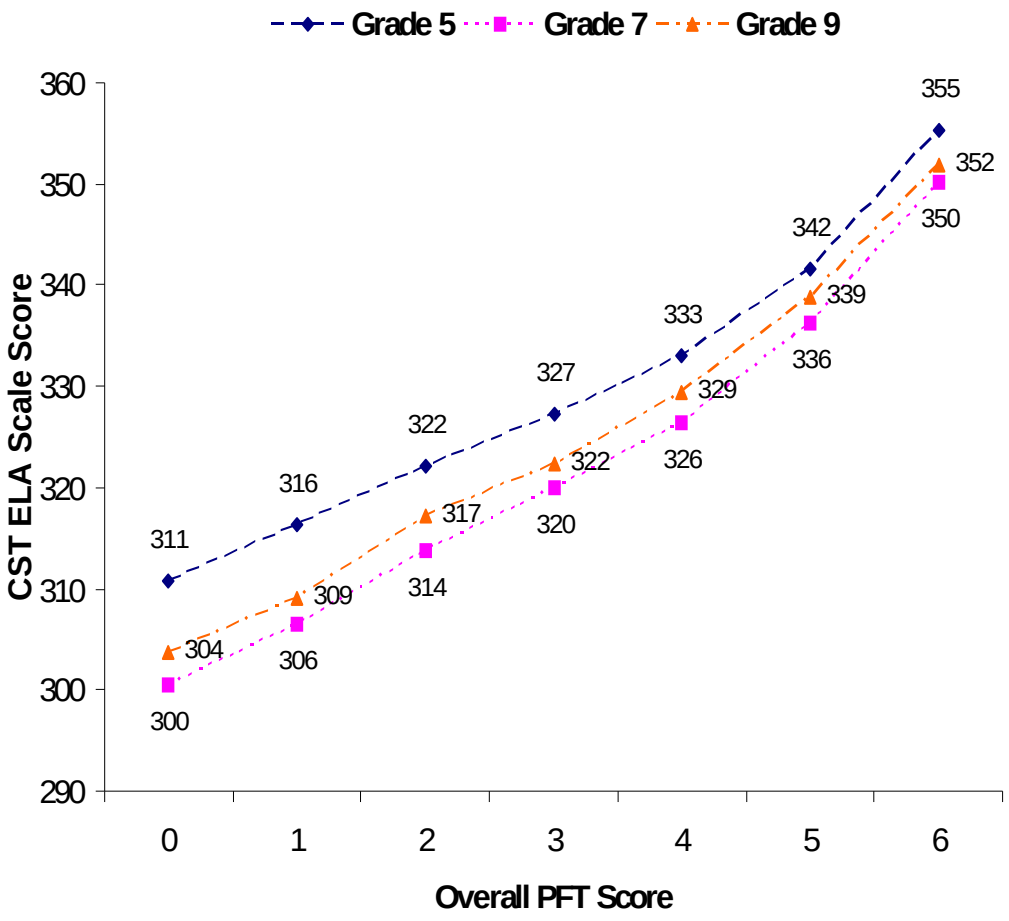


Figure 1. Relationship between physical fitness and academic achievement.

The brain likes novelty. It captures both its attention and focus. Novelty can be anything that surprises or delights. "We are created to desire novelty" (Brown, 2009, p. 171). Use of novelty for children is a way to keep their attention and focus so the instruction can get into long term memory, but it is more powerful than that. Novelty addresses the amygdala, the gate keeper of long term memory. Physical movement during class instruction "counts as a novel experience" (Ratey, 2008, p. 46).

Even though educational researchers and neuroscientists (Ratey, Willis, Wolfe, Medina, Rudy, etc.) have provided evidence that suggests that multisensory input is pivotal for memory, classrooms are set up to restrain children on a spot on the carpet or at a desk. Opportunities for physical movement and sensory exploration during alphabet instruction are not built into alphabetic curriculum (Medina, 2008). Traditional curriculum, found in classrooms all over the world, even those used to teach early-learners in preschool and kindergarten, primarily use the child's eyes and ears (Sprenger, 2008). Only occasionally is the child's voice heard during instruction time (Spenger, 2008). The child's access to print is limited to hearing what the teacher reads aloud, or writes on the board, or is shown in a big book (Lengel, 2010; Sprenger, 2008).

Play, Memory, and Learning

Play is an integral part of who the child is. It is what children do best as they move their bodies unceasingly, turning anything into a gun, a truck, or a hat. "Of all the animal species, humans are the biggest players of all. We are built to play and built through play" (Brown, 2009, p. 5). Play strengthens connections between the areas of the brain that might otherwise be weak. Anything learned through playful instruction and interaction with teacher and peers enhances learning and memory (Brown, 2009).

Integrating play into learning activities and materials strengthens learning (Elkind, 2007). Not only does the child receive pleasure during the experience and socialization that is positive, but the play takes his or her mind off the learning aspect of it, which might be perceived as work. The child physically moves and uses his or her senses to attach meaning to the learning. The amygdala allows the information to get into long term storage because the child is enjoying him or herself (Willis, 2008). "A comparable

study demonstrated that children's reading achievement was greatly facilitated when they were involved in imaginative play with adults" (Elkind, 2009, p. 211).

According to Elkind (2009), through baby and toddlerhood, love, play and work are united as one entity; but as the child ages, enhanced by the school setting and the need for children to become learned members of society, even in kindergarten, play, love and work become disconnected. Piaget said, "Play is the answer to the question, How does anything new ever come about?" (Jerz, 2010, p. 1). Play is rehearsal for real life (Ratey, 2008).

The Structure and Function of the Brain

Prior to birth, the brain creates 250,000 neurons per minute. When a baby is born he or she starts life with 100 billion neurons. A neuron has three components: a cell body, a dendrite (like a branch) and an axon (like a freeway). Information enters the cell body and is sent down the axon to the dendrite to communicate with another neuron. The timing of this action is within milliseconds; and while this is taking place, neurons are communicating in a likewise manner at the same time. Human beings can take in multiple pieces of information at one time. The brain takes all this in comfortably, sorting pertinent information through neural networks, letting unimportant, irrelevant information go (Sprenger, 1999).

"Neuroscientists define learning as two neurons communicating with each other. Neurons have "learned" when one neuron sends a message to another neuron (Springer citing Hannaford, 1999). Neurons have a "use it or lose it" structure called neural pruning. Although the brain does not actually loose neurons, neurons can lose their connections and their ability to make new connections die if not "used at appropriate

times during brain development" (Sprenger, 1999, p. 2). The process of neural pruning is important to understand as it relates to child rearing and classroom instruction. If neurons do not connect with a vital piece of new information, an opportunity for learning is lost.

As neurons make connections and new learning takes place, the information needs to be stored efficiently for long term memory. The brain has three main phases of memory: learning of new information, storage of new information, and retrieving this information for usage (Squire & Kandel, 1999). At any one of these stages, memory can be interrupted or distorted (Sprenger, 2008).

Neurons send messages and makes connections when the information is taken in, primarily through the senses. The child's brain accesses all information through the sensory organs. He or she sees, hears, utters, feels, smells, or touches the information before the information travels to the brain stem on its way to the thalamus. The thalamus acts like the switch board. It analyzes and sorts the information before sending it to the many "association areas" in the neocortex. Visual stimuli goes to the visual association in the occipital lobe, and so forth. Each association is specialized to receive, sort and analyze the new information. If the information needs immediate attention, the reticular activating system (RAS) awakens the brain by sending chemical messages to get the brain's attention and focus (Sprenger, 2008).

The brain searches for meaning in order to make connections with previously learned and stored (two different processes) information gained primarily through our sensory pathways or modalities (sight, hearing, taste, smell, hearing, movement, touch). Instruction which reaches more than one neural pathway helps the child to remember new

information either coming from the child's environment or through direct instruction from parents, siblings, teachers (Sprenger, 2008; Willis, 2009).

As new information enters memory through the senses it has to be taught in such a way that the child understands the information taught. Access to long term memory shuts down until the information is taught in a way that the child can understand the information or the steps to a process (Sprenger, 2008; Willis, 2009). Once it finds its way into memory, the hippocampus (a part of the limbic system), will keep the new information in long term memory if it is factual and critical. If the information is emotional in nature, the limbic system sends it to the amygdala for storage (Sprenger, 2008).

The amygdala is the second filter system that processes emotion. If the new information taught is abstract, holds no meaning for the child, the child may become disinterested, lost, confused, threatened and stressed, the child's brain will shut down and learning will stop (Rudy 2008).

> If the amygdala determines that the stimuli are potentially harmful, it triggers the hypothalamus, which in turn sends hormonal messages to the body, thus creating the physical changes that ready the body for action: heightened blood pressure, increased heart rate, and muscle contractions. (Wolfe, 2001, p. 27)

In contrast, when the amygdala senses that the child is being taught in a sensorial, novel, playful and meaningful way the amygdala accepts the information and establishes it into short term or working memory and then stores it long term memory for future retrieval (Rudy, 2008).

Neurons have assignments for information that might not be used for decades. For example, one set of neurons may house the lyrics for music that might not be heard and recalled for 40 years. As soon as the music is played, the memory is activated and the

words are instantly remembered. Without the music, words would stay in storage in long term memory (Wallace, 1994). This demontrates how long term memory works. Information is recalled only when needed. This is true only if the information has made its way from short term to long-term memory (Willis, 2008).

A third factor in learning is a chemical neurotransmitter called dopamine. It allows information brought in through sensory input to pass through the above two filters if learning is taught through pleasurable experience (Willis, 2010). Says Willis, "Using brain-friendly strategies empowers your child to respond to the most useful sensory input from her environment and turns that data into retrained knowledge" (2010, p. 4).

Stages and Types of Memory

There are several different stages and types of memory that is essential for the teacher to understand in order to better teach young children with maximum efficiency (Sousa, 2006). How the teacher presents new information to children directly relates to what is understood, remembered, retrieved, transferred and utilized by the child (Sprenger, 1999).

The stages are: "sensory/immediate, working, and long-term" (Sousa, 2006, p. 80). Sensory/immediate or short term memory takes in many different pieces of information at one time. It has a filter that, instantly or little by little, filters out unimportant, unrelated information while it searches for patterns and familiarity (Sylwester, 1995). "Our conscious brain thus monitors the total sensory field while it simultaneously searches for and focuses on familiar, interesting, and important elements" (Sylwester, 1995, p. 93). The thalamus and the hippocampus work with the amygdala to move important information into the child's long term memory (Promislow, 2005). The

teacher's job is to create a playful, physical, sensorial, and socially-interactive learning atmosphere that converts abstract information into concrete information so the brain will remember it.

The types of long-term memory are declarative, non-declarative, and emotional. Declarative memory remembers facts, names, items, and music. From declarative memory, we can break it down further into episodic, semantic and procedural memory. Episodic memory is the conscious memory of events that have taken place in one's life. This give the person a sense of who he or she is as an individual because it is everything he or she has heard, seen, done, and participated in.

Semantic memory is the part of memory that remembers facts and figures that are unrelated to episodes in one's life. History is a good example of semantic memory. It does not relate directly to the individual who is studying it. The brain absorbs the information but does not connect it personally to the individual. Because of this, factual learning is often the hardest to achieve. This type of learning needs strategies such as pictorial, verbal, physical, alliterative or musical mnemonics to aid in memorization of factual information (Terry, 2006).

Non-declarative, or more recently called procedural memory, is the type of memory that remembers everything that is not declarative but is physically done through the senses and by the body. Riding a bicycle or driving a car are two examples of how procedural memory works. It is physical, often called muscle memory.

Emotional memory relates directly to how the person was feeling at the time new information was learned. A smell or music might elicit an instant memory of something

that took place years before. The amygdala participates in emotional memory at all times and acts as the gate keeper for memory (Terry, 2006).

The implications for learning are relevant to this study. How teachers present new instruction or reinforce prior learning is the difference between learning and non-learning (Sousa, 2006). Playfully rehearsing new or old information is essential for memory. The more elaborate the practice, the stronger the neural connections are for remembering what is taught (Sousa, 2006; Terry, 2006). Turning a piece of information into elaborate information signals its importance to the brain. Adding a picture, a gesture or body movement, or connecting it to another sense, such as smell, establishes memory. "Material that is more imaginable, or concrete instead of abstract, is better remembered. Pictures and objects are remembered better than are words. This may be because of dual coding of both an image and a word" (Terry, 2006, p. 296).

Human beings were born to learn. Educators have but to learn how to develop the curriculum and methodology to help children both learn and store the learning for maximum long term usage (Smilkstein, 2002). The terms memory and learning are related but have different uses. "Learning refers to acquiring knowledge or behavior, whereas memory refers to retaining and recalling the knowledge or behavior" (Terry, 2006, p. 11). You can learn and loose the information (stored in short term memory) or you can learn and store the information in long-term memory and be able to use it at a much later date when needed.

Classroom Application

In order for teachers to help children to keep newly taught information in long term memory, they must first understand what memory is, where memory is housed, and

how it moves from short term or working memory into long term memory (Sprenger, 2008). A child's brain only accepts and remembers information that gets his or her attention (Willis, 2010). The reticular activating system (RAS) is a selective mechanism that filters all incoming information. It responds less to abstract, rote learning than it does to sensory input, especially if taught through physical, novel and playful activities (Ratey, 2008; Willis, 2008). Integrated sensory input creates meaning for the brain that can be used in the near future by the learner (Bundy et al., 2002; Medina, 2008; Willis, 2008).

If the child uses his or her eyes, ears, mouth, smell, taste, and body to play with the alphabet children will gain mastery of the alphabet and phonemic awareness skills that lead to reading fluency. (Children can see letters in the shapes of objects or animals for letter sound connections; move like the objects or animals represented by the letter; sing songs about the sounds and shapes of the letters; scratch the letters on sandpaper with cinnamon sticks; toss beanbags on letters as they call out the sounds.). The novelty of these types of activities will gain and keep their attention.

Playing with the alphabet letters rather than sitting and copying them on paper will engage them for longer periods of time, causing oxygen to course through the body, and the brain to secret the neurons with BDNF (Ratey, 2008). Participating with a partner or a group of peers with playful and physical alphabet activities provides socialization, laughter, and a feeling of safety, which will awaken the amygdala to open up the doors for memory (Sprenger, 2009; Willis, 2009; Wolf, 2000).

Practice has to take place for the child to remember the newly taught material. The materials and activities have to be carefully planned because what is rehearsed is remembered (Sousa, 2005). The brain learns in intervals, so taking a quick stretching

break or starting a new, related activity will give the child's brain a necessary rest. Instruction can then resume (Willis, 2007).

Research from neuroscience demonstrates that there is a difference in the neuronic structure of the brain between a stimulated and enriched young brain and an under-stimulated, un-enriched one (Jensen, 2006).

> Animal studies have found that enriched environments can induce important changes in the brain, including enhanced functioning and development in areas related to cognitive capacity, learning, memory, and resilience. Depending on the design of the study, the results might include more neurons, longer dendrites, more connections, heavier brains, greater brain mass, more intra-and intercortex connectivity, and enlarged capillaries.(Jensen,2006, p. 56)

Children, from preschool throughout their school experience, must not only gain necessary skills to learn to read, but also must feel able and comfortable to enjoy the learning experience at the same time. Any threats to learning creates stress in the student and the affective filter from the amygdala in the limbic system (known as the visceral or emotional brain) shuts down and does not allow learning to occur (Diamond et al., 1985; Willis, 2008).

The limbic area in the brain is involved with memory and constantly receives information from the senses, affecting visceral motor (internal organs), endocrine (hormonal release into system) and somatic motor effectors (movement) (Diamond et al., 1985). If a child feels a "fight or flight" urge, the endocrine system may release hormones into the bloodstream causing the bowels to run, the stomach to produce acid, the heart to pound, and the muscles to tighten. Students cannot learn in such an environment (Willis, 2008).

Understanding Vygotski's Zone of Proximal Development will help teachers know when to allow a child to discover and when the child needs modeling and guidance

from the teacher (Psychology, 2010) Learning this can help educators watch for frustration and confusion in children. One concept has to be mastered before going on to the next skill. Repetition and feedback must occur. The brain is constantly looking for meaning. Allowing children time to rehearse the information will give the brain time to understand and remember (Wolfe, 2001).

Curriculum must be designed to meet the physical, social, emotional and biological needs of all children (Gurian & Stevens, 2005; Medina, 2009; Sprenger, 2008). Scientists and educators must join to create a dialogue in regards to the development of curriculum that actually matches the needs of children's (both male and female) brain growth and activity. It is no longer a matter of how children learn to read best, but which curriculum stimulates brain growth and development most efficiently in order to produce successful learners (Medina, 2008; Sprenger, 2008).

Gender Issues

A phenomenon is occurring in our society where males of all ages are becoming more and more disenfranchised from education. "We find that male and female brain structure is a direct causal factor" (Gurian, 2001, p. 59). Brain, sociological, and psychological analysis is being done to discover the possible causes. Gender science is a relatively new domain which connects brain science with anthropological and biological sciences to understand children and how they learn most effectively (Gurian & Stevens, 2005, p. 43).

Says Gurian (2005),

> The new nature-based gender science can arm teachers and parents with successful methodologies for teaching boys (and girls) language arts, reading, writing, math, science, athletics, and the arts. This new science makes it possible to care for boys (and girls) who are highly sensitive, who are undermotivated, and who have learning difficulties. (p. 43)

Women are the primary forces in early education and elementary school. Female teachers have a tendency to teach through their learning styles and femininity (Gurian, 2001). It is may not be a match for little boys. The preschool and kindergarten years are the most formative years in a child's education and any threats to learning for either gender seriously hinders academic growth (Gurian, 2001).

"The teacher wants [the boy] to sit down and be quiet and listen, while he wants to run around and jump and yell. After a few weeks he's not going to see the point of going to school at all. That's when the tantrums begin" (Sax, 2005, p. 25). Expecting males to sit with "criss-cross apple sauce" arms and legs and listen while the teacher teaches disappoints both child and teacher (Gurian, 2005; Sax, 2005). Should boys change to fit the curriculum and method or should the method and curriculum fit the boy? (Gurian, 2005).

> (1) In general, the male brain is not set up as well as the female brain for language arts learning; thus males will often need extra linguistic help, adjusted reading choices, and creative teaching to perform at par with females in this area.
> (2) Our school systems are actually contributing to the growing gender gap in language arts by denying boys the content, curricula, teaching strategies, and multimedia techniques they need in order to gain some parity in verbal learning. (Gurian, 2005, p. 139)

Gurian and Stevens (2005) state that 50% of the early childhood population is being left behind. Prior to entering and exiting kindergarten, males lag behind females in reading skill development, regardless of economics (CEP, 2010). The Urban Institute

(2010) found that girls begin and exit kindergarten with a two-point lead in reading over boys which continues to widen over the next 2 years.

Gurian is concerned for males in general. The concern must be greater for males from low income families where poverty and language barriers might impact learning (NAEP, 2010). These children may be diagnosed with learning disabilities and attention deficits, where if we had just taught to their "male" needs, they might have escaped the academic struggle (Gurian, 2001). We have far too many children who do not have a strong skills or understanding of the reading process (NAEP, 2010).

Parents and teachers relate that girls are more willing and able to stick to tasks than boys; that older students fair better in attention span than younger students; and that children not considered at-risk perform and persist on tasks than those judged as at-risk (West et al., 1998, p. xi). According to Salmone (2003) boys have more challenges in the domains of sitting still, attending to and completing tasks, and develop literacy skills at a slower rate.

Statistially, "65% of young boys disadvantage in reading skills, as well as fine and gross motor skills" (p. 86). Gurian (2005) calls this "boy energy" that may keep them for sitting still long enough to learn (p. 44). According to Gurian (2005), it can also be one of the greatest assets as well as it is that which builds homes, roads, rocket ships" (p. 44). This energetic child (which goes for girls as well) needs movement: running, skipping, jumping, hopping, climbing, and kicking (Gurian, 2005).

Fine motor skills and coordination are significant factors to literacy, which is also another factor of age. Large and fine motor skills are involved in writing, play, physical education, keyboarding, manipulating small objects, shoe tying, and so forth, which are

all part of the kindergarten experience. Touching and doing is central to early learning. According to Hannaford (1997), "using hands on experiences for manipulatives during the learning process greatly increases learning efficiency . . . touch is a strong anchor in behavior and learning" (p. 41).

In his brain-based learning teacher trainings, Gurian reminds the teachers to allow males to move, to use manipulatives, to use fewer words with them. He recommends a "physical environment for every lesson" (Gurian, 2001, p. 101). Boys need more space to move, less time sitting on the carpet or at a desk. They need to move while learning, through learning and in support of learning (Gurian, 2001).

Differentiated Instruction

"How children approach learning is central to their chances for success in school. Children's learning styles reflect how they address learning" (West et al., 1998, p. 3). Knowing that children need to utilize several senses (modalities) at one time when learning new information (because it stimulates neural pathways and helps with recall) will change the way teachers involve children in the learning process.

Curriculum which involves the child's senses, the eyes, ears, and mouth, as well as the child's body, will establish the importance of the subject or object taught for long term memory (Sprenger, 2008). Knowing that children need to move as they learn will help teachers configure the classroom to give them room. Understanding the novelty and play is a crucial part of a child's life and essential for learning and memory will inform curriculum directors to design lessons with the child's brain in mind.

The classroom teacher needs to learn about each child's learning styles or strengths (whether auditory, visual, spatial, kinesthetic, or various combinations of

styles). Since every learner is unique, the teacher can teach the child according to how best to get the child's attention in order to get information into their brains (Sprenger, 2008).

Science and Educational Practice

The United States Department of Education's Office of Educational Research and Improvement (OERI) funded the study on *How People Learn: Brain, Mind, Experience, and School* which reviewed a large body of research that, when synthesized, offered "research-based messages that are clear and directly relevant to classroom practice" (Donovan et al., 1999, p. 1). According to this study, classroom practices must be challenged through evaluation, insuring that they align to the principles of learning (1999, p. 3). The OERI is committed to bring insight from research into classroom practice. Some of the insights are: (a) Children, as young as preschool, attempt to make meaning out of their environments; (b) are not clean slates; (c) need to have foundational facts, organized in a way that can be retrieved; (d) need to take control of their own learning; (e) teachers must use the information that children already have and build on that foundation; 6) schools must be child-centered; (f) teachers must closely monitor their students' progress and adjust curriculum and strategies to match the child's needs; (g) teachers must asses students' knowledge often, helping them to discover misconceptions as well as strengths (Donovan et al., 1999). "Now that the newer sciences of cognition and development have transformed our understanding of learning and the development of expertise, measurement theory and practice need fundamental rethinking" (Donovan et al., 1999, p. 10).

Finding out what motivates the student to learn, to stay on task, to self-regulate behavior are found to be some of the keys to learning (Donovan et al., 1999). Scientific evidence on how children biologically, psychologically, physically, and sociologically learn best has yet to fully inform mainstream educators (Medina, 2009; Sprenger, 2009). Although well-educated, teachers rarely read research studies primarily because of time constraints. Teachers may also be more inclined to practical applications and outcomes more than theory.

> If scientific evidence is not used to make educational decisions, then what is the alternative? Historically, across many fields of practice, the alternatives to scientific evidence have been appeals to tradition, philosophy, superstition, anecdote, or intuition (the latter is sometimes cloaked as reflective practice or reasoned professionalism). (McCardle & Chhabra, 2004, p. 48)

"Vast personal experience does not necessarily impart conscious insight into what works. That is, teachers might believe a practice works despite directly observing children's repeated failure using that practice" (2004, p. 50). It may also be that what teachers see in their classroom does not reach the ears of the principal, superintendent, the school board, or curricula developers.

After evaluating the advances in reading research through use of neuroimaging, neurotransmitter measurement, and neuroelectrical recordings that catch the brain in the act of reading, I am inspired to see how powerful the research becomes when educators apply the increasing understanding of the brain to develop and enhance their brain research-compatible reading instruction strategies (Willis, 2008, p. 157).

Brain research "is giving validity to the successful methods that have worked for years, and it is uncovering new information that will change the way we teach and the way students learn for years to come" (Sprenger, 1999, p. 102). As new technological

advances have emerged, it is now possible to do non-invasive research on children's brains to see how best they learn (Pet Scans, fMRIs or functional magnetic resonance imaging, etc.). Scientists are now able to see how and where the brain is activated given various learning stimuli. Multiple studies on this subject are emerging daily which will inform the educational profession (Medina, 2009; Sprenger, 2008). This information needs to connect with mainstream curricula, teacher training and classroom practices.

The *No Child Left Behind Act* (2002) mandated that scientific research is to identify the best practices in education for reading. It cannot just stay in the realm of content, it has to define the vehicle that carries new learning into the child's brain, to stay and be used (Sprenger, 2008). In order to design curriculum for effective practice, it must first be demonstrated through rigorous studies using empirical data.

Researchers continue to study both the learning process and the reading process in order to teach those with disabilities, emergent readers, English Language Learners, and to help older students who have yet to reach proficiency. The achievement gaps between ethnic groups, economic strata, and genders are a subject for more study. "Panel reports continue to play a major role in bringing the research and practice communities up to date on the state of the science in various aspects of literacy" (McCardle & Chhabra, 2004, p. 463).

Reading Programs Used in the Study

Similarities and differences of the two reading programs. The two reading programs, the vehicles for this study, will be analyzed as to how each work to teach and enhance kindergarten students' understanding of alphabetic, phonemic, and phonological concepts and skills in order to acquire complex reading, spelling and writing skills in the

future (Lonigan, 2006). Both the SRA/Open Court Reading Series and the Zoo-Phonics Language Arts Program provide direct, systematic instruction and explicit alphabetic, phonemic and phonological awareness in the daily lessons. Both use literature as the foundation for reading and as the reason why children learn reading skills. Music, poetry, drama and fine arts are incorporated into instruction. Both follow the California State Content Standards for kindergarten and list the standards where they can be seen easily by teachers.

There are differences in how both programs impart the instruction. This has been analyzed through a large body of research, reviewed in Chapter Two, on how the brain in the young child accesses, stores, retrieves, utilizes and transfers information for learning.

The SRA/Open Court Reading Program. The SRA/Open Court Reading Program has been taught in public schools for over 60 years as one of the few consistent proponents of phonics. Even through the Whole Language era, the SRA/Open Court Reading Program continued to present its phonics instruction when phonics was not valued in education (Borman, Dowling, & Schneck, 2000).

The SRA/Open Court Reading Series, developed by McGraw-Hill Publishers, was adopted by the California Stated Department of Education in 1997 and again in 2002. Its kindergarten reading program is comprised of educational practices, backed by a vast body of educational research conducted over the last forty years, in the area of teaching the Alphabetic Principals (the alphabet, phonemic awareness and phonics).

In 1996, the effectiveness of this explicit, systematic program was field tested and a comparison study was completed by Foorman et al, (1997). The findings of this study demonstrate the effectiveness of the SRA/Open Court Reading Series with at-risk

students, as measured through various tests, including standardized tests (SRA/Open Court Reading, 2002, p. vvi, Unit 2).

The SRA/Open Court Language Arts Program is one of the standard-bearers of research-based programs (California Department of Education, 2002) and was adopted in California as one of two California State Adopted Language Arts Programs in 1997 and 2002. It is the mandated reading program for the school district in this study.

The SRA/Open Court Reading Series has been known for decades for its phonics approach to reading as well as one that has used pictorial mnemonics for memory enhancement of letter sounds. The SRA/Open Court Reading Series has always provided a basal reading series with a phonics emphasis since the early 1950s.

Alphabet and Phonemic Awareness Instruction

The SRA/Open Court Reading Series presents the alphabet by first presenting the capital letters and their and lowercase counterparts (N n) at the same time, and also teaching the letter names. The shapes of the upper and lowercase letters are practiced for handwriting daily. Letters are not taught in alphabetic sequence. The letters taught first are based on the letters that have no stops (f, h, l, m, n, r, s) and those most frequently used in word building.

In Unit 3, letter sounds are introduced for the first time but not as a complete entity known as the alphabet. Each student focuses on his or her own special capital letter that begins his or her name and children are to become experts on that capital letter.

Letter sounds are taught individually, found at the beginning of words. Letter sounds are not taught fully until Unit 4. At that time, the pictorial letter cards are introduced to support letter sounds. Each child receives his or her own set with which to

practice. The cards are not drawn in the shape of the letter as recommended by Ehri (et al, 1985) but do start with the initial letter sound of the object (e.g., a bouncing ball = /b/; sizzling sausages = /s/). Vowels are taught letter, and are presented with the sound embedded between two consonants found in the object: lamb, hen, pig, fox, tug. No pictures or mnemonics are given to help remember the long vowels.

While children are being taught the upper and lowercase letters and letter names, words that are most frequently used in speech and text, called high frequency words, are taught at the same time. High frequency words do not have a controlled vocabulary but are taught as a part of early education curriculum so children can begin to read simple sentences. Educators feel that the first twenty-five high frequency words are important as children need to read them quickly and accurate on sight. Specific graphemes and phonemes (units of sound in text and speech, /ea/ for example) are taught later, after the letter sounds are taught, so children can sound out larger words, through onset and rimes.

The terms "explicit, direct, systematic" are used often in the teacher's manual. The teacher is intimately involved in the impartation of instruction and is not seen as a only facilitator. According to the Random House Dictionary of the English Language (1996), the word "explicit" means "fully and clearly expressed, nothing merely implied" (p. 502). The word, "direct" means to have control; to administer, "to give authoritative instruction to" (1996, p. 407). "Systematic" refers to something arranged in an orderly manner (p. 1444).

The National Reading Panel (2000) completed a study that endorsed the model used by the SRA/Open Court Reading Series for over 40 years. The American Federation of Teachers (AFT) identified this reading series "as a program that incorporates research-

based instruction as well as classroom data to support its effectiveness" (SRA/Open Court Reading, p. vii, p. vi). Many school districts that use the SRA/Open Court Reading Series have been given either private grants or federal grants through the United States Department of Education's Reading Excellence Act.

All instruction is housed in various themes relevant to kindergarten children. The activities within the print-rich lessons are designed to develop children's understanding and development of alphabetic, phonemic and phonological awareness skills as established by state frameworks and content standards based on what is deemed appropriate for kindergarten children.

The curriculum is divided into four sections: "Sounds and Letters," "Inquiry," "Reading and Responding" and "Language Arts." A classroom bulletin board focuses the child's attention on new concepts to be learned. This bulletin board is specifically for student ideas and questions on the concepts in the daily lessons, encouraging student ownership and interest.

Inside each of these sections contain a "Warm Up," (a review of prior instruction and the concept 'set' for new learning); "Phonological and Phonemic Awareness" (listening for sounds in nature, words, rhymes, etc.); "Alphabetic Knowledge" (learning the letter names and their shapes); "Letter Shapes" (forming upper and lowercase letters and locating them in words in the classroom); "Reading a Pre-decodable Reader" (learning high frequency words, understanding the structure of books, reading aloud, discussing the pictures, making predictions); "Print and Book Awareness" (locating words that start with focus letter); "Story Crafting" (event sequences, telling the story); "Sounds and Letters" (matching uppercase letters to lowercase letters with objects that

start with the letter sounds); and "Reading the Big Book" (reading literature, vocabulary: meaning and development, and comprehension through discussion).

Quotes from researchers are included throughout the various units as well as important teaching tips. A box called, "Universal Access: Meeting Individual Needs" directs teachers to a supplemental teacher's guide for instruction in language arts for English Language Learners (ELL), special needs students, and for those who are just a little behind.

Informal assessments are available to determine which students are having difficulty as well as those who have mastered the concepts. Student objectives are included in the "Reading and Responding" section which direct student learning and mastery. This section introduces the authors and illustrators to both teacher and child. Different genres of literature are presented, inclusive of both fiction and non-fiction; poetry; nursery rhymes; scientific information; and musical lyrics.

A large body of research demonstrates that phonemic awareness (awareness of phonemes or sounds that relate to symbols) helps children gain an understanding that the words that they speak are comprised of small units of sound, from single sounds to sound combinations, created by syllables or phonemes (Adams, 1994). In the SRA/Open Court Reading series for kindergarten, phonological awareness is taught through direct and systematic instruction, integrated with literature, read-alouds, writing, and science activities.

Rhymes are integral to the daily focus, as are reciting the letter names. As children are read to with the Big Books, in a large group format, children are asked questions and encouraged to both ask and answer questions, as well as reflect on the story

line. Understanding the concept of "book" and "print" is significant to the process. Children learn where the top and bottom of the book is, and who are the author and illustrator. They learn that reading and writing is accomplished left to right and top to bottom.

Guided practice is the direct instruction by the teacher to lead children to various points of learning through student action, whether it be in writing, reading, language conventions, or vocabulary. Informal and formal assessments are presented throughout the series seen in the forms of a teacher's observation log, pre-, mid- and posttests. Assessments cover oral fluency, writing, spelling, vocabulary, comprehension, grammar (usage and mechanics), and literature. A Diagnostic Assessment is available to develop individualized instruction for those who need either remediation. Class and student assessment records are also included for teacher use. Differentiating Instruction for both whole group and small group instruction is provided throughout the units through additional guides and workbooks (SRA/Open Court Reading Series, 2002).

Zoo-Phonics Language Arts Program

History

The Zoo-Phonics Language Arts Program (1985) was created by two special education teachers as a way to reach students with learning disabilities who could not learn the alphabet, reading, spelling and writing skills through an abstract method. The primary concern of Zoo-phonics is to reach every child. Since 1985 their motto has been, "No child shall slip through the cracks" (Bradshaw et al., 1985, p. 23).

The use of pictorial mnemonics and body movement to teach the lowercase letters and sounds, cemented together through a body movement, succeeded with special needs

students of all ages because it used all of the child's modalities. If the child had a visual disability, Zoo-phonics supported the child kinesthetically, aurally, auditorily, and tactily. If the child had an auditory deficit, Zoo-phonics supported the child visually, kinesthetically, aurally and tactily. It became mainstreamed into public schools in 1991 in California through educational conferences, workshops and by word-of-mouth from teachers. It began to spread to other states and countries over the next two decades. The Zoo-phonics Preschool Language Arts Program recently won the Teacher's Choice Award from Learning Magazine (2010).

The Essences of the Program: An Overview

The essences of the program sets it apart from other programs:

1. The animals, drawn in the shape of the lowercase letters, help children remember the shapes and sounds of the letter. The alliterative names of the animals teach the sound.
2. Letter sounds are taught before letter names.
3. Lowercase letters are taught before capital letters.
4. The body movement (Signal) for each animal letter helps "cement" the phonemic information into memory.
5. The alphabet is taught sequentially, as a whole entity, "a – z." the alphabet is not fragmented.
6. Short vowels are taught before long vowels.
7. Phonemic patterns (at, bat, fat, sat, et cetera) are taught first rather than random word lists on non-controlled vocabulary (of, then, was, because, their, they're, there).

8. High frequency words are taught phonemically, not by sight memorization.
9. Phonics is taught as an integrated part of the language arts process.

Zoo-phonics teaches the alphabet as a whole entity, teaching the lowercase letters and their sounds first, "a – z." The children play with the alphabet "a – z" daily through large Animal Alphabet Cards. These act as flash cards so the letter sounds can learned automatically.

Children stand, sit on the carpet, or at their desks when signaling and sounding the alphabet and words. They also move out of their seats to play physical games that connect with the alphabet, graphemes and phonemes, and words: running games, tossing balls, hunting for hidden pictures, playing "Red Light, Green Light," "Mother May I?" and "Simon Says," all while using their bodies to "signal" out the letters as they pronounces the sounds.

Because there are two sets of alphabet letters (upper and lowercase), so many of which look are similar, children may get confused (Adams, 1994). Teachers can instead use pictorial mnemonics to teach the letters, allowing children to move their bodies to reinforce sound-symbol relationships for memory. Because there are letter sounds that are difficult to articulate and distinguish perceptually, one from another, an alliterative name is given to each animal (allie alligator; bubba bear, etc.) which is used so the mouth can pronounce the sounds so the ear can hear them. When the child's eyes, mouth, ears, and body support learning, mastery is achieved quickly.

The alphabet is first taught by showing the very young child the Animal Picture only (see below). The teacher states what kind of animal it is, pronounces the letter's sound by stretching the /a/, and moving the arms like an alligator's snout (open and close;

open and close). The second stage is to show the Animal Alphabet Letter in its "merged" stage, where the same animal letter that they have been seen, pronounced, heard, and physically performed, is now sitting on the lowercase letter for association. As the children play with the merged animals, they make their own transition enabling them to remember the "a" in isolation (in books, on menus, food packaging, et cetera) and can now participate when the parent or teacher reads a book to him or her. The child will point and say, "That's allie alligator! /a/, /a/, /a/."

Figure 2. Large animal alphabet cards, in sequence of learning.

For toddlers first learning vocabulary, teaching the Animal Alphabet to them through the body movements helps them form speech sounds that they have heard but are yet to pronounce properly. "Snake" may be "nake" to the two year old, but with signaling and sound support taught with the Animal Alphabet, the child will learn the /s/ sound quickly and know what the "s" looks like in print. Parents and teachers can use the body movements while saying the sounds to help support speech development in toddlers and children with speech delays.

The premise of Zoo-phonics is that lowercase letters are used in text 95% of the time and should be taught first. Letter sounds relate directly to reading and spelling, while

letter names often distort speech sounds (Adams, 1994). Zoo-phonics believes teaching the lowercase letters first to children will enhance their usage of letters in self-directed activities as they roam the home or classroom looking for letters that match their animal letter friends.

> Herein also lies the principal argument against teaching letter names: The names and phonemic translations of letters differ, and sometimes greatly, from one another. Eventually the reader must learn to respond automatically to each letter with its phonemic translation. That being the goal, why confuse the child's Phonological processor by first teaching it to respond with the letters' names? (Adams, 1994, p. 352)

Many kindergarten students struggle with the shapes of the letters because there are letters that look similar to each other. Many of the sounds of the letters are similar and hard to differentiate one from another. By using pictorial mnemonic devices, and at the same time a related body movement, they provide the brain with stimulation because many senses are activated at one time. The pictorial mnemonics helps to make sense of an abstract concept as it moves its way into long-term memory through the senses and through body movement (Ehri et al., 1985; Ratey, 2008).

Uppercase letters are included in early instruction when the both the upper and lowercase letters are the same in shape (C c, O o, X x; Z z). Uppercase letters are taught in the same playful, physical, multisensory way. Learning capital letters is connected to the prior learning of the lowercase letters animal letters. There is a set of Large Capital Letter Alphabet Cards that shows the same animal resting on the uppercase letters, just like on the Large Lowercase Animal Alphabet.

Children remember the sounds of the letters that match with the letter shapes because they see a funny animal in the shape of the letter; they wiggled their bodies and pronounced the sound every time they see the letter. This helps children to transfer the

information to their environment (grocery store, road signs, menus, books, store signs, etc.) .

As the alphabet is being presented and learned, the teacher (and parent) will ask, "What sound do you hear in the word, 'door'?" Children will quickly signal and say, "deedee deer, /d/, /d/, /d/. Zoo-phonics explores initial sounds until children demonstrate mastery. The next skill to be learned is discriminating ending sounds. Once that is mastered, students are ready to explore medial sounds, which are harder to differentiate because they are housed between two consonants or other letters and sounds. Zoo-phonics calls the vowels "The Hardest Workers" because there are only five of them (sometimes "y" and "w" take on vowel sounds), and they have to be in every syllable. Hard hats and vowel animal puppets are part of the curriculum and materials to help children solidify these concepts.

Once children have successfully learned how to discriminate medial sounds, the teacher can then introduce the "Make It Say . . . Game" using the Large Lowercase Animal Alphabet Cards. The teacher will choose a word family or rime ("at" for example), also selecting the possible consonants with which to build "at" family words. A child is asked to come up, select the appropriate Animal Letter Card (the "c" for example), place it in the right place to form the word (following a left to right progression), and then will lead the class in signaling and sounding out the whole word, "cat." Asking the child to use the word in a sentence builds semantic and syntactic skills as well.

Students are taught to read and spell more challenging words through the same Animal Letters using various levels of flash cards presenting the graphemes seen in word

families (or onset and rimes). This aids children to hear the sound patterns in words (/ad/ in bad, dad, fad, had, lad, mad, sad, glad; /ai/ brain, grain, rain, stain, strain). Once children have mastered CVC words, many blends will be taught as early as Week 6. (e.g. by Week #24, they will have been introduced and have practiced: sp, nd, fr, ft, gl, pl, sl, ck, qu, sk, st; and the digraph, th; the schwas' sounds in "a" and "the").

Specific graphemes and phonemes (units of sound in text and speech) are taught so children can sound out larger words, and always through word families (onset and rimes) so children can hear the repetitive sound patterns. They are presented in a sequential manner, from easy to more difficult. High frequency words that a child can sound blended easily are taught first (up, in, an, on, his, etc.). More challenging high frequency words are taught phonetically as skill levels increase (that, this, these, etc.) (Zoo-phonics, 1985).

Because of the abstract approach in early childhood curriculum, a lower level of learning and mastery is expected of children. A slower path is taken, only introducing a few letters at a time, presenting first only letter sounds most frequently used in speech and words. With Zoo-phonics, teachers can establish the alphabet as the foundation for all reading, spelling and writing, and get the child ready to start the process early in the year because the alphabet is no longer abstract and non-personal.

The Zoo-Phonics Kindergarten Program

Zoo-phonics teaches through two cycles in the day: (a) is to teach "a – z" every day and throughout the day (signaling the /m/ in milk; /d/ for desk, etc.); (b) the second cycle concentrates on two letter sounds and shapes that week and explores as many things that start with those two letters as possible. In week one, children will explore allie

alligator's /a/ sound and bubba bear's /b/ sound. (/a/ on Monday and Tuesday; /b/ on Wednesday and Thursday; a review for /a/ and /b/ on Friday).

Integrated curriculum (in a separate manual, on a CD), includes math, art, science, social studies, cooking/nutrition, psycho-motor, sensory/drama. Children can explore all subjects with their animal letter friends. In math, the children will count with the animal letter: "allie's smile is like the sun, open and close and count to one, one!" (children do the alligator's body signal one time, feeling the count of one); children will add and subtract with apple slices (and eat them too); will make apple prints in art; will try asparagus for snack; will learn about alligators and ants in science; will listen and play along with African rhythms on musical instruments; and locate Africa on the map. Use of technology is encouraged. Children will go to a nanny protected website to see the different topography, people and animals of Africa.

For bubba bear's /b/ sound, children will toss bean bags, do back bends, build bridges with blocks, eat broccoli and bananas (and smell them too); will bake bread and make homemade butter in an old fashioned butter churn that children will physically take turns spinning; and learn about bears, butterflies (and their life cycles), bugs, birds; sing and dance to boogie-woogie music; listen to Bach and Brahms; dance and clap to the rhythm of banjo music, et cetera. Children will signal and sound the letters through science, math, social studies, literature, snack, art, music, thus anchoring the letter sounds in memory (Ratey, 2010).

The curriculum is meaningful, relevant to children, interactive and integrated. Children participate with their senses throughout the lessons. Body movement and sensory stimulation are built into every activity. Home support is available on Mondays

so parents can help children discover the sounds of the week that match items in the home, on a menu, in the grocery store, on a bill board or store front sign. Parents are encouraged to learn the animal-related body signals, too. In the teaching manual (Safari Into Reading, Spelling and Writing), teachers are encouraged to train the parents to learn the body signals, the proper sounds of the alphabet, how to read a literature book and connect the alphabet playfully into the reading, and how to create literacy moments in the home, car, restaurant, grocery store or while waiting in the doctor's office. Zoo-phonics reminds both teachers and parents, "Keep it light and make it fun!" (Bradshaw et al., 1985).

As a part of the Zoo-phonics curriculum, there are puppets, how-to-draws, an interactive DVD, readers, mini-books, music, read-alongs with songs, various reinforcement games, rubber stamps imprinted with the animal letters, and a computer font with the animal letters for both child and teacher use. An extensive assessment battery provides teachers additional tests on all aspects of language arts, from preschool through third grade levels. It includes goals and objectives to help design an individual education plan for each student.

Summary

The SRA/Open Court Reading Series and the Zoo-Phonics Language Arts Program have much in common. Both follow California State Content Standards; both contain direct, systematic and explicit instruction when teaching the alphabet, phonemic and phonological awareness. Both integrate literature, the arts and music into daily instruction. Both programs agree that foundational skills such as the alphabet and phonemic awareness skill development are pivotal for early reading success. They both agree that without these skills, children may not learn to read successfully in the future.

The two reading programs disagree on when to teach capital letters and letter names. The SRA/Open Court Reading Series believes agrees with researchers that say that knowing letter names is a precursor to future reading success (Chall, 1992). Zoo-phonics believes that because text is written in lowercase letters 95% of the time, it is essential to teach these skills first. They also believe that if children master the sounds and letter shapes of the lowercase letters early in the year, kindergarten children can start the reading and spelling process earlier than is expected for kindergarten children.

Where the biggest difference lies is in the delivery of alphabetic information. Whereas the SRA/Open Court Reading Series primarily engages the children's eyes and ears, and occasionally the child's voice, the Zoo-Phonics Language Arts Program engages the whole child: eyes, voice, ears, and body. The child moves through the alphabet, when sound blending, when spelling if needed. With each new grapheme and phoneme learned and reinforced, the child moves through it as he or she uses his or her eyes, voice, and ears, establishing long term memory and future usage.

The SRA/Open Court Reading Series is a well-respected program and has been for over six decades. The Zoo-Phonics Language Arts Program has been tried and tested for twenty-seven years and continues to gain respect nationally and internationally.

CHAPTER 3: METHODOLOGY

Restatement of the Problem

The purpose of this study is to determine the effectiveness of a multisensory approach to teaching the alphabet and phonemic awareness skills to kindergarten children. Three research questions were explored in this study:

1. R Q 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?
2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach
3. R Q 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

Research Method and Design

A quantitative, quasi-experimental research method was used to compare two different reading programs for kindergarten children. For the control group, a traditional, non-multisensory approach and program was used (the SRA/Open Court Reading Series). For the experimental group, a multisensory teaching approach and curriculum (the Zoo-Phonics Language Arts Program) was used as the treatment to teach the alphabet and phonemic awareness skills to kindergarten students.

This study design collected data from two groups of kindergarten students over a school term, from 2006 to 2007, using a series of tests called District Cluster Tests (DCT). For most DCTs, data were collected each trimester, starting in November, ending

in June. A second assessment (to answer Research Question 3) was administered in September of 2007 to 2008 to the same children in the study (now first graders) to determine if they had mastered letter-sound recognition. Students' tests, from every kindergarten in the district regardless if they were in the study or not, were compared to the treatment group.

The Selection of Subjects

This study investigated learning outcomes of kindergarten children that range in age from 4.11 to 6.7 years of age, who come from low to middle income families that have a predominant ethnic mix. The district and classes were selected because they offered demographics typical of the student population in this region of California (see Schools A, B, and C below for ethnic composites).

Out of seven elementary schools, only three schools were chosen to participate in this study because of the similarities in demographics, which lent integrity to the study. The primary ethnic group in the three schools is Hispanic with fluent, limited to no English spoken in the home (57.7%) with an average of 15.9% White population. Other ethnic groups are comprised of Filipino, East Indian, and African American.

The subjects in this study were children ($N = 113$) enrolled in six different kindergarten classes, in three elementary schools, in one multi-ethnic suburban school district in Northern California. Two schools (four kindergarten classes) participated as the control group ($n = 79$) and one school (two kindergarten classes) participated as he experimental group ($n = 34$).

The request to do the study was asked of the Superintendent of Schools, to see if he had two teachers willing to participate in a year-long research study participating as

the experimental group, using the Zoo-Phonics Language Arts Program (Group C). Two teachers from one elementary school agreed to participate with their kindergarten students in this study ($n = 34$).

Through the suggestion of the Superintendent of Schools, teachers participating as the control group were not told that their students' test scores would provide comparative data for this study. All teacher and student names were protected and not revealed with the data. As each student enrolls in the district, a student identification number is assigned to him or her. These student identification numbers were used in the compilation of test scores in lieu of student names. This also was used to insure that the same children in the first grade assessment in 2007 to 2008 were the students in kindergarten in 2006 to 2007. If they were not enrolled in the school during this time, they were excluded from the study.

School names were also protected, using only these assignations: Control Group A (one kindergarten class), Control Group B (three kindergarten classes), and Experimental Group C (two kindergarten classes). For tables and graphs, the raw scores from the classes in both groups were aggregated and disaggregated to show specific information. When the classes from the control group are disaggregated showing individual schools, assignations will be shown as Control A 1; Control Group B 1; Control Group B 2; and Control Group B 3. When test scores of the experimental group are disaggregated, it will be shown as, Experimental Group C 1 and Experimental Group C 2. Disaggregations will be completed to show growth by individual schools over the course of the school year, with a comparison made between the control and experimental groups.

The Teachers in the Study

Participating teachers in the experimental group had Bachelor's Degrees and California Elementary Life Credentials. One teacher had a Master's Degree and the other was in the process of obtaining it. Their teaching experience ranged from 7 years to 12 years. The kindergarten teachers who participated in the control group all had Bachelor's Degrees and California Elementary Life Credentials but did not have Master's Degrees except for one teacher, who also had 35 years of teaching experience at the time of this study. This group's teaching experience ranged from 5 years to 35 years. No teachers in either group had special education or reading specialist credentials.

The Zoo-Phonics Language Arts Program was new to both kindergarten teachers participating in the experimental group. Both teachers participated in a 1-day training session in its methodology and curriculum prior to the start of the school term. Complete sets of Zoo-Phonics materials were supplied to both teachers.

Whereas the teachers in the experimental group participated actively by teaching the treatment vehicle (the Zoo-Phonics Language Arts Program), the teachers in the control group (the SRA/Open Court Reading Series) did not know that their students' test scores would be used as raw scores for data for this study. The superintendent felt it was not necessary to tell the teachers as they would not be affected because we were only using student scores. There was also some concern that because the purchase of the SRA/Open Court Reading curriculum and training was gained through Hewlett-Packard grants and was mandated by the district, as the use of the Zoo-Phonics Language Arts Program might have jeopardized the grant. Permission was given, regardless. The

teachers (control) taught through SRA/Open Court Reading Series as a part of the district mandate and natural course of the year.

Demographics of Schools in the Study

School A, who participated as one of the control groups, had 352 students at the time of this study (2006 to 2007), and 19 kindergarten students whose scores were used in the study. The following explains its ethnic composite. Percent of total: American Indian (2) 0.6%, Asian(14) 4.0%, Pacific Islander (36) 10.2%, Filipino (16) 4.5% , Hispanic (195) 55.4%, African American (11) 3.1% ,White (77) 21.9%, Multiple/No Response (1) 0.3%. Total: (352) 100%.

School B who participated as one of the control groups, had 423 students at the time of this study, with 60 kindergarten students whose scores were used in the study. The following explains its ethnic composite: Percent of total: American Indian (1) 0.2%, Asian (19) 4.5%, Pacific Islander (46) 10.9%, Filipino (16) 3.8%, African American (6) 1.4%, White (17) 4.0%, Hispanic (318) 75.2%, Multiple/No Response (0) 0.0%. Total (423) 100%.

School C who participated as the experimental group, had 251 students at the time of this study, with 34 kindergarten students whose scores were used in the study. The following explains its ethnic composite: Percent of total: American Indian (0) 0.0%, Asian (2) 4 9.6%, Pacific Islander (31) 12.4%, Filipino (39) 15.5%, Hispanic (79) 31.5%, African American (9) 3.6%, White (69) 27.5%, Multiple/No Response 0 0.0%. Total 251 100% (Ed.data, 2010).

The Reading Programs Used in the Study

Prior to this study, all kindergarten through sixth grade teachers had used the district mandated the SRA/Open Court Reading Series (2002) and had used it since 2003. One of the schools in the control group received a grant in 1999 from the David and Lucille Packard Foundation. This foundation set up the Reading Lions Project (1999) for the purpose of reading improvement in California. Funds for Open Court curriculum and training were provided. This grant was renewed in 2003, at which time all schools in the district adopted the Open Court Reading Series. The grant also provided curriculum and training for all Kindergarten to sixth-grade classrooms in this district.

Both the SRA/Open Court Reading Series (control) and the Zoo-Phonics Language Arts Program (1985) (treatment) teach the alphabet, phonemic and phonological awareness skills throughout the year, through a direct, systematic, and explicit approach (Adams, 1994). Many genres of literature and music support children in learning about print and language. Both groups believe that "the immediate and long-term impact of reading depends crucially on the speed as well as the accuracy with which readers can identify the individual letters and words of the text" (Adams, 1994, p. 159). Both programs are aligned with California State Content Standards.

How the control group and the experimental group approaches their instructional content is different for both. SRA/Open Court Reading Series teaches through a traditional way of teaching the letters and their purposes through various phonemic awareness activities that are not considered multisensory in approach. The Zoo-Phonics Language Arts Program encourages students to use the full spectrum of their senses

(eyes, ears, mouth, smell, taste, touch, and movement) throughout alphabetic, phonemic awareness and phonological instruction.

The SRA/Open Court Reading Series teaches the uppercase letters and letter names first because of the belief that "the best predictor of beginning reading achievement to be a child's knowledge of letter names" (Bond & Dykstra, 1967; Chall, 1967). When teaching the upper and lowercase letters and sounds, Open Court presents the letters that are most frequently used in speech. Children are also taught words that are most frequently used in speech and text (called high frequency words). When the sounds of the alphabet are taught later in the year, the use of pictures to represent the letter sounds are provided for the children (e.g., A picture of P<u>a</u>m the L<u>a</u>mb is used to teach the short /a/ sound, etc.) which act as a visual-auditory device for memory. Specific graphemes and phonemes (units of sound in text and speech) are taught later, after the letter sounds are taught, so children can sound blend more complex words, through word families (onset and rimes) (SRA/Open Court Series, 2002).

Zoo-Phonics believes that teaching lowercase letters and sounds first agrees with Adams (1994) who states,

> Herein also lies the principal argument against teaching letter names: The names and phonemic translations of letters differ, and sometimes greatly, from one another. Eventually the reader must learn to respond automatically to each letter with its phonemic translation. That being the goal, why confuse the child's Phonological processor by first teaching it to respond with the letters' names? (p. 352)

Since lowercase letters are used 95 % of the time in text, Zoo-Phonics believes teaching the lowercase letters first to children will enhance their usage of letters.

The Zoo-Phonics Language Arts Program (1985) teaches the alphabet as a whole entity, teaching the lowercase letters and their sounds first, "a – z," and approaches the

alphabet physically. Its premise is that lowercase letters are used in text 95% of the time and that letter sounds relate directly to reading and spelling, while letter names often distort speech sounds, causing confusion for the child (Adams, 1994).

On the first presentation the children see each animal drawn in the shape of a lowercase letter, presented on large flash cards, "a – z." These animal/letters act as a visual mnemonic device so the child can visualize and remember the picture that connects to the letter (Ehri et al., 1984). Letters, without related pictures, are symbols, often similar in shape, and are abstract (Adams, 1996). An alliterative name is given to each animal/letter helping the child hear the sound of the letter and connect it to its letter shape (e.g., allie alligator for the short /a/, etc.). This acts as an auditory-visual memory device. An animal-related body movement is given to each animal letter, called a "signal," which anchors the sound of the letters to the letter shapes, acting as a visual-kinesthetic mnemonic device. At the same time that the child sees the animal/letter, the child pronounces letter sound and moves his body. The child sees, says, hears, and "does" each alphabet letter for the purpose of memorization and mastery.

Children are taught capital letters and letter names after they have mastered the lowercase alphabet and letter sounds (Adams, 1994) using the same mnemonic memory devices that were used for the lowercase letters. Students are taught to read and spell simple to more challenging words through the same animal letters flash cards, presenting the graphemes seen in word families (or onset and rimes). This helps children to hear the sound patterns in words (/ad/ in bad, dad, fad, had, lad, mad, and sad; /ai/ in brain, drain, grain, strain, etc.).

The graphemes and phonemes are presented in a sequential manner, from easy to more difficult. High frequency words, which a child can sound blended easily, are taught first (up, in, an, on, his, etc.). More challenging high frequency words are taught phonetically as the students' skill levels increase (that, this, these, etc.) (Zoo-Phonics, 1985).

Instrumentation

The Test Instrument

The test instrument, called the District Cluster Test (DCT) used in this study to assess students' alphabet and phonemic awareness knowledge was adapted from a series of assessment tests designed by the Open Court Reading Series in 1997 and used in the California Reading Lions Project (CRLP, 1999). These assessment tests used in the CRLP were modified over time by selected teachers and administration participating in a tri-district collaborative. The work of this collaboration resulted in the development of the District Cluster Tests used in this study. The modified DCTs had been used by the district since 2003.

District Cluster Test Aligns With State Content Standards

The DCTs used in this study align with California State Standards established for kindergarten children in the area of alphabet and phonemic awareness instruction (CDE, 2010; see Appendices). DCTs 1 to 6 were used to collect data to answer Research Question 1.

The DCTs assess students' understanding and mastery of the alphabet and phonemic awareness skills through the recognition of: (a) Uppercase Letter Recognition by Letter Name, (b) Lowercase Letter Recognition by Letter Name, (c) Blending

Compound Words and Onset and Rimes, (d) Rhyming, (e) Blending Phonemes (c-a-t = cat), (f) and Segmenting (cat = c-a-t). A seventh DCT 7, which assesses for Letter Sound Recognition of Lowercase Letters, will be used to collect data to answer Research Questions 2 and 3. This DCT is not usually administered until the first week of first grade. From this point on, all DCTs will be listed by number rather than name.

District Cluster Test Time Frames

Depending on the type of DCT, some tests were administered as a group and some were individually administered. Not all DCTs contain three Windows (W 1, W 2, W 3) for testing students. If the learning concept was taught from the beginning of the year, the children would be assessed three times throughout the school term. Some learning concepts are not taught until later in the year because of the level of difficult of the skill, so students would only be assessed in W 2 or W 3, later in the year. W 1 DCTs were administered at the end of the first trimester in November of 2006. W 2 tests were completed in March of 2007. W 3 tests were completed in June of 2007. If a child reached mastery in a prior window, they were not reassessed.

To answer Research Question 1, all of the District Cluster Tests, 1 through 6 were given to each kindergarten student in the study, whether control or experimental. To answer Research Question 2, DCT 7, separated into Consonants and Vowels, with scores then averaged together, was administered. To answer Research Question 3, the students in both the control and experimental groups were assessed with DCT 7 the first week of school in 2007 is first graders.

For an additional view of all kindergarten students in the school district and how they performed on Lowercase Sound Recognition, DCT 7 was administered and data

were collected in 2007. Four of these schools participating in DCT 7 were not in the original study. These four additional schools were not in the same ethnic or economic demographics as the three schools in the study, as they were from upper-middle income families who were predominately White. They were excluded from the study for that reason.

Reliability and Validity

The DCTs have not been tested for reliability or validity as they were not standardized against a large population of students once they were modified from the original assessment series. They are simple tests designed to assess skill development in kindergarten over the course of a school term.

District Cluster Test Content

1. DCT 1 Recognition of Uppercase Letters by Letter Names. Kindergarten students were asked to recognize uppercase letters (capital letters) in a random order. The first assessment took place in W 1 and again in W 2 and W 3.
2. DCT 2 Recognition of Lowercase Letters. The lowercase letters were also presented in random order for children to identify. The first assessment took place in W 1 and again in W 2 and W 3.
3. DCT 3 Blending (Compound words and Onset & Rime). Children were asked to blend two words or sounds together. For example, /birth/ and /day/ becomes birthday. /p/ and /uppy/ becomes puppy. This skill was first assessed in W 3.
4. DCT 4 Rhyming. Rhyme Matching and Rhyme Production test results were combined for an average score: (a) Each child was read three words, two of which rhymed; the student had to determine which to words rhymed; (b) the

child was also read a word to the child had to respond with a word that rhymed. This skill was first assessed in W 3.

5. DCT 5 Blending Phonemes. Students were asked to listen to the sounds pronounced in segmented form by the teacher and put them back together to form a word. For example: /b/ /i/ /g/ became "big." This skill was first assessed in W 3.
6. DCT 6 Segmenting Phonemes. Students were read a word and then had to segment the word into its sound parts. Example: fan became /f/ /a/ /n/. This skill was first assessed in W 3.
7. DCT 7 Lowercase Sound Recognition. This test assesses students' knowledge of consonants and vowel sounds of the lowercase letters. Students were asked to look at a lowercase letters, both consonants and vowels, and give their sounds. The scores, from this test, were combined.

As a part of the original DCT series, the Test for Auditory Analysis Skills (TAAS) was also given to kindergarten students. The directions are as follows: The teacher is to sit behind the student and call out two nonsense words to see if the child can differentiate between the two. The test was difficult to administer and difficult for the child to understand. This can be seen by the low test scores across the kindergarten classes. Only one teacher had success with the test because she had used it since 1993 when it was first developed. Including this test skews tests scores for all students, thus it was deleted from this study as well as from future district tests (Principal from school district study, personal communication, September 10, 2010).

District Cluster Test Time Frames

Not all DCTs contain three windows (W 1, W 2, W 3) for testing students. If the learning concept was taught from the beginning of the year, the children would be assessed three times throughout the school term. Some learning concepts are not taught until later in the year, so students would only be assessed in W 2 or W 3, later in the year. W 1 DCTs were administered at the end of the first trimester in November of 2006. W 2 tests were completed in March of 2007. W 3 tests were completed in June of 2007. If a child reached mastery in a prior window, they were not reassessed.

Data Collection Procedures

In the 2006 to 2007 school term, 113 ($N = 113$) were assessed by their kindergarten teachers through the DCTs described in *District Cluster Test Content.* An additional test on letter-sound recognition was given to incoming first graders (those students who were enrolled in kindergarten the previous year) and in the first week of September in 2007 to 2008. These DCTs had a three-fold purpose: (a) to determine if children had developed alphabetic and phonemic awareness skills; (b) to determine if the child was considered Advanced, Proficient, Strategic, or Intensive; and (c) to compare scores of classrooms and schools in the district. For this study, the students' scores provided comparative data.

Both the control and the experimental groups were evaluated on the basis of the dependent variable (student progress or lack thereof demonstrated by the differences in scores as seen in Windows or W 1, 2, and 3, comparing the two groups). All test scores from the various schools in the district were collected and compiled after the school term was over by the Assistant Superintendant of Instruction.

Kindergarten students were assessed at the end of each trimester starting in November. This was called Window 1 or W 1. Window 2 (W 2) was assessed in March and Window 3 (W 3) was assessed at the end of the school term in June. Because of the difficulty of a specific concept and skill, some tests were not given until W 2 or W 3 because students had not yet been taught that concept. If children reached mastery (e.g., +26/26) in a prior window, the student was not retested in the next window.

In the following school term, 2007 to 2008, these same children, assessed in the experimental and control groups in 2006 to 2007, were assessed by their first grade teachers, throughout the district, on letter-sound recognition for both lowercase vowels and consonants at the beginning of the new school term. As a part of the research design, the researcher asked the teachers participating in the experimental group to assess their kindergarten students' knowledge of letter-sounds at the beginning of the school year in 2006. A DCT for consonants and vowels was used, just as it was used in September 2007 assessment. Trimester assessments for letter-sounds were complete in September and again in November. If the child mastered the skills in any of the windows, they were not tested again.

Permission was granted at the district level by the Superintendent of Schools, by the site principal, and by parents whose children would participate in the experimental group. This was necessary because the curriculum, as the treatment for the experimental group, was a different curriculum and methodology than the district normally used. The treatment was used for the entire school term. Letters of consent were given to the superintendent, the principal, the two teachers, and the parents whose children participated in the experimental group (See Appendices A through D).

The researcher was given permission by the Superintendent of Schools to access student test scores for both the experimental and control groups. These spreadsheets were re-designed to contain only the students' district identification number and school name (Cited in this study as: Control Group A, Control Group B, and Experimental Group C).

Raw scores were gained by counting how many correct answers the students got on each test. Percentages were calculated by raw scores. Comparisons between W 1, W 2, and W 3 demonstrated growth or the lack thereof. When the DCTs were completed, the scores were compiled by each teacher into a Microsoft Excel™ spreadsheet and given to the Assistant Superintendent of Instruction at the school district. Once the scores were compiled, students were eliminated from the study if he or she did not complete all Windows in the cluster tests throughout the year.

The Assistant Superintendent of Instruction annotated if the students were Second Language Learners; from which ethnic backgrounds they belonged; whether a child had been identified for, or was presently in, special education; whether the child had entered the classroom later in the year, or had exited the class mid-year, thus quitting the study. This information was used to determine equivalency of ethnic and economic demographics; to explain why test scores were missing in certain windows; and to give a picture of the academic aggregate of the classrooms. Test scores from these students were not used in a comparative study because the sample was not big enough to do comparisons by gender, ethnic groups, or low-income students.

Institutional Review Board

This study is an analysis of student text data. Permission to conduct the study was received from district officials, teachers and parents. Direct contact with students was beyond the scope of the study.

All completed Argosy University paper work was sent to the Institutional Review Board (IRB) for approval prior to the proposal defense. A proposal of intent was given to the IRB containing the purpose and information in regards to the participants in the study. The proposal disclosed a promise that no harm will come to students, teachers, parents, schools, school districts, or administration. Teachers, administrators, parents, students and school names have been kept confidential in this study. Permission was granted to do the study at this district because there is the potential for benefit for students in the future. No information has been withheld from participants with regard to the nature of study, or its purpose.

Letters (see Appendices A through D) were sent to the district superintendent, the principal of elementary school allowing the experimental group, and teachers in the experimental group. All rights of the participants were explained to the adults. A letter of Informed Consent (Appendix D) was sent to all parents of kindergarten students who were to participate in the experimental study group. It was explained that because of the study, a different reading program would be used with their child than what was to be used in the other kindergarten classes in the district. Parents retained the right to refuse permission and had the right to quit the study at any time. No refusals from parents were given to the researcher. The teaching of the kindergarten children in the experimental group was the full responsibility of the two kindergarten with no interference from the

researcher. The teachers in the control group taught the district mandated curriculum and assessed their students as a part of the natural course of the school year.

Data Analysis

SPSS Tests

DCTs 1, 2, 3, and 4 had either two or three windows in which to make the comparisons, therefore a mixed model Analysis of Variance (ANOVA) was run. For tests that have only one window with which to make a comparison, an independent sample test run. This applies to the DCTs 5, 6, and 7 (for 2007). A repeated measures ANOVA was used when only the experimental group was tested on DCT 7 over the course of the school term. There was no control group comparison for this assessment.

Mean scores for all students were aggregated and analyzed by the *Microsoft Excel® Program* which created tables and graphs so results can be easily viewed. All tables and graphs are explained in narrative form in Chapter 4.

Research Questions

1. R Q. 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?

DCT 1 through 4 will be used to collect raw scores. Results of W 1, W 2, and/or W 3 will be compared as the control vs. experimental groups are compared. A mixed-model Analysis of Variance (ANOVA) will be used to determine differences among the different testing periods, the control and experimental groups, as well as any possible interaction occurring. This will help determine if there is a significant increase in scores,

any differences between the groups. For DCTs 5 and 6, a independent samples t-test will be used because raw data is gleaned only from W 3.

2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?

DCT 7 used to assess students through W 1, W 2, and W 3 with the experimental group only. Vowels and Consonant Sounds were assessed separately but the scores were averaged together. Because there are three windows and no control group comparison, a repeated measures ANOVA was used to determine differences among the different testing periods.

3. R Q 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

DCT 7 was also administered at the beginning of the 2007 school term entering as first graders. Scores were compared, control vs. experimental groups. Two different comparisons of students are shown: The first comparison is from the same control vs. the experimental group participating in the 2006 to 2007 study who shared similar ethnic and economic demographics. The second comparison shows all first grade students who were in kindergarten during the 2006 to 2007 school term vs. the experimental group. Since all students except the experimental group used the SRA/Open Court Reading Series, it was fitting to include their scores as a comparison to see how the experimental group fared against children from a different ethnic and economic demographic. The four additional schools are in a higher economic stratum (and lower percentage of free and reduced lunch eligibility) and are predominantly White.

When comparing the means of two groups on one single test (a test that was not repeated), an independent sample test was used. This test will be run two times, once covering the Vowel Sounds and once covering the Consonant Sounds. Mean scores for all students were aggregated and analyzed by the *Microsoft Excel® Program*. All tables and graphs are presented and explained in narrative form in Chapter 4.

CHAPTER 4: FINDINGS

Introduction of Content

This chapter presents the results of the research presented through narrative, tables and trending tables that show results from the various District Cluster Tests and the statistical analyses that were run. The results are explained through each Research Question. An overall analysis is included after each Research Question analysis.

The purpose of this study was to determine the effectiveness of a multisensory approach to teach the alphabet and phonemic awareness skills to kindergarten children in comparison to a non-multisensory approach.

Three research questions were explored in this study:

1. R Q. 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?
2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?
3. R Q 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

Overview

In one school district in Northern California, three schools, and six kindergarten classes participated in this study. A series of District Cluster Tests (DCTs) were used to assess children to determine growth over the course of the school year. Results from

these tests were used to make the comparisons between the control and experimental groups. Tests will be designated by number rather than name:

- DCT 1—Uppercase Letter Recognition by Letter Name
- DCT 2—Lowercase Letter Recognition by Letter Name
- DCT 3—Blending Compound Words and Onset and Rimes
- DCT 4—Rhyming
- DCT 5—Blending Phonemes (C-A-T = CAT)
- DCT 6—Segmenting (CAT = C-A-T)
- DCT 7—Letter Sound Recognition of Lowercase Letters

Data Presentation

Research Question 1

1. R Q. 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?

DCTs 1 through 6 were used to answer Research Question 1. Not all cluster tests have the same amount of Windows from which to compare data, so different tests for data analysis were run accordingly. For DCTS 1, 2, 3, and 4 a mixed-model Analysis of Variance (ANOVA) was used to determine any statistical differences among the different testing periods, the control and experimental groups, as well as any possible interaction occurring. Raw scores, means, and their standard deviations will be determined by comparing W 1, W 2, and W 3, as well as comparing control vs. experimental groups. For DCTs 5 and 6, which only had W 3 from which to gain data, an independent samples *t* test was run.

For DCT 1, a mixed model Analysis of Variance (ANOVA) showed that time proved to be a significant factor $F(2, 107) = 82.73$, $p < .001$. Examining the means across the different Windows showed an increase from the first Window to the third Window. No significant differences among means was discovered $F(1, 107) = .003$, $p = .953$, which lead to the conclusion that the overall scores on this particular test did not show any statistical difference between the control or experimental groups (See Table 1.). No significant interaction was found in this analysis $F(2, 107) = .704$, $p = .496$, which symbolizes that although scores increased over time for both the Open Court and Zoo-Phonics groups, the actual rate was similar, although Zoo-Phonics scored slightly higher (See Table 1 and Figure 4).

For DCT 2, a mixed model Analysis of Variance (ANOVA) was used to determine differences in test scores as well as any possible differences between Open Court and Zoo-Phonics and any possible interaction that had occurred. Time proved to be a significant factor $F(2, 107) = 121.16$, $p < .001$ and examining the means across the different Windows showed an increase from the first Window to the third Window. No significant differences among means was discovered $F(1, 107) = .032$, $p = .858$ between Court and Zoo-Phonics which is leading to conclude that the overall scores on this particular test did not show any statistical difference between the groups, although Zoo-Phonics scored slightly higher. No significant interaction was found in this analysis $F(2, 107) = .190$, $p = .827$, which shows that although scores increased over time for both the Open Court and Zoo-Phonics groups, the actual rate of growth was similar. (See Table 1 and Figure 4).

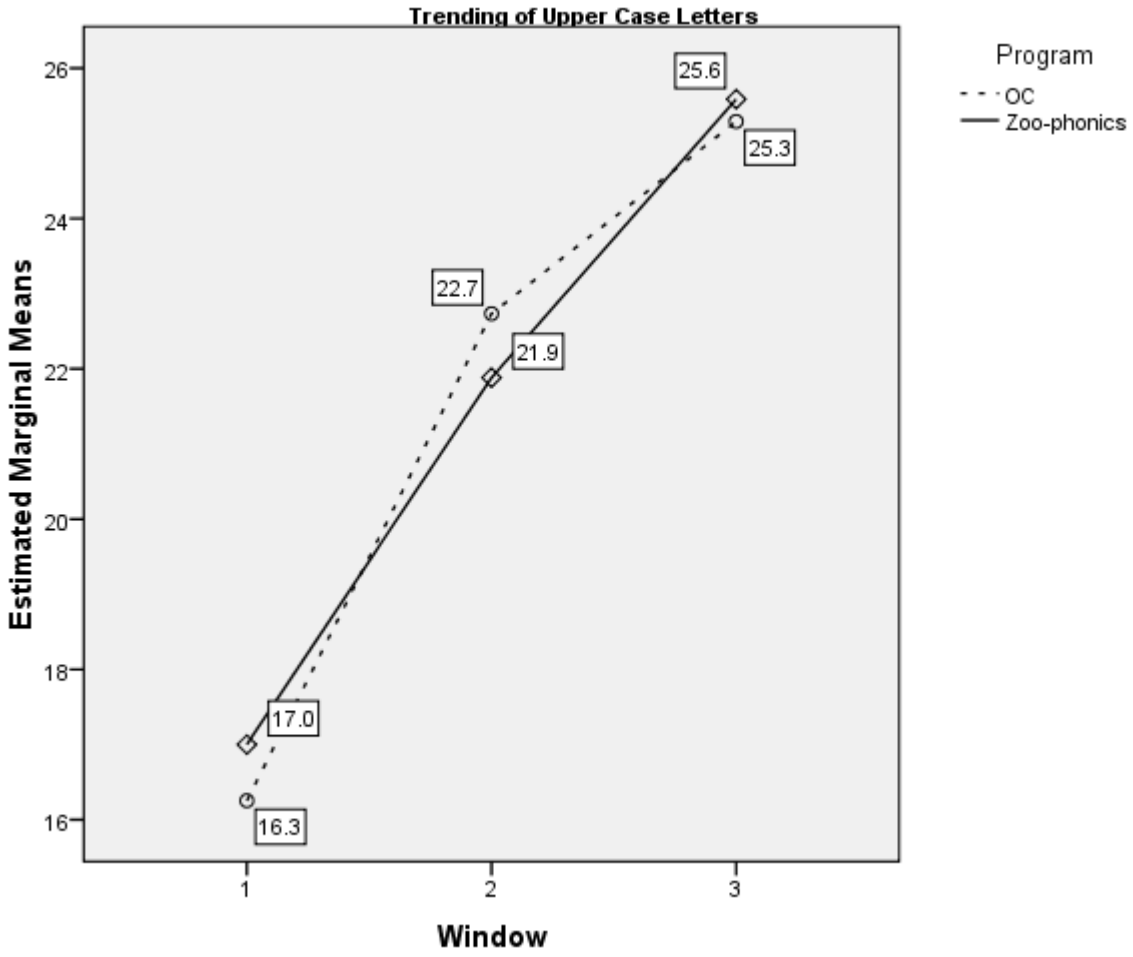


Figure 3. Trending graph A 1, recognizing uppercase letters by letter names.

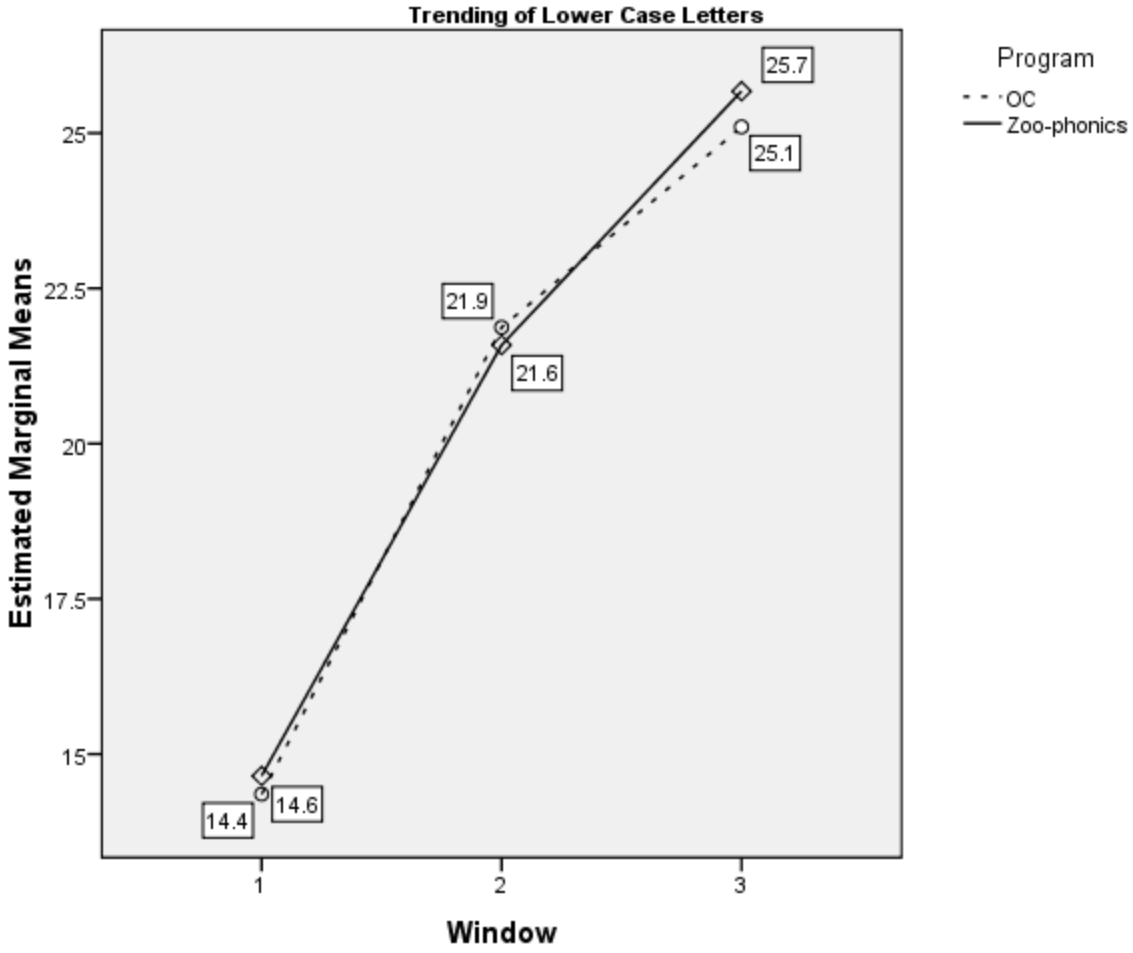


Figure 4. Trending graph A 2, recognizing lowercase letters by letter name.

For DCT 3, a mixed model Analysis of Variance (ANOVA) was used to determine differences in test scores as well as any possible differences between the Open Court and Zoo-Phonics groups and any possible interaction that has occurred. Time proved to be a significant factor $F(1, 109) = 80.31$, $p < .001$ and examining the means across the different Windows showed an increase from the first Window to the second Window favoring Zoo-Phonics.

Between the Open Court and Zoo-Phonics groups, a significant differences among means was discovered $F(1, 109) = 19.37$, $p = <.001$ which is leading to conclude that the overall scores on this particular test did show a statistical difference between the groups, favoring Zoo-Phonics. A significant interaction was found in this analysis $F(1, 109) = 20.41$, $p < .001$, which shows that the increase in scores between the two groups had a different rate of increase, favoring Zoo-Phonics.

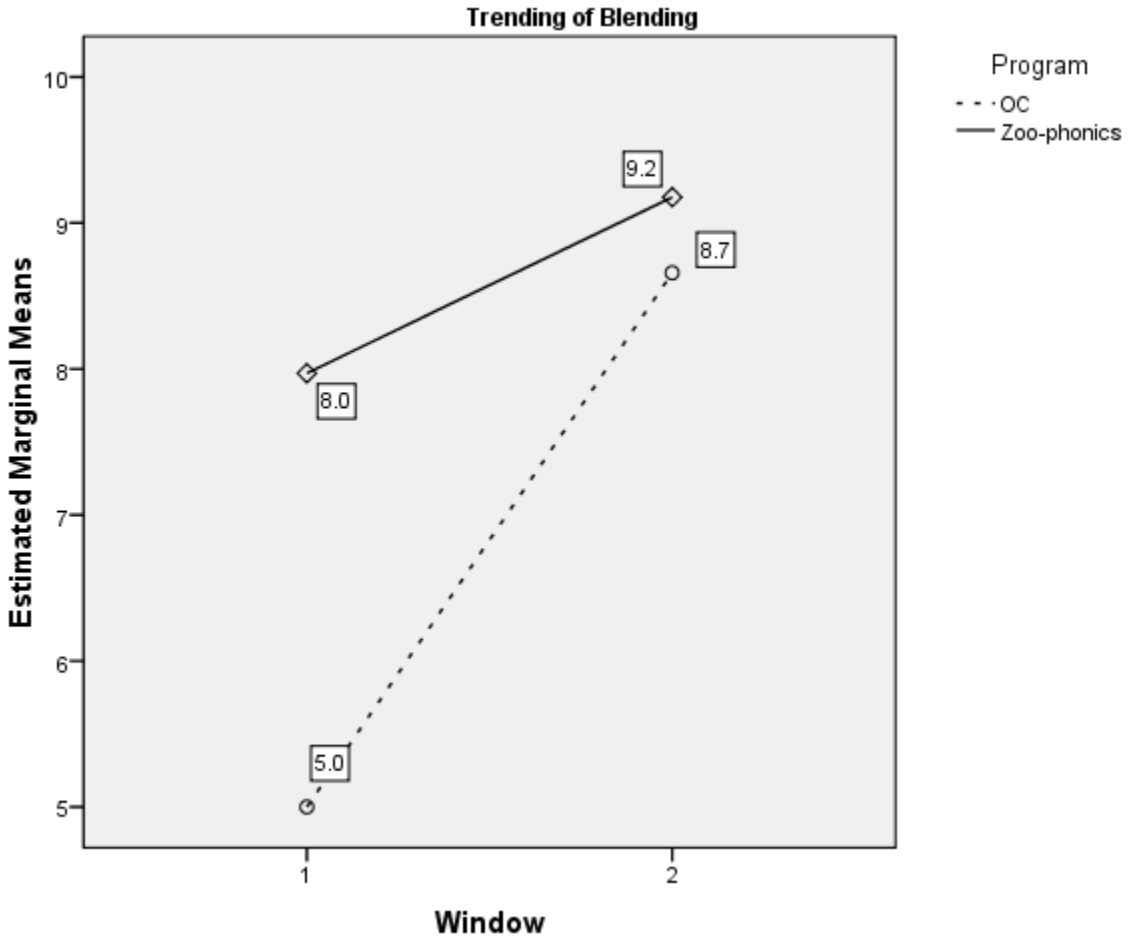


Figure 5. Trending graph A 3, blending compound words, onset and rimes.

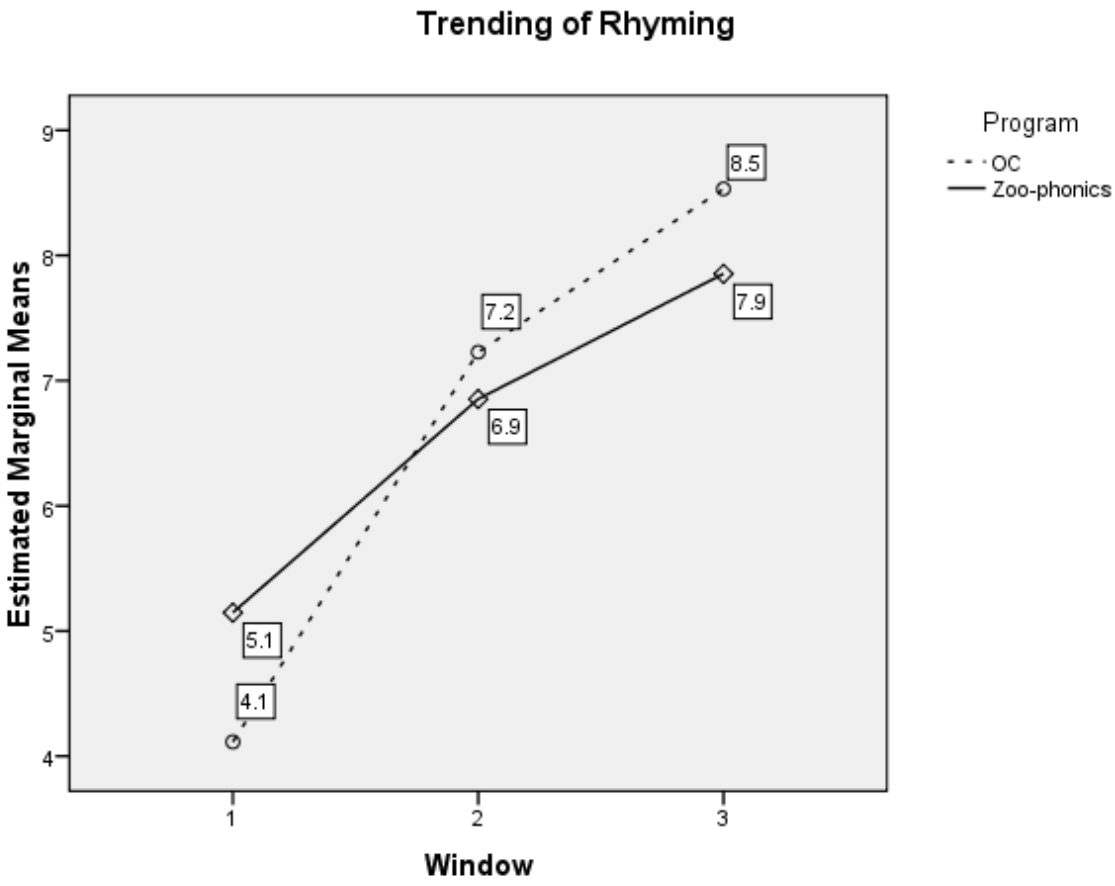


Figure 6. Trending graph A 4, rhyming.

For DCT 4, a mixed model Analysis of Variance (ANOVA) was used to determine differences in test scores for rhyming, as well as any possible differences between the Open Court and Zoo-Phonics groups and any possible interaction that has occurred. Time proved to be a significant factor $F(2, 107) = 109.41$ $p < .001$ and examining the means across the different Windows showed an increase from the first Window to the third Window favoring Open Court. Between the Open Court and Zoo-Phonics groups, a significant differences among means was discovered $F(1, 107) = .000$, $p = .989$ which is leading to conclude that the overall scores on this particular test did

show a difference between the groups, favoring Open Court. A significant interaction was found in this analysis $F(2, 107) = 6.91$, $p = .001$, showing that the increase in scores between the two groups had a different rate, with Open Court testing higher then Zoo-Phonics.

Table 1 shows the factor effects across each DCTs 1, 2, 3, and 4 within subjects (in time), between subjects, and their interactions.

Table 1

Research Question 1: Factor Effects

Factor Effects	Naming Uppercase Letters	Naming Lowercase Letters	Blending	Rhyming
Within Subjects (Time)^	$F = 82.73$ $df = 2$ $p < .001$	$F = 121.16$ $df = 2$ $p < .001$	$F = 80.31$ $df = 1$ $p < .001$	$F = 109.41$ $df = 2$ $p < .001$
Between Subjects (Open Court vs. Zoo-Phonics)	$F = .003$ $df = 1$ $p = .953$	$F = .032$ $df = 1$ $p = .858$	$F = 19.37$ $df = 1$ $p < .001$	$F = .000$ $df = 1$ $p = .989$
Interaction^	$F = .704$ $df = 2$ $p = .496$	$F = .190$ $df = 2$ $p = .827$	$F = 20.41$ $df = 1$ $p < .001$	$F = 6.91$ $df = 2$ $p = .001$
Sample Size (Open Court) Sample Size (Zoo-Phonics)	$n = 79$ $n = 34$	$n = 79$ $n = 34$	$n = 79$ $n = 34$	$n = 79$ $n = 34$

Note. ^Sphericity assumed.

Since DCT 5 was only administered once in W 3, an independent samples t-test was used to determine if there was a difference between the Open Court and Zoo-Phonics groups on average scores. Assuming equal variance, the test resulted in a finding of no difference between the two groups, $t(111) = -1.57$, $p = .119$, even through Zoo-Phonics scored slightly higher.

Since DCT 6 was only is only administered once in W 3, an independent samples t-test was used to determine if there was a difference between the Open Court and Zoo-Phonics groups on average scores. Assuming equal variance, the test resulted in a finding of no difference between the two groups, $t(111) = 0.10$, $p = .922$, even though Open Court scored slightly higher.

Table 2 shows the statistics for DCT 5 and DCT 6. Because it was only tested once in W 3, there is no Trending Graph for a comparison of the mean scores for both groups.

Table 2

Research Question 1: Statistic for Blending and Segmenting

	Program	*N*	*M*	*SD*	*t*	*df*	*p* value
Blending (Phoneme) *	Open Court	79	3.9	1.97	-1.57	111	0.119
	Zoo-Phonics	34	4.6	2.15			
Segmenting (Phoneme)*	Open Court	79	4.1	2.21	0.10	111	0.922
	Zoo-Phonics	34	4.0	2.52			

Note. *Equal Variances assumed based on result of Levene's test.

Table 3

Research Question 1: Summary of All Means and Standard Deviations for DCT 1 to 6

	Program	*N*	*M*	*SD*
DCT #1 Naming Uppercase Letters (W1)	Open	79	16.3	9.07
	Court	34	17.0	9.18
	Zoo-Phonics			
	Total	113	16.5	9.07
DCT #1 Naming Uppercase Letters (W2)	Open	79	22.7	5.88
	Court	34	21.9	7.46
	Zoo-Phonics			
	Total	113	22.5	6.37
DCT #1 Naming Uppercase Letters (W3)	Open	79	25.3	2.88
	Court	34	25.6	1.16
	Zoo-Phonics			
	Total	113	25.4	2.49
DCT #2 Naming Lowercase Letters (W1)	Open	79	14.4	9.12
	Court	34	14.6	8.63
	Zoo-Phonics			
	Total	113	14.4	8.94
DCT #2 Naming Lowercase Letters (W2)	Open	79	21.9	6.12
	Court	34	21.6	7.72
	Zoo-Phonics			
	Total	113	21.8	6.61
DCT #2 Naming Lowercase Letters (W3)	Open	79	25.1	3.18
	Court			
	Zoo-Phonics	34	25.7	.84
	Total	113	25.3	2.71

(continued)

	Program	*N*	*M*	*SD*
DCT 2 Blending Compounds, Onset / Rimes (W1)	Open	79	5.0	3.11
	Court	34	8.0	2.07
	Zoo-Phonics			
	Total	113	5.9	3.14
DCT 2 Blending Compounds, Onset / Rimes (W2)	Open	79	8.7	1.68
	Court	34	9.2	1.75
	Zoo-Phonics			
	Total	113	8.8	1.71
DCT 4 Rhyming (W1)	Open	79	4.1	2.91
	Court	34	5.1	3.12
	Zoo-Phonics			
	Total	113	4.4	3.00
DCT 4 Rhyming (W2)	Open	79	7.2	3.04
	Court	34	6.9	3.18
	Zoo-Phonics			
	Total	113	7.1	3.08
DCT 4 Rhyming (W3)	Open	79	8.5	2.49
	Court	34	7.9	2.58
	Zoo-Phonics			
	Total	113	8.3	2.52
DCT 5 Blending (Phoneme) (W3)	Open	79	3.9	1.97
	Court	34	4.6	2.15
	Zoo-Phonics			
	Total	113	4.1	2.04
DCT 6 Segmenting (Phoneme) (W3)	Open	79	4.1	2.21
	Court	34	4.0	2.52
	Zoo-Phonics			
	Total	113	4.1	2.29

Research Question 2

2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?

To answer Research Question 2, the Experimental Group (only) was assessed in the first week of school in September, 2006, in order to develop a baseline through DCT 7. Kindergarten students were assessed in W 1 (the middle of September), in W 2 (the middle of November), and in W 3 (the middle of February) in which all kindergarten children in the Experimental Group reached mastery, answering Research Question 2 positively.

Using DCT 7, a repeated measures Analysis of Variance (ANOVA) was used to determine if students taught by a multisensory method (Zoo-Phonics) to teach letter sound recognition for letter names had a different average score over the course of the school year (W 1 to W 3). A significant effect, $F(2, 30) = 167.74$, $p < .001$, examining the means across the different Windows, showed a significant increase from the first Windows to the second Window, leveling off slightly in the third Window. The importance of this picture is that Window 3 was assessed in the middle of February, not in June when W 3 is normally tested. There are 26 letters in the alphabet so from W 1 to W 2, children on average, mastered 23 lowercase letters and their sounds. In the time frame from W 2 to W 3, the students gained the additional three letters, showing that the entire alphabet was mastered by all children in the group. When looking at the standard deviation, the distribution was small, showing that all children reached mastery at the same point in time.

Table 4

Research Question 2: Factor Effects DCT 7

	DCT Lowercase Letters
Within Subjects (Time)^	$F = 167.74$ $df = 2$ $p < .001$
Sample Size (Zoo-Phonics)	$n = 32$

Note. ^Sphericity assumed.

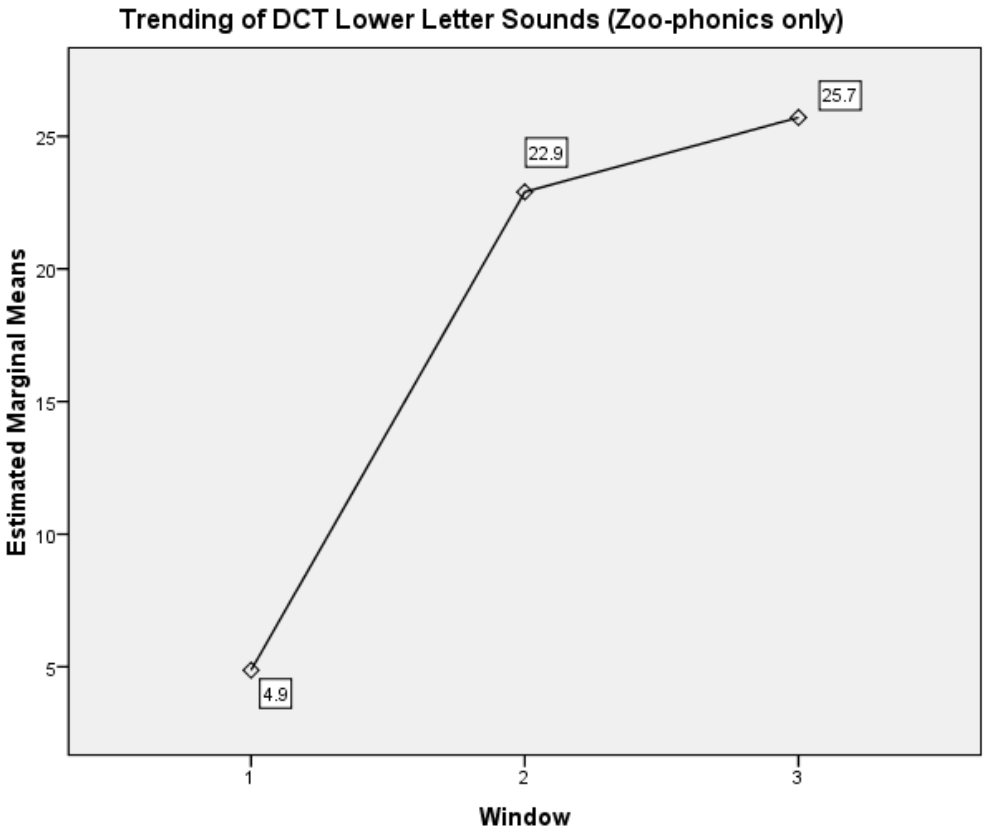


Figure 7. Research question 2, trending graph.

Table 5

Research Question 2: DCT Lowercase Letter Sounds Test Raw Scores, Its Means (Average) and Standard Deviation for Each Window.

n = 32			DCT Lowercase Letter Sounds	
Year School		Method W1	W2	W3
2006 -2007	C	Zoo-Phonics	0 22	26
2006 -2007	C	Zoo-Phonics	0 8	26
2006 -2007	C	Zoo-Phonics	0 22	26
2006 -2007	C	Zoo-Phonics	20 24	26
2006 -2007	C	Zoo-Phonics	8 25	26
2006 -2007	C	Zoo-Phonics	0 18	26
2006 -2007	C	Zoo-Phonics	0 25	26
2006 -2007	C	Zoo-Phonics	0 21	26
2006 -2007	C	Zoo-Phonics	0 26	26
2006 -2007	C	Zoo-Phonics	8 23	23
2006 -2007	C	Zoo-Phonics	24 26	26
2006 -2007	C	Zoo-Phonics	11 20	21
2006 -2007	C	Zoo-Phonics	26 26	26
2006 -2007	C	Zoo-Phonics	24 26	26
2006 -2007	C	Zoo-Phonics	0 26	26
2006 -2007	C	Zoo-Phonics	7 20	26
2006 -2007	C	Zoo-Phonics	0 25	26
2006 -2007	C	Zoo-Phonics	10 26	26

(continued)

Year School		Method W1		W2	W3
2006 -2007	C	Zoo-Phonics	0 21		26
2006 -2007	C		1 19		26
2006 -2007	C	Zoo-Phonics	2 26		26
2006 -2007	C	Zoo-Phonics	0 19		26
2006 -2007	C	Zoo-Phonics	0 22		25
2006 -2007	C	Zoo-Phonics	26 26		26
2006 -2007	C	Zoo-Phonics	0 24		26
2006 -2007	C	Zoo-Phonics	5 26		26
2006 -2007	C	Zoo-Phonics	0 21		26
2006 -2007	C	Zoo-Phonics	1 23		26
2006 -2007	C	Zoo-Phonics	0 25		26
2006 -2007	C	Zoo-Phonics	2 26		26
2006 -2007	C	Zoo-Phonics	0 23		26
2006 -2007	C	Zoo-Phonics	2 26		26
		Average	4.9	22.9	25.7
		Std Deviation	8.73	3.73	1.02

Research Question 3

3. R Q 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

In order to answer Research Question 3, DCT 7 was given to all students who participated in the 2006 to 2007 study, who became first graders in the school term 2007 to 2008. Two distinct pictures presented through this assessment.

1. Data (N = 113) from the 2007 to 2008 school term, compared the control group (Schools A and B) to the experimental group (School C). Students were assessed with DCT 7.
2. Data (N = 270) from the 2007 to 2008 school term, compared all first graders from all schools, even those who did not participate in the original control group (Schools A and B) or experimental group (School C). This gave data to show how the experimental group (School A) scored (low economics, ethnic mix) in comparison to more affluent schools (Schools D, E, F, and G) who come from predominantly White, upper-middle income families. Schools A, B, D, E, F, and G were considered the control group. School C was the experimental group.

DCT 7 was administered at the beginning of the school term in September of 2007, when the prior year's kindergartners became first graders. The goal was to see if the independent variable (a multisensory approach used to teach the alphabet and phonemic awareness skills) had a correlation with the dependent variable (lowercase letter sound recognition as measured by DCT 7). This test would show if the first grade students previously taught through a multisensory approach (Zoo-Phonics) in Kindergarten, would perform better or as well as the first graders in the control group (Open Court). The groups are independent of each other (experimental vs. control) because there was only one Window assessed in September 2007. The test was divided into consonant sounds and vowel sounds and data were collected separately for both.

Consonants

An independent samples *t*-test was used to determine if there was a significant difference in first-grade scores in recognizing consonant sounds between the students that were taught with the Open Court method versus those taught with the Zoo-Phonics multisensory method in kindergarten. This analysis was run twice, first comparing students of similar SES (social economic status) backgrounds and then by comparing all schools in which data were collected, where the SES background was dissimilar.

For similar SES backgrounds, there was no significant differences in test scores recognizing consonants, $t(157) = -1.04$, $p = .298$, although Zoo-Phonics-phonics scored slightly higher than schools A and B in the control group. For all schools (dissimilar SES), there also was no difference in average scores in consonant sounds in first grade, $t(307) = -.44$, $p = .659$, although Schools D, E, F, and G (Open Court) scored slightly higher than the Zoo-Phonics group (School C), and higher than the Schools A and B in the control group.

Vowels

An independent samples *t*-test was used to determine if there was a significant difference in first-grade scores in recognizing vowel sounds between the students that were taught with the Open Court Reading Series versus those taught with the Zoo-Phonics multisensory approach while in kindergarten in 2006 to 2007.

This analysis was run twice, first comparing students of similar SES backgrounds and then comparing all schools in which data were collected, where the SES background was dissimilar. For similar SES backgrounds, there was no significant differences in test scores recognizing vowels, $t(157) = -1.32$, $p = .188$, even through Zoo-Phonics scored

slightly higher. For all schools (dissimilar SES), there also was no difference in average score in vowel sounds in first grade, $t(307) = -.49$, $p = .625$, even though Schools D, E, F, and G (Open Court) scored slightly higher than the Zoo-Phonics group (School C), and higher than the Schools A and B in the control group.

Student test data were run twice to show how the experimental group compares to both similar and dissimilar demographic groups:

1. DCT 7 was administered to first graders in all schools regardless of ethnic and economic demographics. All schools are bundled by the mean;
2. DCT 7 was administered to first graders in the original control and experimental groups, with similar ethnic and economic demographics. Schools are bundled by the mean.

Table 6

Research Question 2, Statistics for Consonants and Vowels (All Schools)

	Program	*N*	*M*	*SD*	*t*	*df*	*p* value
Consonants *	Open Court	270	17.8	4.80	-0.44	307	0.659
	Zoo-Phonics	39	18.2	4.53			
Vowels *	Open Court	270	3.7	1.68	-0.49	307	0.625
	Zoo-Phonics	39	3.8	1.52			

Note. *Equal Variances assumed based on result of Levene's test.

Table 7

Statistics for Consonants and Vowels (Only Schools in Prior Analysis)

	Program	*N*	*M*	*SD*	*t*	*df*	*p* value
Consonant Sounds *	Open Court	120	17.2	5.09	-1.04	157	0.298
	Zoo-Phonics	39	18.2	4.53			
Vowel Sounds *	Open Court	120	3.4	1.70	-1.32	157	0.188
	Zoo-Phonics	39	3.8	1.52			

Note. *Equal Variances assumed based on result of Levene's test.

Summary of Findings

Conclusions and Summary of Findings for Research Question 1

1. R Q. 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?

DCTs 1 to 4 were used to assess both the Control Group (n = 79) and the Experimental Group (n = 34). Time proved to be a significant factor and examining the means across the different Windows showed an increase from Window to Window for both groups. No significant difference was seen between Open Court and Zoo-Phonics overall.

For DCT 3 (Blending Compound Words and Onset and Rimes), a significant difference among means was discovered which is leading to conclude that the overall

scores did show a difference between the two groups and that the increase in scores between the groups had a different rate of learning. Zoo-Phonics scored slightly higher in DCT 3 than Open Court.

In the case of DCT 3, the slope of the line between means is steeper for the Open Court group versus the Zoo-Phonics group. The Open Court Group showed that in W 1 (November 2006), most students had no sound knowledge. The Zoo-Phonics group scored higher on the Estimated Marginal Means ($M = 8$) in September, showing that by mid-November, 2006, the Zoo-Phonics students had almost mastered the skill DCT 3 (+8/10). The Open Court Group ($M = 5$) showed an accelerated growth between W 1 and W 2 arriving at almost the same Estimated Marginal Means as Zoo-Phonics ($M = 9.2$ vs. $M = 8.7$) at the end of the year, so growth was seen for both groups. It may be interpreted that the Zoo-Phonics group had less to learn from W 1 to W 2 because significant growth had already taken place between the beginning of the year in September 2006 and November 2006.

In DCT 4, Rhyming, a significant difference among means was discovered which is leading to conclude that the overall scores did show a difference between the two group. The Open Court group slightly outperformed the Zoo-Phonics group. The Zoo-Phonics group started at a higher Estimated Marginal Means ($M = 5.1$) in W 1 than did Open Court ($M = 4.1$). Between each Windows there is a different learning rate for each of the groups. Open Court ends with a higher Estimated Marginal Means ($M = 8.5$) than Zoo-Phonics scoring a slightly lower Estimated Marginal Means ($M = 7.9$).

For DCTs 5 and 6, only a W 3 assessment was administered. An independent samples *t*-test was used to determine if there was a difference between the Open Court

and Zoo-Phonics groups on average scores. Assuming equal variance, the test resulted in a finding of no difference between the two groups, even though Zoo-Phonics is favored overall in DCT 5 (Blending Phonemes) and Open Court was favored overall in DCT 6 (Segmenting Phonemes).

Since both tests are similar yet a reverse of each other (blending: "cat" = c – a – t) and (segmenting: c – a – t = "cat"), both require letter sound knowledge. Zoo-Phonics demonstrated strong letter sound knowledge early in the year so it is unknown why the Zoo-Phonics group scored lower on the Segmenting Phonemes DCT. Open Court may spend more time on segmenting skills than Zoo-Phonics.

In answer to Research Question 1, there is no statistical difference between the SRA/Open Court Reading Series and the Zoo-Phonics Language Arts Program in this study. The Zoo-Phonics Language Arts Program scores slightly higher in the following areas: DCT 1, Uppercase Letters and Letter Names; DCT 2, Lowercase Letters and Letter Names; DCT 3, Blending Compound Words and Onset and Rimes. Open Court scores slightly higher in DCT 4, Rhyming. This shows that as a multisensory approach, the Zoo-Phonics Language Arts Program is as effective as the non-multisensory group as represented by the SRA/Open Court Reading Series. Zoo-Phonics often has higher raw scores, although statistically, there is no statistical difference between the groups.

Conclusions and Summary of Findings for Research Question 2

2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?

DCT 7, Lowercase Letter Sounds was administered to kindergarten students (N = 34) in W 1, W 2, and W 3 throughout the school year, starting the first week of school (mid-September, 2006) to gain a baseline for lowercase letters and letter sound knowledge. According to the Assistant Superintendent of Instruction, DCT 7 is normally only administered in first grade.

A repeated measures Analysis of Variance (ANOVA) was used to determine if students taught by the Zoo-Phonics multisensory approach had a different average score over the different Windows that were assessed. Students were assessed on the knowledge of lowercase letter sounds (vowels and consonants combined). Between W 1 and W 1, all students in the class had almost reached mastery. Note that Windows 1 was assessed in mid-September, 2006. W 2 was assessed in mid-November, 2006. Windows 3 was assessed in the mid-February, 2007.

The experimental group (N = 34) started the year with low skills in a close distribution in lowercase letter sounds. They began with a mean of M = 5 in W 1. These students demonstrate quick growth in W 2 with a mean of 22.9 letter sounds learned, almost reaching full mastery in the first 2 months of school. In W 3, there was an average of 2.8 lowercase letter sounds more to be gained for an mean of 25.7, which is the maximum score (26 letters in the alphabet). This test demonstrates the effectiveness of a multisensory approach to teach kindergarten children the sounds of the lowercase letter sounds, which is needed in order to be able to read and spell words.

Conclusions and Summary of Findings for Research Question 3

3. R. Q. 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

DCT 7 was used as the test vehicle for the first comparison between all the students in Control and Experimental Groups plus all first grade students in the district who were taught with Open Court the previous year. They became a part of the Control Group ($N = 270$) for this assessment. The Control Group ($n = 231$) was comprised of Schools A, B, D, E, F, G. School C was the Experimental Group ($n = 39$). All students participating in this assessment were enrolled as kindergartners in 2006 to 2007.

An independent samples *t*-test was used to determine if there was a significant difference in lowercase sound scores (consonants and vowel sounds assessed separately) between the students that were taught with Open Court in comparison with those taught with the Zoo-Phonics method. It is important to note that when Schools D, E, F, and G joined the Control Group, they were from a more affluent economic demographic, who were predominantly White. School C in the Experimental Group had similar demographics to Schools A and B. They all were from a predominantly Hispanic and low economic demographic.

In the first comparison, for all schools, there was no significant difference in average scores in consonants or vowels recognition in first grade. The statistics showed all schools demonstrated growth, with a variation between schools. The more affluent schools scored slightly higher than Zoo-Phonics, but not statistically different. Zoo-Phonics scored higher than Schools A and B, but not statistically different.

A second comparison was done between the three schools in this study (Control and Experimental) which had similar ethnic and economic demographics. This included the students in control group (Open Court) from Schools A and B versus the experimental group (Zoo-Phonics) students from School C.

An independent samples *t*-test was used to determine if there was a significant difference in first-grade scores in recognizing consonants and vowel sounds between the students that were taught with the Open Court method versus those taught with the Zoo-Phonics multisensory approach in kindergarten. There was no significant difference in average scores in between Schools A, B or C. All schools demonstrated growth at varying but similar rates. Zoo-Phonics scored higher than both Schools A and B.

The tests were run and data were analyzed for each Research Question. Raw scores from the various DCTs provided the data to make the comparisons, Window to Window, for both the control group and the experimental group. For Research Questions 1 and 3, no statistical difference was seen between the Open Court and Zoo-Phonics groups, although Zoo-Phonics slightly outscored Open Court in most DCTs. Open Court scored slightly higher in one DCT and only scored higher in another DCT when students from a more affluent demographic were assessed against them.

To answer Research Question 1, six DCTs (1 through 6) were given students in the control and experimental groups. When looking at the Trending Test for Upper Case Letters by Letter Names, all students started at (relatively) the same place on the Estimated Marginal Means and tracked at the same pace until W 3 where they ended up at the same Estimated Marginal Means (25.6 experimental vs. 25.3 control).

It was a surprise that Zoo-Phonics learned the uppercase letters and letter names as rapidly as the control group. In the Zoo-Phonics methodology, the primary focus is on lowercase letters and letter sounds, not on uppercase letters and letter names. Capital letters are introduced incidentally throughout the daily instruction, but usually only when the lower and uppercase letters look the same or similar (C c, M m, N n, O o, et cetera). Capital letters and letter names are not the focus of instruction until the 27th week of school. At this time, they are taught along with the rules for capitalization. Children often bring letter name knowledge from home through the "A B C Song," it is possible that students had some prior knowledge of skills. It is probable that while the experimental teachers were teaching the Zoo-Phonics Program, they inadvertently taught letter names at the same time, out of habit.

To answer Research Question 2, DCT 7 was used to assess the experimental group (only) to determine the rate of growth over W 1, W 2, and W 3, statistically significant growth was seen, demonstrating that a multisensory approach is an effective way to teach letter sounds to lowercase letters, achieving mastery by W 1 or November, 2006, even for students considered at-risk (low-income, high-ethnic population). It was expected that students would make substantial growth in the first 2 months of school because the multisensory approach takes an abstract concept and turns it into a concrete and playful activity, which is better for understand and memory.

To answer Research Question 3, DCT 7 was used to assess the experimental and control groups to make a comparison between groups. In comparison 1 where all students were assessed regardless of ethnic and economic demographics, it was expected that the Zoo-Phonics multisensory program would teach at-risk students as efficiently as a non-

multisensory program. What was not expected was that when all schools were combined (A, B, D, E, F, G, and H) regardless of demographics, Zoo-Phonics slightly outscored all of them, although there was no statistical difference in scores. Schools with lower demographics (A and B) pulled down the scores of the schools with higher demographics (D, E, F, and G).

It was not expected that the original control group (same demographics) would fare as well as the Zoo-Phonics experimental group. This shows that both methodologies create positive student growth for lowercase letters and sounds over the course of the school year. The only difference seen is that Zoo-Phonics emphasizes lowercase letters and sounds earlier in the year so the children can begin sound blending simple vowel-consonant and consonant-vowel-consonant words earlier

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Overview

The purpose of this study was to determine the effectiveness of a multisensory approach to teach the alphabet and phonemic awareness skills to kindergarten children in comparison to a non-multisensory approach. A quantitative, quasi-experimental research method was used to compare two different reading programs for kindergarten children over one school term, from 2006 to 2007, with a 1-week assessment completed in September of 2007.

Children (N = 113) enrolled in six different kindergarten classes, in three elementary schools, in one multi-ethnic suburban school district in Northern California, were the subjects in this study. The district and classes were selected because they offered demographics typical of the student population in this region of California. Students were assessed on the alphabet and phonemic awareness skills (upper and lowercase letter name recognition, blending onsets and rimes, rhyming, segmenting words, blending words and lowercase letter sound recognition) through District Cluster Tests (DCTs).

The Findings in Chapter 5 of this study, presented the results of the data description and analysis. The three Research Questions structure the analysis and summary of the results.

Hypotheses

H1: A multisensory approach to teach the alphabet and phonemic awareness skills to kindergarten students is more effective than a non-multisensory teaching method.

$H1_0$: A multisensory approach to teach the alphabet and phonemic awareness skills to kindergarten students is not more effective than a non-multisensory teaching method.

The Research Questions

1. R Q. 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?
2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?
3. R Q 3: Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

Data Presentation

District Cluster Tests

A series of District Cluster Tests (DCTs) were used to assess children to determine growth over the course of the school year. This data will be used to make the comparisons between the control and experimental groups. The three assessment Windows will be represented as W 1, W 2, and W 3. Children were assessed only after a specific concept or skill has been taught, therefore, many of the DCTs were administered in Window 3 only because the level of skill difficulty could not be taught to children earlier in the year. The District Cluster Tests used to make comparisons for analysis will be designated by number rather than name:

Tests will be designated by number rather than name:

- DCT 1—Uppercase Letter Recognition by Letter Name
- DCT 2—Lowercase Letter Recognition by Letter Name
- DCT 3—Blending Compound Words and Onset and Rimes
- DCT 4—Rhyming
- DCT 5—Blending Phonemes (C-A-T = CAT)
- DCT 6—Segmenting (CAT = C-A-T)
- DCT 7—Letter Sound Recognition of Lowercase Letters

DCTs 1, 2, 3, and 4 were administered to all of the kindergarten students, control and experimental, in Windows 1, 2, and 3. DCTS 5 and 6 were administered in only Window 3 due to the difficulty of the skill to be assessed. DCT 7 was used to answer Research Questions 1 and 2. In Research Question 1, DCT 7 was assessed in W 1, W 2, and W 3. In Research Questions 2, DCT 7 was assessed in W1 only, in the following school term, 2007. The DCTs assess students' understanding and mastery of the alphabet and phonemic awareness skills.

Interpretation of Data

Summary Conclusions for Research Question 1

1. R Q 1: Do kindergarten students, taught through a multisensory approach, perform at a higher level on a measure of the alphabet and phonemic awareness than students taught through a non-sensory approach?

DCTs 1 through 6 were used to answer Research Question 1. For DCTS 1, 2, 3, and 4 a mixed model Analysis of Variance (ANOVA) was used to determine any statistical differences among the different testing periods, the control and experimental groups, as well as any possible interaction occurring. Raw scores, means, and their

standard deviations will be determined by comparing W 1, W 2, and W 3, as well as comparing control vs. experimental groups. For DCTs 5 and 6, which only had one Window from which to gain data, a samples *t*-test was run independently.

Results

Overall, no statistical difference was seen between the Open Court and Zoo-phonics groups, although Zoo-phonics scored slightly higher than Open Court in most DCTs. In DCT 3, over all, no significant difference was found except for the fast rate of growth for Open Court. Open Court has a steep slope of ascent from W 1 to W 2 because they started with lower scores having less alphabet knowledge ($M = 5$) in W 1 than Zoo-phonics ($M = 8.0$). Zoo-phonics slightly outscored them in amount of letter knowledge obtained in W 2. The standard deviation for the two groups were higher in W 1 and lower in W2 as children gained skills. The standard deviation in W 2 was the same for both groups.

Open Court scored slightly higher in DCT 4 (rhyming) and only scored slightly higher in DCT 7 when students from a dissimilar economic and ethnic demographic were assessed as a part of the control group. There was no significant differences seen in either DCT between groups.

DCT 1 Uppercase Letter Recognition by Letter Name

For DCT 1**,** the Trending Table for Uppercase Letters Recognition by Letter Names shows that both groups of students started at relatively the same place on the Estimated Marginal Means (Zoo-phonics, $M = 17.0$ vs. Open Court, $M = 16.3$) and tracked at the same pace, ending up at the same Estimated Marginal Means (25.6

experimental vs. 25.3 control). There is no statistical difference in the scores between the two groups, although Zoo-Phonics scored slightly higher.

Analysis

The SRA/Open Court Reading Series for kindergarten teaches uppercase letters and letter names at the beginning of the year. Zoo-phonics, as a part of its methodology, teaches lowercase letters and letter sounds at the beginning of the year because students need lowercase letters and letter sounds in order to sound blend words for future reading and spelling. Lowercase letters are used in text 95% of the time, and capital letters only about 5% of the time. Teaching lowercase, uppercase, letter sounds, and letter names together is a lot of abstract information to teach young kindergarten children (Adams, 1994; Bradshaw et al., 2005).

Zoo-phonics believes that if a child has developed automaticity when matching letter sounds to the lowercase letters, reading and spelling can begin earlier than is normally expected for kindergarten children. Zoo-phonics waits for student mastery of lowercase letters and sounds before focusing on uppercase letters and letter names so no confusion ensues. Uppercase letters are introduced throughout the year, but only incidentally: (a) when they begin a character's name in a literature book that will be read that week, and (b) when the lowercase and uppercase letters look similar (C c, O o). Letter names are downplayed until Week 27. If children call out a letter name, the teacher says the sound of the letter to reinforce it over the letter name.

It was a surprise that students in the Zoo-phonics group learned the uppercase letters and letter names at the same time as the Open Court group in that they were not supposed to be taught yet. It is probable that while the experimental teachers were

teaching the Zoo-Phonics Program, they inadvertently taught letter names at the same time, out of habit. Zoo-Phonics trains teachers to break themselves of the habit of the use of letter names when identifying the lowercase letters and when spelling out a word. Having only a one-day training in the methodology of Zoo-Phonics, habits are hard to break. Children most often come to school with letter name skills from home instruction.

DCT 2 Lowercase Letter Recognition by Letter Name

A mixed model Analysis of Variance (ANOVA) was used to determine differences in test scores for DCT 2, as well as any possible differences between the Open Court and Zoo-Phonics groups, and any possible interaction that has occurred. Time proved to be a significant factor $F(2, 107) = 121.16$, $p < .001$ and examining the means across the different Windows showed an increase from the first Window to the third Window.

No significant differences among means was discovered $F(1, 107) = .032$, $p = .858$ which is leading to conclude that the overall scores on this particular test did not show any statistical difference between the groups, although Zoo-Phonics scored slightly higher. No significant interaction was found in this analysis $F(2, 107) = .190$, $p = .827$, which symbolizes that although scores increased over time for both the Open Court and Zoo-Phonics groups, the actual rate was similar.

Analysis

The Trending Table of Lowercase Letter Name Recognition shows how closely both groups tracked throughout the year. Both groups started, on average, with the ability to recognize 14 letters by letter name. By W 2 they both knew 21 letters by name and finished with knowing twenty-five letters, on average. The standard deviation for the

Zoo-Phonics group shows a smaller distribution than is seen for the Open Court group. It was not expected that the Zoo-phonics group would match the names of the letters to the lowercase letters. Zoo-phonics does not focus on letter names until students reach mastery of sounds to lowercase letters. The students learn lowercase letters and letter shapes on the first day of instruction in kindergarten. It is interpreted that the teachers from the experimental group must have taught letter names inadvertently, out of habit or the children brought some letter name knowledge with them to school. The data show that both groups of students grew significantly over time and with the same rate of growth.

DCT 3 Blending Compound Words and Onset and Rimes

A mixed model Analysis of Variance (ANOVA) was used to determine differences in test scores for DCT 3, as well as any possible differences between the Open Court and Zoo-phonics groups, and any possible interaction that had occurred. Time proved to be a significant factor $F(1, 109) = 80.31$, $p < .001$ and examining the means across the different Windows, showed an increase from the first Window to the second Window favoring Open Court. The slope of their ascent was steep, showing rapid growth.

A significant difference was discovered $F(1, 109) = 19.37$, $p = <.001$ which is leading to conclude that the overall scores on this particular test did show a statistical difference between the groups, favoring Open Court. A significant interaction was found in this analysis $F(1, 109) = 20.41$, $p < .001$, which symbolizes that the increase in scores between the two groups had a different rate of increase seen from W 1 to W 2., favoring

Open Court. Overall, Zoo-phonics slightly outscored Open Court ($M = 9.2$ vs. $M = 8.7$) although no significant difference was seen between scores.

Analysis

The Zoo-phonics group tested significantly higher in W 1 (first assessed in March) because of student mastery of letter sounds to lowercase letters early in the year (as established through Research Question 2). In W 2 (assessed in June), Open Court caught up to Zoo-phonics demonstrating an increased rate of growth from Window 1 to the Window 2. The standard deviation for both groups was equal in W 2.

As a part of the methodology of Zoo-phonics, the experimental group learned the sounds and shapes of the letters from the beginning of the school term through its multi-sensory curriculum. This accounts for their higher scores in the Estimated Margin of Means in W 1 (assessed in March) for the experimental group. Open Court has a sharp ascent from W 1 to W 2 (June) suggesting significant growth. The control group was not taught letter sounds until mid-year thus delaying their ability to Blend Phonemes until they mastered letter-sound skills. Sound blending is tracking through words a letter sound at a time (or by letter combinations).

In order to successfully sound blend simple words, kindergarten children need to know the sounds of the lowercase letters and know them automatically on sight. Zoo-phonics encourages daily practice with the Large Animal Alphabet Cards (lowercase letters are drawn with the animals merged on top of them, following the letter shapes) which imprints sound-symbol into memory. The children are seeing the animal letter, saying the animal's alliterative name, pronouncing the sound the letter makes, hearing

this phonemic information, and physically doing an animal-related body movement to cement the letter sound to the letter shape.

According to the Zoo-phonics curriculum, games, and activities are played daily with the alphabet, building letter sound automaticity, through a multisensory approach. The letter sounds are also connected to the Zoo-phonics instruction from math, literature, art, music, science, social studies, et cetera, so the children are inundated with sound-symbol information throughout the day.

DCT 4 Rhyming

A mixed-model Analysis of Variance (ANOVA) was used to determine differences in test scores for rhyming, as well as any possible differences between the Open Court and Zoo-phonics groups, and any possible interaction that has occurred. Time proved to be a significant factor $F(2, 107) = 109.41$, $p < .001$ and examining the means across the different Windows showed an increase from the first Window to the third Window for both groups.

A significant difference among means was discovered $F(1, 107) = .000$, $p = .989$ which lead to the conclusion that the overall scores on this particular test did show a difference between the groups in favor of Open Court. A significant interaction was found in this analysis $F(2, 107) = 6.91$, $p = .001$, which symbolizes that the increase in scores between the two groups had a different rate of growth, with Open Court learning more rapidly and testing higher then Zoo-Phonics ($M = 8.5$ vs. $M = 7.9$). Both groups grew significantly over time.

Analysis

Rhyming is an important factor for learning to read for kindergarteners, as children are taught phonics in order to learn to read and spell, which is based on onset and rimes or word families. The brain seeks patterns when learning new information. Sound blending is taught through sound patters such as: at, bat, cat, fat, and so forth. Both programs have rhyming as a part of the curriculum. Poems and nursery rhymes are the vehicle to train the ear to hear sound patterns in words.

The sight difference in scores may stem from the focus on rhyming which may be prominent in the Open Court curriculum than in the Zoo-Phonics curriculum, although both programs provide the teachers poems and nursery rhymes to read aloud to the children; inviting children to participate in rhyming activities. This does not account, for the 0.6 difference in mean scores.

The standard deviation for the three Windows was higher for both groups, demonstrating that students had a wider range of distribution in both groups. This skill must have been challenging for some of the students, thus lowering the averages for both groups.

DCT 5 Blending Phonemes

DCT 5 was only administered only once in W 1 in June, so an independent samples t-test was used to determine if there was a difference between the Open Court and Zoo-Phonics groups' average scores. Assuming equal variance, the test resulted in a finding of no significant difference between the two groups, $t(111) = -1.57$, $p = .119$, even through Zoo-Phonics scored slightly higher.

Analysis

Only one Window was assessed in June because sound blending is considered a difficult skill for children and much instruction must be taught leading up to skill mastery. At the end of the year, both groups reached mastery. In DCT 5, the total number of possible right answers is five, which is considered the ceiling. Zoo-phonics students, on average, knew +4.6 out of 5 possible correct. The Open Court students, on average, knew +3.9 out of 5 possible correct.

Because this DCT was only given at the end of the school term, there is no way of knowing whether either group of students knew how to sound blend earlier in the year. According to the both curriculums, daily lessons include activities where the teacher shows students what words look like and how letters are used to spell words. In the Zoo-phonics teacher instruction manual, the Large Animal Alphabet Cards are placed together to spell vowel-consonant (VC) or consonant-vowel-consonant (CVC) words from word families (onset and rimes). Children signal (the body movement related to the animal letter) and sound through the letters that form the word. This sound blending activity is done as early as Week 2 and is practiced daily. Children are not expected to sound blend and spell independently at first.

DCT 6 Segmenting Phonemes

DCT 6 is only administered once in W 1 in June, so an independent samples *t*-test was used to determine if there was a difference between Open Court and Zoo-phonics groups on average scores. Assuming equal variance, the test resulted in a finding of no difference between the two groups, $t(111) = 0.10$, $p = .922$.

There is a possibility of five correct answers in DCT 6. On an average, Open Court scored 4.1. Zoo-phonics scored 4.0. The standard deviation was high and about the same for both groups, showing that distribution of scores had a wider spread due to the difficulty of the skill.

Analysis

The segmentation of words is included in kindergarten testing because it is an important phonemic awareness skill. To learn how to spell, the students need to take those individual sounds heard in a whole word and separate them. A quick way to know if a child can segment words is to ask, "What sounds do you hear in the word *cat*?" This skill appeared somewhat difficult to some students in both groups as evidenced by the distribution found in the standard deviation.

Summary for DCTs in Research Question 1

There was no significant difference in many of the DCTs given to the control and experimental groups. Each DCT summary is presented separately:

DCT 1: Uppercase letters recognized by letter names. There was no significant difference found between the two groups or their rate of learning. Zoo-phonics scored slightly higher than Open Court.

DCT 2: Lowercase letters recognized by letter names. There was no significant difference found between the two groups or their rate of learning Zoo-phonics and Open Court tracked almost in the same lines, with Zoo-phonics scoring only slightly higher.

DCT 3: Blending compound words and onset and rimes. There was significant difference seen in several areas in the results. Zoo-phonics started higher on the estimated Marginal Means (M = 8.0) when first assessed because student had learned lowercase

letters and sounds from the beginning of the year, whereas the Open Court group was not taught lowercase letter sounds until later in the year. Open Court grew at a faster rate because they started from 5.0 on average and grew to 8.7, which showed in their favor. There was no significant difference seen in the two groups (M = 9.2 vs. M = 8.7) although Zoo-phonics scored slightly higher in Window 3.

DCT 4: Rhyming. A difference in scores between the two groups shows in favor of Open Court in the rate of growth. Zoo-phonics had higher scores in W 1 as seen in the Estimated Marginal Means (M = 5.1 vs. M = 4.1), but had a smaller rate of growth throughout the year. Open Court outscored Zoo-phonics (M = 8.5 vs. M=7.9) in W 3.

DCT 5: Blending. There was no statistical difference between the two groups. Zoo-phonics scored slightly higher than Open Court (4.6 vs. 3.9). The standard deviation was somewhat high showing that for some children this skill was difficult.

DCT 6: Segmenting. There was no statistical difference between the two groups. Zoo-phonics scored slightly higher than Open Court (4.1 vs. 4.0). The standard deviation was somewhat high showing that for some children this skill was difficult.

Overall Analysis

Overall, both the Open Court (control group) and the Zoo-phonics (experimental group) grew significantly over the course of the year as evidenced by the DCTs used in this study. Only in two tests showed a significant difference throughout the analysis: Blending Compound Words and Onset and Rimes (rate of growth favoring Open Court; score, favoring Zoo-phonics) and Rhyming (favoring Open Court). Both reading programs have been discovered to be effective approaches to teach the alphabet and phonemic awareness skills. This will be discussed in detail in Implications of Findings.

Hypothesis

The null hypothesis for this study did not fail to reject that there was statistical significance in the data tested for Research Question 1. Tests scores for all students in the study were static demonstrating a similar growth rate for all children, control, and experimental.

Research Question 2

2. R Q 2: Can kindergarten children learn the sounds and shapes of the letters by November of the school term through a multisensory approach?

To answer Research Question 2, only DCT 7 (recognizing lowercase letters by letter sounds) was administered to kindergarten students in the experimental group only. Three different Windows throughout the school year were used as a comparison of student growth. The first assessment was administered the first week of school, September 2006, to gain a baseline for lowercase letters and sound knowledge. W 2 was assessed in November, 2006; W 3 was assessed in February, 2007. No Window 4 assessment was given because all children reached mastery in February.

District Cluster Test 7 and Test Results

For analyzing results from DCT 7, a repeated measures Analysis of Variance (ANOVA) was used to determine if students taught by the Zoo-phonics multisensory approach showed growth throughout the three assessment Windows. There was a significant rate of increase from the first Window to the third Window.

The experimental group ($N = 34$) started the year with few lowercase letter sound knowledge. On an average, students began with a mean of $M = 5$ in Windows 1 (assessed September 13, 2006). These students demonstrate quick growth in Windows 2, (assessed

November 13), with an average = 22.9 letter sounds learned (Knowing 23 letters out of 26 letters total is considered mastery because there are letters that are seldom used, such as X and Z).

In Windows 3 (assessed February 12th, 2007), there was an average of 2.8 letter sounds to further obtain for a mean of 25.7. The maximum score for alphabet mastery is 26 letters. This test demonstrated the effectiveness of a multisensory approach to teach kindergarten children the sounds of the lowercase letter sounds to the shapes of the letters because it only took 2 months to reach almost total mastery for all students. The standard deviation, diminished as time progressed, (from 8.73) in W 1, to 3.73 in W 2, to W 3 where there was a very small distribution (1.02), meaning all children had reached mastery. Regardless of whether the children were males or females, native English speakers or limited in English, all children mastered the sounds of the lowercase letters at relatively the same rate and at the same time.

Summary for Research Question 2

Overall, significant growth was demonstrated through student test results showing that all kindergarten children can learn the sounds of the lowercase letters earlier in the year than is expected in the California State Framework and Content Standards for language arts. Regardless of whether the children were males or females, native English speakers or limited in English, all children mastered the sounds of the lowercase letters at relatively the same rate and at the same time. This is significant to this study. The Literature Review reveals great concern over males in kindergarten not performing on par with girls of the same age. It also statistically demonstrated that ethnically at-risk children

not only do not start on par with their white middle income counterparts but they rarely catch up to them in their school careers. The pictorial mnemonics and body movement allows boys to feel more comfortable physically while learning and provides oxygen to the brain and BDNF to saturate the neurons. The active and playful games while learning the alphabet and words keeps their attention. The novelty and playfulness of multisensory instruction opens the amygdala for enhanced memory.

As part of the research design, experimental teachers assessed their kindergarten students the first week of school, to determine a baseline for lowercase letters and sounds. Most students scored very low in W 1 (September) but had almost complete mastery, on average, by W 2 (November). By W 3 (assessed in February) the majority of students in both classes of the experimental group ($N = 34$) had reached mastery of lowercase letters and sounds, the foundation for reading, spelling, and writing.

Hypothesis

The null hypothesis for this study failed to reject that there was no statistical significance in the data tested for Research Question 2. Windows 1, 2, and 3 provided data over time which demonstrated significant growth for all kindergarten students in the experimental group. The largest measurement was from W 1 to W 2 where most of the growth took place.

Research Question 3

Are letter-sound scores for first grade children higher when taught through a multisensory approach than for first graders who were taught through a non-multisensory approach?

To answer Research Question 3, an additional DCT 7 had to be administered in September of the following school term (2007) when all kindergarteners had become first graders. The reason this had to take place the following year was because the district does not assess kindergarteners on letter sounds until first grade. Since data were collected from the district scores, the September results had to be included in this study.

Research Question 3 had two different comparisons: Comparison 1: The first comparison was made between all the students in the original control group, plus all first grade students in the district taught with Open Court in the prior year, regardless of ethnic and economic demographics. This control group is called, Schools, A, B, D, E, F, and G (n = 270). The experimental group (n = 39) taught through Zoo-phonics is called School C, which were the original kindergartners from the 2006 to 2007 study. This analysis gave a glimpse of how the experimental group (low economics, ethnic mix) compared

against schools (Schools D, E, F, and G) who are predominantly from White, upper-middle class families.

For consonants, an independent samples t-test was used to determine if there was a significant difference in first-grade scores in recognizing consonants and vowels between the students that were taught with the Open Court method versus those taught with the Zoo-phonics method with kindergarteners. For all schools (dissimilar SES), there was no difference in average scores in consonant sounds in first grade, $t(307) = -.44$, $p = .659$, although Schools D, E, F, and G (Open Court) scored slightly higher than the Zoo-phonics group (School C), and even higher than the Schools A and B in the control group. The statistics showed that all schools demonstrated growth in various degrees and rates.

For vowels: For all schools (dissimilar SES), there also was no difference in average score in vowel sounds in first grade, $t(307) = -.49$, $p = .625$, even though Schools D, E, F, and G (Open Court) scored slightly higher than the Zoo-phonics group (School C), and higher than the Schools A and B in the control group.

Comparison 2: A second comparison was done between the original schools in this study (control and experimental) that had the similar ethnic and economic demographics. This includes the students ($n = 120$) in the control group (Open Court) across two schools only: A and B versus the experimental (Zoo-phonics, $N = 39$) from School C.

For consonants, an independent samples *t*-test was used to determine if there was a significant difference in 1st grade scores in recognizing consonants and vowels between the students that were taught with Open Court versus those taught with Zoo-phonics in

kindergarten. For similar SES backgrounds, there was no significant differences in test scores recognizing consonants, $t(157) = -1.04$, $p = .298$, although Zoo-phonics scored slightly higher (9%) than schools A and B in the control group. All classes demonstrated growth at varying but similar rates.

For vowels, for similar SES backgrounds, there was no significant differences in test scores recognizing vowels, $t(157) = -1.32$, $p = .188$, although Zoo-phonics scored slightly higher. All classes demonstrated growth at varying but similar rates.**Summary for Research Question 3**

Overall, there was no significant difference between the groups whether analyzed together or independently from either Comparison 1 or 2. When viewing the test where all first grade students were compared (Comparison 1) Open Court (the schools from predominantly white, upper-middle class families) were slightly favored. When the schools in the original study were analyzed together and averaged (Comparison 2), Zoo-phonics group slightly was slightly favored. All schools made significant gains throughout the year showing that both programs are effective.

Analysis

Both the Research Question and the test analysis fails to recognize that the Zoo-phonics group knew most of the sounds and shapes of the lowercase alphabet by November of 2006 and had fully mastered them by February of 2007. When assessed in September of 2007 it demonstrates only that all children (control and experiment) knew the sounds and letters. This does not show the significance of a multisensory approach to successfully teaching the sounds and shapes of the letters earlier in the year. Neither the California State Framework or Content Standards require or expect children to start the

reading and spelling process by November in the kindergarten year, although Zoo-phonics does.

It was no surprise to find that the experimental group could test as high as they did when compared against schools from dissimilar economic and ethic demographics. It is significant to say that there were no statistical differences seen between the control group and the experimental group when the schools have different socio-economic standings.

A flaw in the research design by the researcher hindered learning about the effects of multi-sensory learning when seen through student test results and analysis. This will be discussed further in Implications of Findings.

Hypothesis

The null hypotheses for this study did not fail to reject that there was statistical significance in the data tested for Research Question 1. Tests scores for all students in the study were static, demonstrating a similar growth rate for all children, control, and experimental.

Implications of Findings

The literature review did not support the findings in Research Questions 1 and 3 nor did it support the teachers who taught Zoo-phonics as the experimental group vehicle or the children who learned through the Zoo-phonics Language Arts Program. The literature review did support the findings in Research Question 2. All children in both classes, male and female, proficient and limited English speakers, all learned the sounds of the lowercase letters in November, mastering the last three letters, as tested before or by W 3 in February.

The fault for the findings for Research Question 1 and 3 is the researcher's to bear**.** The research design was faulty from the beginning due to two reasons: (a) the limited understanding of the researcher to complete a research project, and, (b) the researcher's concern over bias. The researcher is one of the authors of the Zoo-phonics Language Arts Program.

In order to set up a research design, one has to look at the end result and work backwards. It took the entire study for the researcher to fully develop the research questions. Designing the research study was not well planned from the beginning. The lack of knowledge limited the researcher from knowing how to set up control and experimental groups; what tests to use to extract data; and what the parameters of the researcher were to monitor the research study.

The fear of bias on the part of the researcher kept her from a hands-on role in monitoring the study. It was believed that any interference from the researcher as author of Zoo-phonics Language Arts Program might be seen as manipulative and would invalidate the study. In order to avoid this, the researcher did not monitor any tests given, when given, or even if given by the control as well as the experimental group beyond what was normally administered as part of the normal routine of the school year through the District Cluster Tests.

The researcher did not make any requests of the teachers in the control group. On the advice of the Superintendent of Schools, the teachers did not know their students' test would be used as a comparison. The researcher has since learned that it is within the parameters of the researcher to set up the control and experimental groups and request specific tests to be given, even as author of the experimental reading program.

The researcher trained the two experimental teachers with a 1-day workshop in Zoo-phonics and left them to teach for the year. An occasional e-mail or phone call was given by the researcher, but only to see that the research was ongoing with the experimental teachers. All teachers from the control group, including the teachers from Schools D, E, F, and G, have used the SRA/Open Court Reading Series since 1999. They were trained extensively in its use by authorized Open Court trainers, and, at the time of this study, had seven years of experience with it.

No additional tests were required by the researcher from either the experimental or control groups, which directly, but unwittingly sabotaged this research study. Had the experimental teachers been asked to assess their children quarterly on the students' ability to read and spell simple to more complex words, their mastery of the blends and a few digraphs (th, sh), et cetera, this study might have had different results. A research question similar to Research Question 2 could have been answered showing the reading and spelling ability of many students in the two experimental classes. This would have shown a significant difference in the test analyses and a whole different picture of multisensory learning.

It may be questioned that the two experimental teachers, having had only a one-day training in Zoo-phonics, might be at fault for the limited progress of the students. This is not the case. After the study was over, in 2007, the researcher had an opportunity to talk with the two teachers and hear of their enthusiasm towards the program. As prior Open Court teachers, they had seen the difference in growth rates with Zoo-phonics instruction and methodology. They had followed the curriculum as requested and the children learned.

The literature review did support the findings in Research Question 2. All children in both classes, male and female, proficient and limited English speakers, all learned the sounds of the lowercase letters in November, mastering the last three letters, as tested before or by W 3 in February. With the concerns over limited growth seen for males and for low economic and at-risk ethnic demographics, the findings should generate curiosity over the possibility that multisensory learning does benefit children. The differences between the SRA/Open Court Reading Series and the Zoo-phonics Language Arts Program is somewhat like comparing apples to oranges. They are both fruit, both provide vitamins and minerals for nutrition, and juice can be made of both, but they are not the same. Open Court teaches capital letters and letter names first, agreeing with the premise that knowing the names of the letters is the strongest predictor of future reading success (Chall,1992). Zoo-phonics believes that teaching capital letters and letter names actually delays the reading process. By teaching children the lowercase letters and letter sounds first, the children can begin the reading, spelling and writing process much earlier than is intended by the California State Framework for Language Arts and its Content Standards. Unfortunately, no additional student assessments were required, by the researcher, to demonstrate student growth with the experimental classes.

The question begs to be asked: By using the Zoo-Phonics Multisensory Language Arts Program, why did the experimental group not demonstrate more growth over the SRA/Open Court Reading Series? Each District Cluster Test has a ceiling of so many possible correct answers. Given enough time over the year, children will learn the intended skills. As is seen in Research Question 3, the experimental group had almost mastered all of the sounds of the lowercase alphabet in November of 2006 and mastered

it completely by February, 2007. This could not be compared by the control group because in the school district where the study took place, kindergarten children are not assessed on letter sounds until they are in first grade. By the time they are assessed in first grade, all children had mastered lowercase letter sounds skills due to the gift of time. There was no way to show significant growth for the experimental group. This is not a true comparison and affects the results in Research Question 3 in this study.

Some additional testing was done by the experimental teachers at different times of the 2006 to 2007 year, but nothing consistent was required by the researcher, so nothing consistent was completed. There were tests that demonstrated that children were reading and spelling VC and CVC words; that most of the children could segment and blend words on a higher level than DCTs 5 and 6. Had a stronger, more hands-on approach been taken by the researcher more data would have been available to demonstrate the effectiveness of a multi-sensory approach.

The implication of this study is that Zoo-phonics, a Multisensory Language Arts Program, teaches as effectively as the SRA/Open Court Reading Series, a well-respected, reading program. There were no significant differences seen in most of the District Cluster Tests between the two groups in this study. In order for the research in the Literature Review to support the data, Zoo-phonics would have had to prove that it was more effective than the SRA/Open Court Reading Series. For Research Questions 1 and 3, in this study, it did not. For Research Question 2, it did.

The lesson content and criteria of the two reading programs are the same. They both align with State Framework and Content Standards for reading. It is the way in which the concepts are taught that is different. It is also the order in which skills are

taught that varies. The SRA/Open Court Reading Series curriculum primarily directs use of the child's eyes, mouth and ears in instruction and activities. The Zoo-phonics Language Arts Program directs the use of the child's ears, mouth, ears, touch, and body movement to input new information and store it in long-term memory.

Recent research from neuroscience supports a multisensory approach to teaching because of the nature of the brain and how it works. We remember:

> 10% of what we read, 20% of what we hear, 30% of what we see, 50% of what we see and hear, 70% of what we discuss with others, 80% of what we personally experience, and 95% or what we teach others. (Dale, 2010, p. 1)

The brain prefers many modalities or senses to be used to take in new information (Sprenger, 2008). When learning new information, the brain likes the body to participate (Lengel & Kuczala, 2010). Novelty arouses its attention and keeps its focus (Medina, 2008). The brain only learns when it feels comfortable and happy (Willis, 2008). Zoo-phonics believes the theory that says the more modalities that are used, the stronger the neural connections are for memory (Ratey, 2008; Willis, 2008; Wolfe, 2001).

Recommendations for Future Research

No single study can be generalized to the whole population, especially one with a small sample as seen in this study. The findings of this study can still inform educators and researchers to analyze the results against what cognitive scientists and neuroscience is presenting to the educational field.

This study was a quantitative, quasi-experimental research design. After participating in this research study, it is now believed that a mixed methodology study would have allowed the researcher to interview the teachers in both the control and experimental groups to hear and analyze what teachers think as they are teaching children

through the two different programs. Teachers analyze how and what children need in learn to read, spell and write as they are teaching. Interviews with teachers, parents, children, and administrators would provide more depth to the study and a better understanding of the teaching process from the perspective of the end-users in the classrooms. “Adding qualitative flesh to the quantitative bones is a good strategy to overcoming some of these problems” (Sydenstricker-Neto, 2010, p. 1).

Having a larger group of students, randomly chosen, from many different school districts, within the same or similar economic and ethnic demographics would provide a more reliable study. By having an interaction with the teachers throughout the year, clearly defining the dates for data collection, and providing additional tests to be administered to students would more clearly answer the research questions, and would provide a more robust study.

This study needs to be replicated using a larger sample of students, completed in a more controlled testing environment. Any tests developed to assess upper and lowercase letters recognized by letter name, letter sound recognition, rhyming, blending, and segmenting will be appropriate because these skills are basic to alphabetic and phonemic awareness development and are readily available in schools across the United States. A longitudinal study would benefit the profession as it would show how children learn most effectively over the course of several years, if treatment were continued.

The following suggestions for research might expand the knowledge base of multi-sensory learning to teach the alphabet and phonemic awareness to the educational profession.

1. A replicated but more rigidly controlled research study on the effects of multi-sensory learning to teach the alphabet and phonemic awareness skills to kindergarten children might provide evidence that would encourage a large scale, longitudinal study. Comparing this group with a non-multisensory approach might define the merits of multisensory learning.
2. Breaking down the components of a multisensory approach would clarify their importance to memory: movement, pictorial mnemonics, auditory-visual-aural memory devices, alliteration, and so forth. By testing each component against its opposite (movement vs. non-movement during alphabetic instruction, etc.) might define its significance in curriculum design and instruction.
3. Testing the efficacy of teaching lowercase letters and sounds first before uppercase letters and letter names would also provide a study that might inform educators and curricula developers.
4. Testing the efficiency of multisensory learning to teach the alphabet and phonemic awareness skills by gender, ethnic groupings, English Language Learners, and Special Needs students, in comparison to the similar students learning through non-multisensory curriculum might demonstrate best practices for these demographics, especially those seen as at-risk students.

REFERENCES

Adams, M. (1990). *Beginning to read: thinking and learning about print: A summary.* Cambridge, MA: MIT Press.

Adams, M. (1994) *Beginning to read*. Cambridge, MA: MIT Press.

Ayres, L. (1995). *The efficacy of three training conditions on phonological awareness of kindergarten children and the longitudinal effect of each on later reading acquision.* Retrieved from http://www.jstor.org

Borman, G., Dowling, M. N., & Schneck, C. (2000). *The national randomized field trial of open court reading.* Retrieved from http://itp.wceruw.org/Fall%2007%20seminar/BormanFINAL%20OCR%20RFT9%20to%20EEPA_2_.pdf

Bradshaw, G. (1985). *Using the wild to teach the child*. Groveland, CA: Zoo-Phonics.

Brown, J., Fenske, M., & Neporent, L. (2010). *The winner's brain: 8 strategies to achieve success*. Cambridge, MA: Da Capo Lifelong Books.

Bundy, A., Lane, S., & Murray, E. (2002). *Sensory integration* (2nd ed.). Philadelphia, PA: F. A. Davis Company.

Byrne, B., Fielding-Barnsley, R., & Ashley, L. (2000). Effects of preschool phoneme identity training after 6 years: Outcome level distinguished from rate of response. *Journal of Educational Psychology*, *92*(4), 659-667.

California Department of Education. (2005). *California physical fitness test: A study of the relationship between physical fitness and achievement in California using 2004 results.* Retrieved from http://www.peacefulplaygrounds.com/pdf/right-to-recess/ca-physical-fitness-test-results.pdf

Center on Educational Policy. (2009). *Are achievement gaps closing and is achievement rising for all*. Washington, DC: Center on Education Policy

Chall, J. (1992). The new reading debates: Evidence from science, art and ideology. *Teachers College Record, 94*(2), 315-329.

Clair, K. (1999). *A typographic workbook: A Primer to history techniques and artistry*, New York, NY: J. Wiley & Sons.

Diamond, M. C., Scheibel, A. B., & Elson, L. M. (1985). *The human brain coloring book*. New York, NY: Harper Collins.

Donovan, M., Bransford, J., & Pellegrino, J. (Eds.) (1999). *How people learn: Bridging research, and practice*. Washington, DC: National Academy Press.

Early Childhood Longitudinal Study—kindergarten class of 1998-1999 (ECLS-K): America's kindergartners. (2000). Retrieved from http://nces.ed.gov/ecls/kindergarten.asp

Economic impact of achievement gap in America's schools, summary findings. (2009). Retrieved from http://www.google.com/search?sourceid=navclient&ie=UTF-8&rlz=1T4ACAW_enUS348US351&q=Economic+Impact+of+the+Achievement+Gap+in+America%e2%80%99s+Schools+

Ehri. L. (2005). Learning to read words: Theory, findings, and issues. *Scientific Studies of Reading, 9*(2), 167-188.

Elkind, D. (2007). *The power of play, how spontaneous, imaginative activities lead to happier, healthier children*. San Francisco, CA: Da Capo Lifelong Books

Feinstein, S. (2006). *Learning and the brain: A comprehensive guide for educators, parents and teachers*. Lanham, MD: Rowman & Littlefield Education.

Flesch, R. (1995). *Why Johnny can't read*; New York, NY: Harper & Row.

Gardner, H. (2004). *Frames of mind: The theory of multiple intelligences.* New York: NY: Perseus Books.

Gurian, M. (2001). Boys and girls learn differently (1st ed.). San Francisco, CA: Jossey-Bass.

Gurian, M. (2003). *The boys and girls learn differently*: San Francisco, CA: Jossey-Bass.

Gurian, M. (2005). *The minds of boys* (1st ed). San Francisco, CA: Jossey-Bass.

H.R. 2614: *Congress: Reading excellence act*. (1997). Retrieved from http://www.govtrack.us/congress/bill.xpd?bill=h105-2614&tab=related

Jacobs, H. (2010). *Curriculum 21 essential education for a changing world* (1st ed.). Alexandria, VA: ASCD.

Jensen, E. (2006). *Enriching the brain* (1st ed.). San Francisco, CA: Jossey-Bass.

Jerz, J. L. (2010). *Satire/play*. Retrieved from http://mysite, verizon.net/vzesz4a6/current/id85.html

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*(4), 437-447.

Kagan, S., & Kagan, M. (1998). *Multiple intelligences: The complete MII book*. San Clemente, CA: Kagan Publishing.

Krashen, S. (2002). *Whole language and the great plummet of 1987 to 1992: An urban legend from California, Phi Beta Kappan*. Retrieved from http://www.accessmylibrary.com/coms2/summary_0286-25508926_ITM

Kuhl, P, Gopnik, A. & Meltzoff. A. (1999). *The scientist in the crib*. New York, NY: Harper Collins.

Lane, H. B., Pullen, P. C., Eisele, M. R., & Jordan, L. (2002). Preventing reading failure: Phonological awareness assessment and instruction. *Preventing School Failure, 46*, 101-111.

Liberman, A. (1999). The reading research and the reading teacher need the right theory of speech. *Scientific Studies of Reading, 3*(2), 95-111.

Lengel, R., & Kuczala, M. (2010). *The kinesthetic classroom: Teaching and learning through movement.* Randolph, NJ: Corwin / RTC Publishers.

Mannix, D. (2010). *Life skills activities for secondary students*, Retrieved from http://books.google.com/books

Mastropieri, M., & Scruggs, T. (2004). The inclusive classroom (2nd ed.). Upper Saddle River, NJ: Pearson.

McCardle, P., & Chhabra, V. (2004). *The voice of evidence in reading research* Baltimore, MA: Paul H. Brookes.

McGraw-Hill. (2002). *Results with open court reading,* Retrieved from http://www.eric.ed.gov/PDFS/ED464189.pdf

Medina, J. (2008). *Brain rules* (1st ed.). Seattle, WA: Pear Press.

Nathan, R., & Stanovich, K. (1991a). The causes and consequences of differences in reading fluency. *Theory Into Practice, 30*, 176-184.

Nathan, R., & Stanovich, K. (1991b). *Decoding skills: Word identification and fluency.* Retrieved from www.eduplace.com/marketing/nc/pdf/fw_p44-48.pdf -

National Association for Educational Policy. (2009). *Government education policy*. Retrieved from http://nces.ed.gov/ipedspas

National Center for Education Statistics. (2001). Early Childhood Longitudinal Study: kindergarten class of 1998-1999. Washington, DC: Office of Educational Research and Improvement.

National Center for Educational Statistics. (2008). *NAEP State Profiles.*Retrieved from http://nces.ed.gov/ipedspas

National Center for Educational Statistics. (2010). Institute for Educational Sciences, United States Government. Retrieved from http://nces.ed.gov/nationsreportcard/studies/gaps/

National Head Start Association. (2010). *Basic head start facts,* Retrieved from http://www.nhsa.org/files/static_page_files/81DEB0C5-1D09-3519-ADD3D63D86FECFFD/Basic_Head_Start_Facts.pdf

National Reading Panel. (2000). *Children's reading statistics.* Retrieved from http://www.nationalreadingpanel.org/publications/publications.htm

Nation's Report Card. (2010). *NAEP data explorer.* Retrieved from http://nces.ed.gov/nationsreportcard/lttdata/

Nevills, P., & Wolfe, P. (2009). *Building the reading brain* (2nd ed.). Thousand Oaks, CA: Corwin Press.

No child left behind act (NCLB; United States Government). (2009). Retrieved from http://www2.ed.gov/nclb/landing.jhtml

Obama, speech to National Urban League (2010), Retrieved: August, 15, 2010 http://www.conservative.org/acuf/issue-163/issue163news1#ixzz0yxfBGOJ9

Perry, B. D. (2010). *The developmental hot zone*. Retrieved from http://teacher.scholastic.com/professional/bruceperry/hot_zone.htm

Piaget, J. (2004). *The language and thought of the child*. New York, NY: Routledge. (Original work published 1923)

Profiles and Reports. (2010). Retrieved from http://www.ed-data.k12.ca.us/Navigation/fsTwoPanel.asp?bottom=%2Fprofile.asp%3Flevel%3D06%26reportNumber%3D6

Promislow, S. (2005). *Making the brain body connection*: *A playful guide to releasing mental, physical, and emotional blocks to success.* Vancouver, British Columbia, Canada: Kinetic Publishing / Enhanced Learning & Integrations.

Raizada, R. D. S., Richards, T., Meltzoff, A., & Huhl. P. (2007). *Socioeconomic status predicts hemispheric specialization of the left inferior frontal gyrus in young children*. Retrieved from http://ilabsWashington.edu/index.html

Random House Dictionary. (1996). New York, NY: Random House Publishers.

Ratey, J., M. D. (2008). *Spark* (1st ed.). New York, NY: Little, Brown & Company.

Rose, S. (1992). *The making of memory: From molecules to mind*. New York, NY: Bantum Press.

Routman, R. (1991). *Invitations changing as teachers and learners K-12*. Toronto, Ontario, Canada: Irwin Publishing.

Rudy, J. (2008). *The neurobiology of learning and memory*. Sunderland, MA: Sinauer Associates.

Salomone, R. (2003). *Same, different, equal*. New Haven, London: Yale University Press.

Skinner, B. F. (1989). The origins of cognitive thought. *American Psychologist, 44*(1), 13-18.

Smilkstein, R. (2006). Learning and the brain. In S. Feinstein (Ed.), *The Praeger handbook of learning and the brain*. Lanham, MD: Rowman & Littlefield Education.

Snow, C., Burns, M., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Solso, R., Maclin, M., & Maclin, O. (2005) *Cognitive psychology* (7th ed.). Boston, MA: Pearson.

Sousa, D. (2005). *How the brain learns to read*. Thousand Oaks, CA: Corwin Press.

Sprenger, M. (1999). *Learning and memory*. Alexandria, VA: ASCD.

Sprenger, M. (2008). Differentiation through learning styles and memory (2nd ed.). Thousand Oaks, CA: Corwin Press.

Stanovich, K. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*, 360-407.

Sydenstricker-Neto, J. (2010). Research *design and mixed-methodology approach: A hands on experience.* Retrieved from http://www.socialresearchmethods.net/tutorial/Sydenstricker/bolsa.html#Why Mixed

Sylwester, R. (1995). *A celebration of neurons: An educator's guide to the human brain.* Alexandria, VA: Association for Supervision and Curriculum Development.

Terry, W. (2006). *Learning and memory* (3rd ed.). Boston, MA: Pearson.

Title I Program, created by the Elementary and Secondary Education Act. (1965). Retrieved from http://www2.ed.gov/policy/elsec/leg/esea02/index.html

Title V Developing Hispanic-Serving Institutions Program, or HIS Program (U.S. Department of Education, National Center for Education Statistics). (2008). Retrieved from http://nces.ed.gov/ipedspas

Torgesen, J. (1998, Spring/Summer). *Catch them before they fall*. American Educator/American Federation of Teachers.

Urban Institute. (2003). *Urban Institute gender gap in higher education focus of new urban institute research project*. Retrieved from http://www.urban.org/education/index.cfm

Vandervelden, M., & Siegel. L. (1995). Phonological recoding and phoneme awareness in early literacy: A developmental approach. *Reading Research Quarterly, 30*(4), 854-875.

Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT Press.

Wallace, W. T. (1994). Memory for music: Effects of melody on recall of text. journal of experimental psychology. *Learning, Memory, and Cognition, 20*(6), 1471-1485.

West, J., Denton, K., & Germino-Hausken, E. (2000). *America's kindergartners: Statistical analysis report.* Washington, DC: National Center for Education.

Willis, J. (2007). *Brain-friendly strategies*. Alexandria, VA: ASCD.

Willis, J. (2008). *How your child learns best*. Naperville, IL: Sourcebooks.

Wolfe, P. (2001). *Brain matters*. Alexandria, VA: ASCD.

Worden, P., & Boettcher, W. (1990). Young children's acquisition of alphabet knowledge. *Journal of Reading Behavior, 22*, 277-295.

Yellard, N. (1998). *Gender in early childhood: Making sense of gender issues in mathematics and technology*. Retreived from http://books.google.com/books

APPENDICES

APPENDIX A

Letter of Permission to Principals/Superintendents

Letter of Permission to Principals/Superintendents

Date

Name of Principal and/or Superintendent
School Address
City, State, zip

Dear……

Please allow me to introduce myself. My name is Charlene Wrighton, and I am a Doctoral Candidate at Argosy University in San Francisco, California. I am requesting permission to complete a research project at your school site.

I am in the research stage of my dissertation and need two kindergarten teachers willing to use our Zoo-Phonics Language Arts Program fully (as designed, exclusive of other programs) for the course of one year. This study will compare the effectiveness of our multisensory approach for teaching language arts to kindergarten students (ESL and special needs students included) to the effectiveness of other language arts series such as Open Court used in your school or school district.

It will be necessary for teachers to be trained prior to the school year. Each will need to give a pre-test as a baseline on basic alphabetic skills (phonemic awareness, etc.) at the beginning of the year prior to teaching the students. Teachers will then give quarterly tests to assess growth and determine need. An end-of-the-year test to evaluate all learned skills will be administered by the classroom teacher. She or he will use whatever assessment tool that will be used by your other language arts program or tests used in the district. Comparisons will be made through these assessments.

If your permission is granted, I will either come to your site to train your teachers with the *Zoo-Phonics® Language Arts Program* and/or fully supply the classroom with the initial assessments, the Zoo-Phonics materials needed, as well as the literature books used in the Instruction Manual. I will be available all year for consultation, if the teacher needs help in any way. Mid-year visits will be arranged at the convenience of your teachers. Once tests are administered and completed, I request permission to not only view the results but to copy and use them as part of the compilation process in my dissertation.

Parents will need to sign a letter of permission (enclosed) for their child to be taught in a language arts program other than the one you are using in your school or district. They must also give permission to have their child be a part of a research project. All teacher and student names will be held in strict confidence and will be assigned a number when used in data compilation.

You, your teachers, and parents have the right to see my research project at anytime. Once teachers and students are up and running with the *Zoo-Phonics Language Arts Program*, I will continue to research "best practices" for the teaching of language arts to kindergarten children, especially those considered at risk. It is hoped that by the time the data are compiled and the literature is reviewed, this completed study will add to the body of knowledge of what are the best educational practices in language arts for teaching all children, but especially low performing children in kindergarten. Because our nation is burgeoning with non- to limited English speaking students and the rate of en-enriched or low income students is growing as well, ways to successfully teach *all* students must be found and implemented. The *Zoo-Phonics Language Arts Program* has not been tested in a clinical study and it is hoped that perhaps the results will be sufficiently compelling to encourage such a study.

I will be happy to talk with you further about this if you have any concerns. If you, your teachers, and your parents do grant permission, I would like to schedule meeting (conference call is acceptable) with all of you. If your teachers are already proficient in Zoo-Phonics, I will talk with them by telephone, will immediately send out materials, and then will arrange a meeting during first of the year to touch base with the teachers.

I hope to hear from you soon, as I am eager to begin this project. Thank you for your consideration.

_____

Charlene A. Wrighton, M.A., Ed.
Doctoral Candidate, Argosy University, San Francisco
1000 Street Address
City, ST, 94000
(800) 800-8000

APPENDIX B

Letter of Permission to Teachers

Letter of Permission to Teachers

Date

Name of Teacher
School Address
City, State, zip

Dear……

Please allow me to introduce myself. My name is Charlene Wrighton, and I am a Doctoral Candidate at Argosy University in San Francisco, California. I have requested permission from your principal and superintendent to complete a research project at your school site. I need your permission as well.

I am in the research stage of my dissertation and need two kindergarten teachers willing to use our *Zoo-Phonics Language Arts Program* fully (as designed, exclusive of other programs) for the course of one year. This study will compare the effectiveness of our multi-modal approach for teaching language arts to low performing kindergarten students (ESL and special needs students included) to the effectiveness of other language arts series such as Open Court, Scholastic, Houghton-Mifflin, etc. used in your school or school district.

It will be necessary for you to attend a one day training workshop prior to the school year. You will be required to assess your students the first we've they've entered school. This pre-test will act as a baseline on basic alphabetic skills (phonological awareness, the alphabetic principal, etc.). It is essential that this pre-test be completed before giving language arts instruction to your students.

As a part of the curriculum instruction, you will then give quarterly tests to assess growth and determine need. An end-of-the-year test to evaluate all learned skills will be administered by the classroom teacher. You will use whatever assessment tool that will be used by the schools in the district for kindergarten children. Comparisons will be made through these assessments.

If your permission is granted, I will come to your site for a one-day workshop to train your teachers with the *Zoo-Phonics® Language Arts Program* and/or fully supply the classroom with the initial assessments, the Zoo-Phonics materials needed, as well as the literature books used in the Instruction Manual. I will be available all year for consultation, if the teacher needs help in any way. Mid-year visits will be arranged at the convenience of your teachers. Once tests are administered and completed, I request permission to not only view the results but to copy and use them as part of the compilation process in my dissertation.

Parents will need to sign a letter of permission (enclosed) for their child to be taught in a language arts program other than the one you are using in your school or district. They must also give permission to have their child be a part of a research project. All teacher and student names will be held in strict confidence and will be assigned a number when used in data compilation.

You, your teachers, and parents have the right to see my research project at anytime. Once teachers and students are up and running with the *Zoo-Phonics Language Arts Program*, I will continue to research "best practices" for the teaching of language arts to kindergarten children. It is hoped that by the time the data are compiled and the literature is reviewed, this completed study will add to the body of knowledge of what are the best educational practices in language arts for teaching all children, but especially low performing children in kindergarten. Because our nation is burgeoning with non- to limited English speaking students and the rate of en-enriched or low income students is growing as well, ways to successfully teach *all* students must be found and implemented. The *Zoo-Phonics Language Arts Program* has not been tested in a clinical study and it is hoped that perhaps the results will be sufficiently compelling to encourage such a study.

I will be happy to talk with you further about this if you have any concerns. If you, your teachers, and your parents do grant permission, I would like to schedule meeting (conference call is acceptable) with all of you. If your teachers are already proficient in Zoo-Phonics, I will talk with them by telephone, will immediately send out materials, and then will arrange a meeting during first of the year to touch base with the teachers.

I hope to hear from you soon, as I am eager to begin this project. Thank you for your consideration.

_____

Charlene A. Wrighton, M.A., Ed.
Doctoral Candidate, Argosy University, San Francisco
1000 Street Address
City, ST, 94000
(800) 800-8000

APPENDIX C

Parent Letter Requesting Permission to Observe Students and to View Confidential Documents

Parent Letter Requesting Permission to Observe Students and to View Confidential Documents

Date

Name of Parent
School Address
City, State, Zip

Dear……

Please allow me to introduce myself. My name is Charlene Wrighton, and I am a Doctoral Candidate at Argosy University in San Francisco, California. I want to do a research study on how best to teach kindergarten children in language arts. This research study will compare the Zoo-Phonics Language Arts Program to other language arts programs used in various schools across the nation.

I have asked permission of the principal to work with two kindergarten teachers at your child's school in the use of the Zoo-Phonics Program. Part of the requirements is for each teacher to use the Zoo-Phonics Program fully (as designed) exclusive of any other program or materials in order to determine how effective it is in teaching students the alphabet, and how to read, spell and write. Your child will be assessed at the beginning of the school term and then every 3 months and at the end of the year to measure his or her growth. The success of the Zoo-Phonics Arts Program will be measured against the success of another language arts program used in your child's school or district.

I request permission from you to have your child learn language arts skills this year through the Zoo-Phonics Language Arts Program, for the teacher to assess your students quarterly, and for me to view the test results, to copy and to use them as part of the compilation process in my report. No names of students, parents, or teachers will be listed. This information will be kept confidential. Enclosed is a brochure telling more about our program and how it easily it teaches all children. You have the right to request to see my research project at anytime. I will be happy to talk with you about this if you have any concerns.

I need your permission before I can start this research project and view/copy your child's test results. If you agree, would you please sign the enclosed permission slip form and return it to your child's teacher?

Thank you very much,

_____

Charlene A. Wrighton, M.A., Ed.
Doctoral Candidate, Argosy University, San Francisco
1000 Street Address
City, ST, 94000
(800) 800-8000

APPENDIX D

Permission to View Test Scores and Use as Analysis

Permission to View Test Scores and Use as Analysis

To Whom It May Concern:

I, _____, the parent of _____

Give my permission for Mrs. Charlene Wrighton, Doctoral Candidate at Argosy University, San Francisco, California, to use pre- and post-test scores as well as quarterly tests to determine the efficacy of the *Zoo-Phonics Language Arts Program.*

I also give my child's teacher permission to copy the pre- and post-test scores for her study.

Mrs.Wrighton has assured me of complete confidentiality in her work. My child's name, the teacher's name or my name will not be seen in any report, article, or dissertation.

I assert my right to discontinue permission at any time. I also acknowledge that I have the right to discuss this with the researcher and to see the researcher's final report.

_____ _____

Parent Signature Date

APPENDIX E

District Language Arts Assessment for Kindergarten Children

District Language Arts Assessment for Kindergarten Children

CALIFORNIA KINDERGARTEN CONTENT STANDARDS
and Worksheets for many of these standards

Language Arts

Reading

1.0 Word Analysis, Fluency, and Systematic Vocabulary Development

*Students know about letters, words, and sounds. They apply this knowledge to read simple sentences.

Concepts About Print
1.1 Identify the front cover, back cover, and title page of a book.
1.2 Follow words from left to right and from top to bottom on the printed page.
1.3 Understand that printed materials provide information.
1.4 Recognize that sentences in print are made up of separate words.
1.5 Distinguish letters from words.
*1.6 Recognize and name all uppercase and lowercase letters of the alphabet.

Phonemic Awareness
1.7 Track (move sequentially from sound to sound) and represent the number, sameness/difference, and order of two and three isolated phonemes (e.g., */f, s, th/, /j, d, j/*).
1.8 Track (move sequentially from sound to sound) and represent changes in simple syllables and words with two and three sounds as one sound is added, substituted, omitted, shifted, or repeated (e.g., vowel-consonant, consonant-vowel, or consonant-vowel-consonant).
*1.9 Blend vowel-consonant sounds orally to make words or syllables. 1.10 Identify and produce rhyming words in response to an oral prompt.
1.11 Distinguish orally stated one-syllable words and separate into beginning or ending sounds.
1.12 Track auditorily each word in a sentence and each syllable in a word.
1.13 Count the number of sounds in syllables and syllables in words.

Decoding and Word Recognition
*1.14 Match all consonant and short-vowel sounds to appropriate letters.
1.15 Read simple one-syllable and high-frequency words (i.e., sight words).
1.16 Understand that as letters of words change, so do the sounds (i.e., the alphabetic principle).

Vocabulary and Concept Development
1.17 Identify and sort common words in basic categories (e.g., colors, shapes, foods).
1.18 Describe common objects and events in both general and specific language.

2.0 Reading Comprehension

Students identify the basic facts and ideas in what they have read, heard, or viewed. They use comprehension strategies (e.g., generating and responding to questions, comparing new information to what is already known). The selections in *Recommended Literature, Kindergarten Through Grade Twelve* (California Department of Education, 2002) illustrate the quality and complexity of the materials to be read by students.

Structural Features of Informational Materials
2.1 Locate the title, table of contents, name of author, and name of illustrator.

Comprehension and Analysis of Grade-Level-Appropriate Text
2.2 Use pictures and context to make predictions about story content.
2.3 Connect to life experiences the information and events in texts.
2.4 Retell familiar stories.
2.5 Ask and answer questions about essential elements of a text.

3.0 Literary Response and Analysis

Students listen and respond to stories based on well-known characters, themes, plots, and settings. The selections in *Recommended Literature, Kindergarten Through Grade Twelve* illustrate the quality and complexity of the materials to be read by students.

Narrative Analysis of Grade-Level-Appropriate Text
3.1 Distinguish fantasy from realistic text.
3.2 Identify types of everyday print materials (e.g., storybooks, poems, newspapers, signs, labels).
3.3 Identify characters, settings, and important events.

Writing

1.0 Writing Strategies

Students write words and brief sentences that are legible.

Organization and Focus
1.1 Use letters and phonetically spelled words to write about experiences, stories, people, objects, or events.
1.2 Write consonant-vowel-consonant words (i.e., demonstrate the alphabetic principle).
1.3 Write by moving from left to right and from top to bottom.

Penmanship
1.4 Write uppercase and lowercase letters of the alphabet independently, attending to the form and proper spacing of the letters.

Written and Oral English Language Conventions

The standards for written and oral English language conventions have been placed between those for writing and for listening and speaking because these conventions are essential to both sets of skills.

1.0 Written and Oral English Language Conventions

Students write and speak with a command of standard English conventions.

Sentence Structure
1.1 Recognize and use complete, coherent sentences when speaking.

Spelling
1.2 Spell independently by using pre-phonetic knowledge, sounds of the alphabet, and knowledge of letter names.

Listening and Speaking

1.0 Listening and Speaking Strategies

Students listen and respond to oral communication. They speak in clear and coherent sentences.

Comprehension
1.1 Understand and follow one-and two-step oral directions.
1.2 Share information and ideas, speaking audibly in complete, coherent sentences.

2.0 Speaking Applications (Genres and Their Characteristics)

Students deliver brief recitations and oral presentations about familiar experiences or interests, demonstrating command of the organization and delivery strategies outlined in Listening and Speaking Standard 1.0.

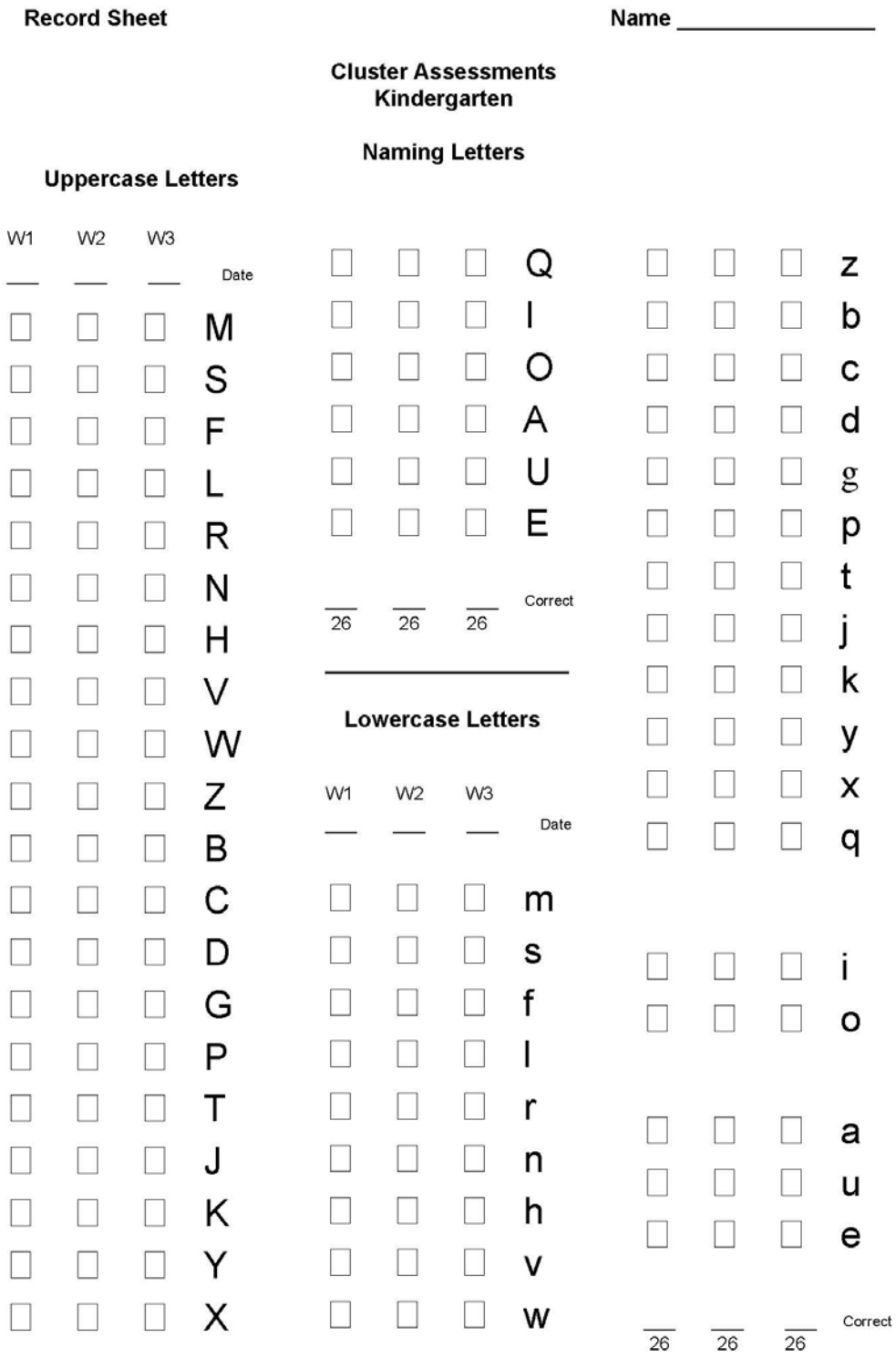
Using the listening and speaking strategies of kindergarten outlined in Listening and Speaking Standard 1.0, students:
2.1 Describe people, places, things (e.g., size, color, shape), locations, and actions.
*2.2 Recite short poems, rhymes, and songs.
2.3 Relate an experience or creative story in a logical sequence.

http://www.cuesd.tehama.k12.ca.us/maywood/staff/jstout/k_stands.htm

APPENDIX F

District Cluster Tests

District Cluster Tests



Record Sheet

Name _____

Cluster Assessments
Kindergarten

Naming Letters

Uppercase Letters

W1	W2	W3	Date
___	___	___	
☐	☐	☐	M
☐	☐	☐	S
☐	☐	☐	F
☐	☐	☐	L
☐	☐	☐	R
☐	☐	☐	N
☐	☐	☐	H
☐	☐	☐	V
☐	☐	☐	W
☐	☐	☐	Z
☐	☐	☐	B
☐	☐	☐	C
☐	☐	☐	D
☐	☐	☐	G
☐	☐	☐	P
☐	☐	☐	T
☐	☐	☐	J
☐	☐	☐	K
☐	☐	☐	Y
☐	☐	☐	X

☐	☐	☐	Q
☐	☐	☐	I
☐	☐	☐	O
☐	☐	☐	A
☐	☐	☐	U
☐	☐	☐	E
___	___	___	Correct
26	26	26	

Lowercase Letters

W1	W2	W3	Date
___	___	___	
☐	☐	☐	m
☐	☐	☐	s
☐	☐	☐	f
☐	☐	☐	l
☐	☐	☐	r
☐	☐	☐	n
☐	☐	☐	h
☐	☐	☐	v
☐	☐	☐	w

☐	☐	☐	z
☐	☐	☐	b
☐	☐	☐	c
☐	☐	☐	d
☐	☐	☐	g
☐	☐	☐	p
☐	☐	☐	t
☐	☐	☐	j
☐	☐	☐	k
☐	☐	☐	y
☐	☐	☐	x
☐	☐	☐	q
☐	☐	☐	i
☐	☐	☐	o
☐	☐	☐	a
☐	☐	☐	u
☐	☐	☐	e
___	___	___	Correct
26	26	26	

NAME:

This is an individually administered assessment.
Directions for administration:
Say, "**This will help me learn what you know about rhyming words. I will say three words, and you will tell me the two that rhyme. Example: cat-hat-far. The two words that rhyme are *cat* and *hat*. *Far* does not rhyme with *cat*. *Far* does not rhyme with *hat*. Are you ready?"**

RHYMING

Window 1	Window 2	Window 3	Date of administration
_____	_____	_____	
☐	☐	☐	The words are ***house, mouse* and *bird*?** Which two words rhyme?
☐	☐	☐	The words are ***can*, *box*** and ***fan***? Which two words rhyme?
☐	☐	☐	The words are ***star, car*** and ***bicycle***? Which two words rhyme?
☐	☐	☐	The words are ***boat, goat*** and ***chair***? Which two words rhyme?
☐	☐	☐	The words are ***shell, tire*** and ***bell***? Which two words rhyme?

Rhyme Matching

Directions: Now we are going to do something a little different. I will say a word, and you will tell me a rhyming word. If I say *sun*, you would say *fun. Are you ready? (In the line below the prompt, write the word that the student produces.)*

☐	☐	☐	Tell me a word that rhymes with *sad.*
			_____
☐	☐	☐	Tell me a word that rhymes with *may.*
			_____
☐	☐	☐	Tell me a word that rhymes with *red.*
			_____
☐	☐	☐	Tell me a word that rhymes with *lake.*
			_____
☐	☐	☐	Tell me a word that rhymes with *fan.*
			_____
____/5	____/5	____/5	Rhyme Production
____/10	____/10	____/10	Rhyme Total

Record Sheet **Name** _____

Cluster Assessments
Kindergarten

Blending
(Compounds/Onset & Rime)

W1	W2	W3					
___	___	___	Date				
☐	☐	☐	1.	/birth/	/day/	What is the word?	birthday
☐	☐	☐	2.	/cart/	/wheel/	What is the word?	cartwheel
☐	☐	☐	3.	/bi/	/cycle/	What is the word?	bicycle
☐	☐	☐	4.	/ham/	/burger/	What is the word?	hamburger
☐	☐	☐	5.	/tele/	/phone/	What is the word?	telephone
☐	☐	☐	6.	/m/	/oon/	What is the word?	moon
☐	☐	☐	7.	/p/	/uppy/	What is the word?	puppy
☐	☐	☐	8.	/t/	/ickle/	What is the word?	tickle
☐	☐	☐	9.	/h/	/appy/	What is the word?	happy
☐	☐	☐	10.	/s/	/uper/	What is the word?	super
___	___	___	Correct				
10	10	10					

Record Sheet **Name**_____

Cluster Assessments
Kindergarten

Test of Auditory Skills (TAAS)

W2	W3		
___	___	Date	
☐	☐	1.	sun
☐	☐	2.	nic
☐	☐	3.	cumber
☐	☐	4.	oat
☐	☐	5.	eat
☐	☐	6.	ache
☐	☐	7.	gay
☐	☐	8.	row
☐	☐	9.	plea
☐	☐	10.	lap
☐	☐	11.	lay
☐	☐	12.	sale
☐	☐	13.	sack
___	___	Total Correct	
13	13		

Record Sheet **Name**_____

Cluster Assessments
Kindergarten

Blending (Phoneme)

W3
___ **Date**

☐ 1. /b/ /i/ /g/ (big)

☐ 2. /l/ /a/ /p/ (lap)

☐ 3. /m/ /a/ /n/ (man)

☐ 4. /t/ /long i/ /m/ (time)

☐ 5, /s/ /t/ /o/ /p/ (stop)

☐ 6. /h/ /i/ /m/ (him)

___ Correct

Segmenting (Phoneme)

☐ 1. fan (/f/ /a/ /n/)

☐ 2. pig (/p/ /i/ /g/)

☐ 3. mud (/m/ /u/ /d/)

☐ 4, cane (/c/ /long a/ /n/)

☐ 5, bib (/b/ /i/ /b/)

___ Correct

Record Sheet **Name**_____

Cluster Assessments
Kindergarten
Word Reading

W3

___ Date

- ☐ had
- ☐ got
- ☐ but
- ☐ let
- ☐ did
- ☐ us
- ☐ in
- ☐ so
- ☐ and
- ☐ see
- ☐ by
- ☐ you
- ☐ of
- ☐ the
- ☐ her
- ☐ was
- ☐ for
- ☐ like
- ☐ that
- ☐ most
- ☐ from

___ Total Correct

Record Sheet **Name** _____

Cluster Assessments
Kindergarten

W3 **Matching Consonants and Sounds**

_____ Date

- ☐ s
- ☐ d
- ☐ p
- ☐ m
- ☐ h
- ☐ t
- ☐ n
- ☐ l
- ☐ b
- ☐ c
- ☐ r
- ☐ g
- ☐ j
- ☐ f
- ☐ x
- ☐ z
- ☐ w
- ☐ k
- ☐ q
- ☐ y
- ☐ v

_____ Total Correct
21

Record Sheet **Name** _____

Cluster Assessments
Kindergarten

W3 **Matching Short Vowels and Sounds**

_____ Date

- ☐ i
- ☐ a
- ☐ o
- ☐ u
- ☐ e

_____ Total Correct
5