

***Equal Alphabet Proficiency Seen in Boys and Girls with the
Zoo-phonics Multisensory Language Arts Program***

2014 - 2016



An Independent Study Conducted by E3 Research

Equal Alphabet Proficiency Seen in Boys and Girls with the Zoo-phonics Multisensory Language Arts Program

Abstract

According to 2015 NAEP reading test scores, fourth grade Black students have an 18% proficiency rate, with only 2% at the Advanced level. Hispanic fourth grade students have a 21% proficiency rate, with only 3% at the Advanced level. Fourth grade White students have a 46% proficiency rate, with only 12% at the Advanced level.

Wide achievement gaps exist in language arts between White and Asian, Latino and Black students as well as between genders, with females having a wide advantage over males. Black, Latino and Native American males from a low SES are considered the highest risk students in the nation.

This study determined the differences in performance between the two genders in low SES demographics when learning the lower- and uppercase alphabets (shapes, names, and sounds) through the Zoo-phonics Multisensory Language Arts Program for preschool and kindergarten children.

This descriptive study used a multiple cohort designed to determine the alphabetic proficiency of students during the 2014-2016 school years. Four cohorts were comprised of 1,619 three- and four-year-old preschoolers and kindergarten students in three school districts in Kentucky, Oklahoma and California.

Overall findings showed that three-year old girls performed slightly better than boys initially, resulting in no significant difference in alphabetic knowledge between the genders by the end of the first trimester of kindergarten. One interesting result was that girls moderately out-performed boys in the half-day preschool programs but showed no statistical difference in full-day preschool programs. Students performed equally, leading us to conclude that the overall poor reading performance of our nation's students can be effectively addressed by beginning the reading process using a multisensory approach such as Zoo-phonics.

Introduction

In 2015, test results of 18,700 twelfth-grade students, based on the National Center for Education Statistics (NCES), showed that only one-third of these twelfth graders were deemed ready for the academic rigors of college, especially in the area of reading. "These scores...from the Nation's Report Card show a widening gap between the highest- and lowest-performing students" (Nation's Report Card, 2015).

According to the 2009 Program for International Student Assessment, fifteen-year-old students in the U.S. ranked 14th in reading, 17th in science and 25th in math in a worldwide comparison. "This is an absolute wake-up call for America," U.S. Education Secretary Arne Duncan said in an interview with the Associated Press. "The results are extraordinarily challenging to us, and we have to deal with the brutal truth. We have to get much more serious about investing in education" (Armario, 2010).

What form of "investing" is Duncan speaking of? From 2002–03 to 2012–13, current expenditures for students enrolled in public schools increased from \$10,455 to \$11,011 per student (NCES, 2016). The United States spends more money on their K-12 public school students than any other country, and yet we are not inter-

nationally competitive (Associated Press, 2013). Within 13 years, the United States has slipped from ranking second in college graduation rates to ranking thirteenth (PISA, 2013).

According to Bill Bushaw, Executive Director of the National Assessment Governing Board (NAGB), "We're not making the academic progress that we need to so that there's greater preparedness for post-secondary, for work, for military participation. These numbers aren't going the way we want" (NAEP, 2015).

The report estimates that only 37% of students, for both reading and math, scored well enough to be considered likely to possess the knowledge and skills to be academically prepared for higher education. The average reading score is 57% for any racial and ethnic group, with no changes seen since 2013 assessments (NAEP, 2015).

According to 2015 reading test scores, fourth grade Black students have an 18% proficiency rate, with only 2% at the Advanced level. Hispanic fourth grade students have a 21% proficiency rate, with only 3% at the Advanced level. Fourth grade White students have a 46% proficiency rate, with only 12% at the Advanced level. Eighth grade students maintained relatively the

same scores as when they were in fourth grade showing that students did not gain reading skills as they aged (NAEP, 2015).

The National Report Card (2015) shows that in the reading domain for White, Black and Latino fourth grade students, over the course of 23 years, little growth has taken place. From 1996 to 2015, Blacks have made, on average, 0.43% annual growth, Latinos have made 0.40% annual growth, and Whites have made 0.50% annual growth (NAEP, 2015).

Achievement gaps are found between students living in middle and upper economic strata compared to those in the lower socio-economic strata (SES), and between White and Asian student populations compared to Black, Latino, and American Indian and Alaskan Native student populations. White and Asian males outscored their ethnic male counterparts consistently. White and Asian females were considerably higher than females in Black, Latina or American Indian and Alaskan Native ethnic groups. Consistently, Latinos slightly outscored Black students (NAEP, 2010, 2015). This is noteworthy considering many Latino students speak English as their second language.

These scores also indicate that fourth and eighth grade White females outscored White males, regardless of economic strata by a wide margin across the 1992 to 2015 test cycles, with few exceptions. Black, Latino and Native American males from a low SES are considered the highest risk students in the nation. The likelihood of many of them completing high school is low (NAEP, 2015).

These nation-wide test results beg the question, why are scores so low after all the changes put forth by No Child Left Behind, State Standards, Common Core Standards, the Every Student Succeeds Act (ESSA), and the continual re-designing of curricula and theory over the past 30 years?

Too many children are not making the gains necessary in public schools to reach their full potential or to become productive citizens (Lynch, 2007). "I think we have to invest in reform, not in the status quo," Duncan said (Armario, 2010).

Scientific Foundation

A large and growing body of research has shown a wide and growing achievement gap between White and Asian students, Latino and Black and other minority groups as well as between genders, with females having a wide advantage over males in the area of language arts.

If these male students also have an academic disability, an attention deficit, with or without hyperactivity, success is improbable. But, this is not new news. What is alarming is that *all* boys, universally, and regardless of ethnicity or economic status, have a disadvantage built in to the brain, which jeopardizes their success right from the start of life.

According to many studies, there are hard-wired differences in the brains of girls and boys that must be analyzed in order to correct the trajectory of static or declining scores for all students, but especially males who are at risk (Sax, 2005).

A longitudinal study conducted by the National Institute of Health (Bonomo, 2010) found that girls and boys, from birth, mature at different rates and in different areas.

Rather than develop along the same lines as girls' brains, only slower, boys' brains develop at a different order, time, and rate than girls'—in the areas of the brain that affect language, spatial memory, and motor coordination. Bonomo (2010) as cited by Hamlon, Thatcher & Cline (1999) found that while the areas involved in language and fine motor skills mature about six years earlier in girls than in boys, the areas involved in targeting and spatial memory mature some four years earlier in boys than they do in girls.

Cassidy and Ditty (2001, as cited in Bonomo, 2010) found that newborn girls hear sounds in higher ranges where speech sounds are spoken, giving the advantage to girls' burgeoning language. Newborn boys are more attracted to movement (Bonomo, 2010).

As babies grow into toddlers, gender differences continue and are clearly seen in preschool. Girls are able to form words and sentences earlier, as their fine motor control is more refined. Boys develop spatial and motor skills earlier than girls. By age three, vocabulary is more fully developed in girls, with 99% of their speech being understandable. At age four and half, boys' speech is 99% comprehensible. In three-year-old boys muscle mass is more fully developed. They are more physically coordinated, quick, aggressive and impulsive than girls (Gurian, 2001).

In preschool- and kindergarten-aged boys, there is less "cross-talk" between the brain hemispheres, delaying them from learning abstract concepts. Girls move between the two hemispheres, allowing them to easily learn and access abstract concepts such as language. They are able to multi-task more fluidly (Gurian, 2001). This hemispheric specialization dictates specific learning skills in children, particularly in the areas of language and math abilities. PET and fMRI imaging demonstrate that both hemispheres in the girl's brain are more continually active, where boys are primarily active in their right hemispheres. Even at rest, girls show activity in both hemispheres (Gurian, 2001).

Boys need more room to play and to play more roughly than girls. Boys live in the limbic area of their brains, expressing themselves emotionally through movement and action. Girls use verbalization to express their emotions. Boys are 95% more likely to be hyperactive than girls. Girls are more likely to have fluctuating hormones that affect their emotions (Gurian, 2001).

In first grade many boys still struggle with language, reading, spelling, and writing skills and take longer to master them. However, they learn math skills earlier and more quickly than girls. Girls learn to read and write sooner and more fluidly.

When looking at the demands of reading, spelling and writing, it appears that boys have a brain-body disadvantage from birth which often continues throughout their school careers. Letters are symbols that represent sounds in words and are very abstract. Whereas boys primarily work and play in the right hemisphere of their brains, they have more difficulty accessing symbolic, abstractions such as verbal information found in reading, spelling and writing, which is located in the left hemisphere (Gurian, 2001). Says, McGuinness (2014),

"In most countries around the world, nearly all children master the written code and learn to read and spell with relative ease. In these countries a poor reader is defined by reading speed, not by accuracy. In English-speaking countries, poor readers are slow as well, but their main problem is accuracy, not speed. This difference is a function of the difficulty of mastering the immensely complex written code for the sounds of the English language."

Supporting the claims of McGuinness, The *Boys' Reading Commission* (2012) has the same findings:

"Attainment data for England consistently shows girls outperforming boys in reading, with the gap remaining relatively stable from the early years to GCSE level over the past decade. At the introduction of the National Literacy Strategy in 1998, only 64% of boys were reaching the level expected for their age at the end of primary school compared with 79% of girls, a gap of 15 percentage points. By 2000, the gap had been closed to 6 percentage points, but since then it has remained pretty static at this crucial stage of education, meaning 20% of boys (and 12% of girls) start secondary school unable to read at the expected level."

A wide array of research suggests that boys in their formative years need concrete instruction to enable them to grasp complex and abstract language arts concepts. In order for boys to learn, they have to have physical activity during the lessons. This movement gets the body comfortable and the amygdala open and reading for instruction (Willis, 2008).

Movement and exercise is a powerful stimulant to memory, according to Berwid and Halperin (2012). The findings in their study state that not only does movement and exercise stimulate memory in the hippocampus area by secreting Brain-Derived Neuro Trophic Factor (BDNF - a chemical protein) onto the neurons strengthening them, but also the effect carries over for days and perhaps weeks. Ratey (2010) states that BDNF not only strengthens neurons for memory but actually cause new neurons to grow. He calls BDNF, "Miracle-Gro for the brain." So crucial is purposeful movement and exercise to learning that without it learning may not take place. Weigh this in a context where children sit at desks and boys are told to hold still and be quiet.

All children need to be physical in order to learn. Considering that boys are half the nation's population, educators and curriculum designers should take their needs seriously (Gurian, 2001; Neu & Weinfeld, 2007). For the last several decades recess and physical education have been reduced in school to give time for more reading instruction. According to the American Academy of Pediatrics, "Recess is a crucial and necessary component of a child's development and, as such, it should not be withheld for punitive or academic reasons" (Strauss, 2016).

As noted, BDNF produced during recess and exercise continues to impact cognitive function long after the activity ends. Even adults experience positive affects in cognitive performance due to exercise. Science Daily (2016) reported that researchers have evidence that show that "learning, memory and brain repair depend on the ability of our neurons to change with experience... and that exercise may enhance this essential plasticity of the adult brain."

The way language arts curricula (see-hear-say) and classrooms are structured (a spot on the rug, sit at a desk, straight lines, quiet voices), boys are at a disadvantage while girls are given the advantage. Sitting still at tables or desks, holding a pencil too early, attempting to learn the alphabet, reading, spelling and writing through symbolic knowledge in a physically constraining manner may confound boys (Wrighton, 2010).

Multiple studies from neuroscience have found that children in general, and boys specifically, need to move in order to learn (Medina, 2008; Ratey 2010; Berwid & Halperin 2013). Movement and multisensory input is pivotal to understanding the concepts being taught. With meaning and understanding comes memory and usage (Kagan & Kagan, 1998). Few classrooms are structured and present curricula that allow children opportunities for sensory exploration and physical movement during pre-reading, reading and writing instruction (Medina, 2010).

Traditional curricula, especially those used to teach the alphabet to early learners in preschool and kindergarten, primarily use the children's eyes and ears but not the rest of their bodies or senses (Sprenger, 2008; Medina, 2009). The child's access to print is limited to hearing what the teacher reads aloud, writes on the board, or is shown in a big book (Sprenger, 2008; Lengel, 2010).

According to Gardner (1983) boys are primarily "bodily kinesthetic" and need to move in order to learn. Movement in the classroom is often restricted and may be seen more as an interruption to the lessons rather than a path to learning in many preschool and kindergarten classrooms. Research demonstrates that junior high and high school boys need physical movement just as much during learning instruction to stimulate "brain alertness and performance" (Gurian, 2005).

All children need novelty (Medina, 2008) and mnemonic devices in order to learn, but especially boys, who need memory devices that move information from the abstract to the concrete. Ehri, Deffner & Wilce (1984) stated that integrated picture mnemonics were 100% effective in teaching kindergarten students to learn letter-sound associations when the picture exactly matched the letter on which it is placed. They state “integrated pictures were effective because they linked two otherwise unconnected items in memory. The shapes of letters included in pictures reminded learners of previously seen pictures with those shapes whose names began with the relevant letter sound.”

Social interaction and 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, is often discouraged (Spenger, 2008) and may be viewed as interruptive.

In traditional curricula developed for preschool and kindergarten children, there is little evidence where lessons and activities require the child’s sensory input or physical movement during alphabetic instruction. Most traditional teaching focuses on the child’s use of eyes and ears. Learning the alphabet, reading, spelling and writing 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 board.

To compound the difficulty, there are lower- and an uppercase alphabets with similar and dissimilar sounds and shapes making learning even more difficult to 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). If the abstract nature of the alphabetic sound and symbol relationship is not understood and mastered by preschoolers and kindergartners with automaticity and rapid recognition, the children have little hope for learning how to read and write in their near future (Wrighton, 2010).

The limbic area of 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 (muscle movement) (Gurian, 2001). “Embodied cognition” is a term that explains the relationship between body (senses) and brain function. Fadjo (2012) relates that embodied cognition “arises from bodily interactions with the world.” These mind-body connections take place in the womb as the child moves throughout the gestation period. From birth, children take in the world through touch, sight, smell, taste, hearing, vocalizations and movement (Wrighton, 2010). These critical interactions result in increased levels of engagement and attention. Without attention occurring many students have difficulty concentrating and gaining mastery of the topic (Griffith, 2014).

If a child feels a “fight or flight” urge during the learning experience, the endocrine system releases 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; Wolfe, 2001). As evidenced by the poor test scores in America’s youth, students are anything but comfortable with their ability to read and write successfully (NAEP, 2010).

Children must feel able and comfortable enough to enjoy the learning experience at the same time. Any threats to learning create 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 (Willis, 2008; Diamond, et al., 1985).

Neuroscience supports components of the *Zoo-phonics* methodology: pictorial mnemonics (Ehri, et al., 1984; Asher, 1993), movement (Asher, 1993; Jensen, 2001; Medina 2008; Ratey, 2009), game-based activities (Jensen, 2001), sensory exploration, and novelty (Medina 2008). *Zoo-phonics* quickly gains and keeps children’s attention, moving newly taught information into long term memory (Jensen, 2000; Medina 2008; Ratey, 2010). Children learn more effectively when they purposefully move. According to the American Academy of Pediatrics (2012), exercise and movement maximize attention, understanding, memory, utilization and transference to all areas of the language arts processes. Because of the physicality and playful nature of the *Zoo-phonics* approach to learning, children across all demographics learn language arts skills at similar rates and depth, providing them confidence and a strong foundation for more advanced learning (Liu, 2015).

Program Description

The *Zoo-phonics Multisensory Language Arts Program* is a developmental, sequential and comprehensive phonics- and literature-based language arts program for early and primary education: toddlers, preschoolers, kindergartners and first graders. Beginning with the teaching of the alphabet, phonemic and print awareness, the curricula move children playfully, developmentally, and physically into each of the early reading, spelling and writing domains.

Children first learn through the *Lowercase Animal Alphabet*, where animals are drawn in the direct shape of each lowercase letter (Ehri, et al., 1984). This is the first and most crucial mnemonic that *Zoo-phonics* uses to turn abstract symbols into concrete and playful animal letters.

Each *Animal Letter* has an alliterative name that helps the child master the sounds of the letters quickly: allie alligator, bubba

bear, catina cat, etc. This auditory mnemonic bridges the gap between the visual and the auditory alphabetic process.

Each *Animal Letter* has a related body movement (Signal) that acts a catalyst and a third mnemonic that cements letter sounds to the letter shapes (alligator's jaws open and close, /a/; bear reaches for honey, /b/; cat washes her face, /c/; etc.). The children "see, say, hear and do" as well as touch, sing, dance, pantomime, toss, catch, slither, jump and run. The *Uppercase Animal Alphabet* is comprised of the capital letters with the same animals as the lowercase alphabet, which provides an associative affect for easy mastery.

Zoo-phonics teaches the alphabet as a whole entity, taught in alphabetical order. *Zoo-phonics* focuses on the lowercase letters and their sounds first before teaching letter names and capital letters because 95% of text is written with lowercase letters. Children learn the shapes, sounds and Signals of the letters so quickly (long term memory), there is no need to teach the most frequently used letters first. Within two weeks to two months, most children have the entire alphabet to utilize.

A variety of instructional curricula and materials support each step of the language arts process, including Animal Alphabets, pictorial mnemonics for lower- and uppercase letters, grade-specific decodable readers, music that teaches the alphabet and phonetic concepts, puppets for letter sound reinforcement, mini-books, student technology, alphabet and phonics games, and a complete, stand-

alone handwriting program. An assessment inventory provides quick tests for the teacher and help to remediate, accelerate, and set goals and objectives for each student. A strong parent component is included in the daily lessons. The curricula are digitized for *SmartBoards*. Because *Zoo-phonics* is concrete, mnemonic, playful, flexible, and physical, learning is accessible to English Language Learners and special needs students. *Zoo-phonics* also has a *Spanish Multisensory Language Arts Program*. Arabic and Danish versions are being developed.

As children learn the alphabet, relevant information is taught in the areas of literature, math, music, art, sensory-drama, science, social sciences, cooking and nutrition, and physical education, with lessons that are included in the *Zoo-phonics* curriculum. This integrated curriculum further anchors the letter sounds in memory, as well as building vocabulary and knowledge of the world.

Once the alphabet is mastered, initial, ending and medial sounds are taught. These letters can then be strung together to form simple vowel-consonant (VC) and consonant-vowel-consonant (CVC) words. Children are taught to segment, blend, and rhyme at this time. Children continue to use their bodies to Signal out the sounds of the words, inputting the information into long-term memory (Jensen, 2000; Medina, 2009; Ratey, 2009). Soon, more complex phonetic, reading, spelling and writing concepts are sequentially taught, still using the Signals, until mastery is achieved.

The Essences of Zoo-phonics

1. The pictorial *Animal Alphabets* (upper and lowercase) helps children remember the shapes and sounds of the letters.
2. Letter sounds are taught before letter names. You cannot sound-blend with letter names.
3. Lowercase letters are taught before capital letters, as lowercase letters are used 95% of the time in text.
4. An animal-related body movement (called a Body Signal or Signal) for each Animal Letter helps "cement" the graphemic and phonemic information into memory (connecting sounds to letter shapes) and adds a physical response for inputting and retrieving information.
5. The alphabet is taught sequentially and as a whole entity, "a – z." The alphabet is not fragmented.
6. Short vowels are taught before long vowels because there are many short vowel words for children to master, including many High Frequency Words.
7. Phonemic patterns (at, bat, fat, sat) are taught first. High frequency words that are easy to sound-blend are also taught (up, on, at, not, did, etc.). More challenging high frequency words (of, it, was, etc.) are taught through their phonetic word families (rimes) later. **Children's brains need patterns in order to learn.**
8. The *Zoo-phonics* curricula are fully integrated with other academic subjects (math, art, music, science, physical education, social studies, cooking, sensory-drama and self-help skills) daily.

The Study

The current research is intended to demonstrate the efficacy of the *Zoo-phonics Multisensory Language Arts Programs* for preschool and kindergarten as a productive and efficient approach to teaching early literacy concepts to all students. This study focused on preschool and kindergarten students' proficiency in the alphabetic domain, with the goal of identifying any differences related to gender performance.

Younger students are now pressured to learn earlier and to advance their literacy skills at an accelerated rate not experienced by their predecessors. Because of this, curricula for kindergarten children have changed dramatically in recent years due to expectations driven by static results of standardized testing and increasing demands set by Common Core Standards.

This study evaluates what kindergarten students are able to learn and assesses the differences in early literacy skill development that may be present between girls and boys. This study examines children in preschool (three- and four-year-olds) and kindergarten (five-year-olds). The study encompasses two school years, 2014-2015 and 2015-2016. Data from 1,064 students were collected in a rural district in Kentucky, a suburban district in Oklahoma, and one suburban elementary school in California with a high Latino population.

Purpose

The purpose of this multiple cohort, descriptive study was to determine whether there are differences in performance between the two genders when learning the lower- and uppercase alphabets (shapes, names, and sounds) through the *Zoo-phonics Multisensory Language Arts Program* for preschool and kindergarten children in authentic preschool and kindergarten classrooms.

Hypothesis

We hypothesized that all students, regardless of gender, would show significant growth in alphabetic knowledge between the pre-test at the beginning of the school year and the post-test at the end of the school year for preschool children and the end of the first trimester for kindergarten students. Three- and four-year-olds received alphabet instruction throughout the school year while kindergarten students received the same alphabetic instruction during the first trimester of the school year. The study focused on the alphabetic domain and measured proficiency in lower- and uppercase letter name recognition, letter sounds, the Zoo-phonics Alliterative Animal Names and the Body Signals (cuing systems) (Griffith & Wrighton, 2015). All enrolled students were assessed and included in the data set regardless of demographics, SES, or service needs.

Traditional beliefs suggest that in language arts females perform better than males and Caucasian children out-perform minority students. Socio-economic status is a strong factor in predicting literacy outcomes. Our

earlier studies suggest that research on gender gaps are not supported for students who learned language arts skills through the *Zoo-phonics* methods and curriculum. When demographic factors are considered, we would expect to see a consistent distribution of achievement scores across all groups when *Zoo-phonics* curriculum and instructional techniques are used with fidelity.

Our second hypothesis predicted that the majority of students in the study would reach alphabetic proficiency by the end of their regular instruction period. The *Zoo-phonics Beginning Reading Assessment, Version 3 (Z-BRA3)* was used to measure changes in alphabetic knowledge over time using four lower- and uppercase measures: letter and shape identification, letter sound knowledge, Zoo-phonics Alliterative Animal Names and Body Signals.

Research Questions

The study used two descriptive Research Questions:

RQ1: Do preschool (three- and four-year-olds) and kindergarten students receiving the *Zoo-phonics Multisensory Language Arts Program* demonstrate significant growth in alphabetic knowledge following normal instruction?

RQ2: Are there significant differences in alphabetic literacy skill levels between girls and boys after receiving *Zoo-phonics Multisensory Language Arts Instruction*.

Method and Design

This descriptive study used a multiple cohort design to determine the alphabetic proficiency of preschool and kindergarten students during the course of two academic years. The *Zoo-phonics Multisensory Language Arts Program* for preschool and kindergarten was used as the instruction program and the *Z-BRA3* was used to assess 1,619 students, consisting of four cohorts in three grade levels. Cohort 1 included 109 Head Start three-year-olds, Cohort 2 included 259 Head Start four-year-olds who attended half-day public preschool programs, Cohort 3 included 187 four-year-olds who attended public, full-day preschool programs and Cohort 4 included 1,064 kindergarten students. The study included data from two school years, 2014-2015 and 2015-2016. All students were assessed on alphabetic knowledge at the beginning and the end of their alphabetic instruction periods. Kindergartners were re-assessed on alphabet skills at the first trimester period but were not re-assessed at the end of the year because the vast majority of kindergartners had alphabetic proficiency by the end of the first trimester.

Methodology

Three school districts were involved in the study: Ohio County Schools in Western Kentucky, Putnam City Schools in Oklahoma, and Menifee Union School District in California. Teachers and Instructional Assistants were trained to use the *Zoo-phonics* curriculum, materials

and instructional techniques with fidelity. Testing was designed to measure growth over one school year for preschool students and growth during the first trimester for kindergarten students. Three- and four-year-old students were assessed at the beginning of the school year, at the mid-point in January, and the end of the year in May. Kindergarten students were assessed at the beginning of the year and at the end of the first trimester in November. Data were collected for all students using the alphabetic portion of the *Z-BRA3*.

Participants

The study drew data from two widely diverse groups of preschoolers (three- and four-year-olds) and kindergarteners. Participating schools were located in rural Kentucky, suburban Oklahoma, and a suburban district in California. The study sought students who were ethnically diverse with a low Socio-Economic Status (SES).

Ohio School District, Kentucky. Data from Head Start/Preschool and kindergarten were used from Ohio County Schools in rural Hartford Kentucky, in six elementary schools. Free or Reduced-Price Meals were received by 67% of the students, indicating a relatively low overall SES for the area. Only 2% of the students in this district were English Language Learners (ELL). The Ohio County Schools District is a rural school and little cultural enrichment is available. They are currently ranked 82nd out of 152 districts in the state.

Putnam City Schools, Oklahoma. This ethnically diverse suburban school district is proximal to Oklahoma City. Four elementary schools participated in the study. Students who participated in the study attended preschool, kindergarten and first grade. Those receiving Free or Reduced-Price Meals ranged between 67% and 96% indicating low overall SES for the area. The demographic mix for the four schools in the study averaged 40% Caucasian, 27% Black, 22% Latino, 7% Native American, and 4% Asian.

Menifee School District, Menifee, California. Quail Valley Elementary School is located in a suburban community in Menifee California. The ethnic breakdown is 69% Latino, 25% Caucasian, 2% African American, and 1% Asian. On the Free or Reduced-Price Meals Program are 73% of the students, indicating a low overall SES for the area. Thirty-six percent of the students are English Language Learners (ELL).

The teachers, instructional assistants, and principals in each study were trained by a credentialed and certified Zoo-phonics Trainer of Teachers (TOTs), and all were provided the materials, instructional techniques, and mentoring throughout the year needed to be successful with the *Zoo-phonics Multisensory Language Arts Program*. The Principal Investigator (PI) visited each school site for assessment training, monitoring, and data collection.

Integral to the study at each school was fidelity. All principals, teachers and instructional assistants signed an agreement assuring that they would use the *Zoo-phonics Program* with full fidelity, using the *Zoo-phonics Program* and its methodology as designed.

Data from three cohorts were used in the study for the school years, 2014 - 2015 and 2015 - 2016.

Cohort 1 – 109 Head Start three-year-olds: (in a half-day program) 66 boys and 43 girls.

Cohort 2 – 259 Head Start four-year-olds in a half-day program: 131 boys and 128 girls.

Cohort 3 – 187 four-year-olds in a full-day program: 90 boys and 97 girls

Cohort 4 – 1,064 kindergarteners: 544 boys / 520 girls

Data from a total of 1,619 students were used in the study. This resulted in a nearly 50:50 ratio of boys to girls.

Boys = 831 (51.37%)

Girls = 788 (48.63%)

Instruments

Data were collected using the *Z-BRA3*. While this instrument measures components of the alphabet, fluency and comprehension domains, only the alphabetic portion of the instrument was used in this study. Four components specific to *Zoo-phonics* instruction were measured for both lower- and uppercase letters: 1) letter names and shapes, 2) letter sounds, 3) the Zoo-phonics Alliterative Animal Names and 4) the Body Signals. The testing uses a cumulative approach. All alphabetic components are assessed during the pre-test. For subsequent assessments, previously mastered components were not re-assessed.

Analysis

A General Linear Model with Repeated Measures was used to determine proficiency levels and gains between assessment periods for all cohorts. The significance level for all tests was set at $p \leq .05$.

- Descriptive statistics were used to compare proficiency levels within each cohort and subsequently disaggregated into gender groups.
- T-tests were used to measure the differences between pre- and post-mean scores for each variable. Gains are reported by cohort and related gender groups.
- Cohen's *d* was used to test for effect size, the standardized difference between two means.
- Levine's Test of Equal Variances was used to evaluate the homogeneity of variance across gender groups.
- Data from two school years and within each cohort were aggregated for analysis.

Proficiency Levels

Table 1 shows the proficiency levels for each cohort specific to each of the four *Zoo-phonics* components at the end of the school year. Preschool students were assessed three times during the year, fall, winter and spring. Kindergarten students were assessed at the be-

ginning of the school year and at the end of the first trimester (November). A year-end alphabetic assessment was not included for kindergarten students because the mean scores indicated that both boys and girls attained near-mastery by the end of the first trimester. The differences between gender and cohort scores are listed for each alphabetic component in Table 1.

Table 1 - Year-End Alphabetic Scored by Cohort and Gender

		Lowercase				Uppercase			
		Name	Sound	Animal	Signal	Name	Sound	Animal	Signal
3 Year Olds	Boys	5.44	14.76	13.30	15.40	6.06	8.53	8.29	5.53
	Girls	7.79	17.83	16.86	18.05	3.81	9.90	9.74	5.12
	Diff.	2.35	3.07	3.56	2.60	-2.25	1.37	1.45	- .41
4 Year Olds	Boys	10.33	19.88	19.16	20.49	9.13	13.76	13.85	9.83
	Girls	13.60	22.58	21.64	22.90	13.07	18.84	18.55	14.10
	Diff.	3.27	2.70	2.48	2.41	3.94	5.08	4.70	4.27
4 Year Olds	Boys	24.09	25.16	24.22	25.21	24.22	25.24	25.38	22.78
	Girls	24.96	25.29	25.07	25.58	24.46	25.25	25.63	24.04
	Diff.	0.80	0.13	0.85	0.37	0.24	0.01	0.25	1.26
Kindergarten	Boys	23.59	24.36	24.01	24.01	23.57	24.21	23.89	21.36
	Girls	24.14	24.61	24.47	24.91	24.20	24.73	24.62	22.16
	Diff.	0.55	0.25	0.46	0.90	0.63	0.52	0.73	0.80

Table 1 presents year-end proficiency levels for the study's four cohorts. Two variable sets are used for the study. The first is a combination of letter names and sounds, and the second sets adds the *Zoo-phonics* Alliterative Animal Names and Body Signals, both key learning strategies included in the *Zoo-phonics Program*. The inclusion of Alliterative Animal Names and Body Signals specific to each letter adds learning strategies and cognitive reinforcements not found in other language arts programs. A review of each cohort's year-end proficiency levels demonstrates differences associated with gender and also the levels of

proficiency attained in each condition. Notably, only in the three-year-old cohort were uppercase letter names (-2.25) and Body Signals (-.41) slightly favored boys. All other measures and differences slightly favored girls.

The greatest differences between boys and girls occurred in the four-year-old, half-day programs. As might be expected, girls generally outperformed boys in the three-year-old cohort. These differences decreased markedly in the four-year-old, full-day program and in kindergarten. In these two cohorts, the gender-performance differences were less than one letter in every variable.

Table 2 - Three-Year-Old Head Start Students - Year-End Proficiency - Number of Letters Known

		Lowercase				Uppercase			
		Name	Sound	Animal	Signal	Name	Sound	Animal	Signal
3 Year Olds	Boys	5	15	13	15	6	9	8	6
	Girls	8	18	17	18	4	10	10	5

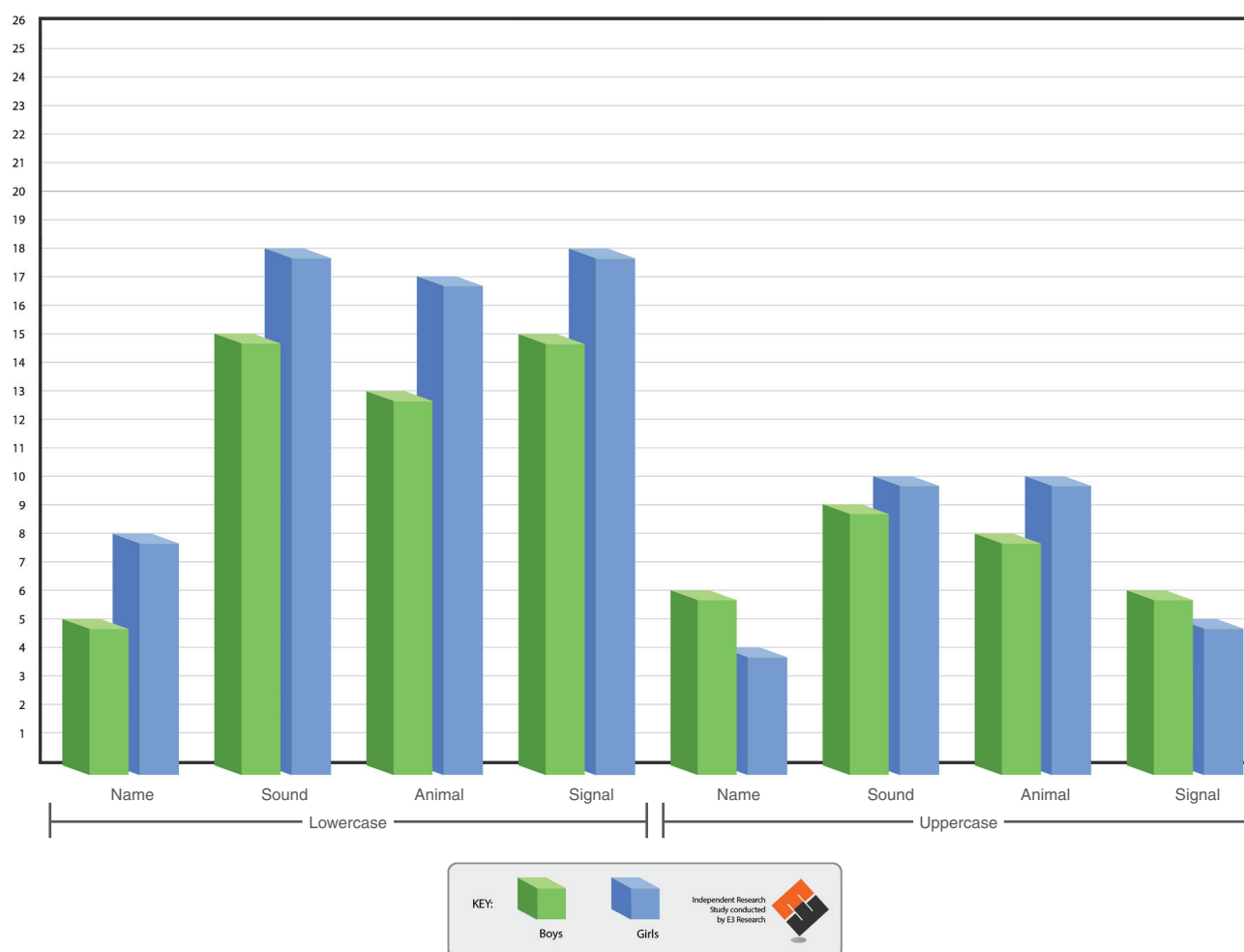
Average lowercase difference between girls and boys across all 4 measures = 3.5 letters (girls' advantage)

Average uppercase difference between girls and boys across all 4 measures = 0 letters

Average difference between girls and boys for Lowercase Name and Sound = 3.0 letters (girls' advantage)

Average difference between girls and boys for Uppercase Name and Sound = 0.5 letters (boys' advantage)

Graph 1 - Three-Year-Old Head Start Boys and Girls.



This graph shows lower- and uppercase alphabetic proficiency for four measures at the end of the year, for two school years.

Mean scores show that three-year-old girls generally outperformed boys by an average of 3.5 (3.4%) letters across the four variables measured in the study. Lowercase shapes, sounds, Alliterative Animal Names and Body Signals were stressed, rather than letter names and uppercase letters for children at this age. The *Zoo-phonics*' philosophy believes in teaching the most important alphabet skills first and not overloading young children with too much information at one time.

All of the variables measured are predicated on recognizing the shape of the lowercase letters. The result is a high correlation among letter shapes, sounds, Alliterative Animal Names and Body Signals.

We noted that students in the 2014-2015 study had less uppercase alphabetic knowledge at the end of the year (including *Zoo-phonics* alphabetic information) than the three-year-olds did in the 2015-2016 study. In *Zoo-phonics*, the uppercase alphabet is not taught to this age group. However, we found that because of the same Animals, sounds and Signals that are used for both the lower- and uppercase letters, positive associations were naturally

made by three-year-olds. In the second year the result was an overall mean gain of five lower- and uppercase letters. Moderating factors included improved teacher proficiency in the second year, when three-year-olds were included with the four-year-olds who were ready for capital letter information. Parents and siblings may have shared uppercase alphabet information as well.

It is important to note that uppercase information may have limited lowercase proficiency because this age group did not achieve full mastery in lowercase alphabetic information, which is key to the *Zoo-phonics* instruction. Three-year-olds in the 2015-2016 study showed that teaching uppercase letters still caused some interruption but on a lesser scale.

Table 3 - Four-Year-Olds (Head Start, Half-Day Program) – Year-End Proficiency - Number of Letters Known

		Lowercase				Uppercase			
		Name	Sound	Animal	Signal	Name	Sound	Animal	Signal
4 Year Olds Half-Day	Boys	10	20	19	20	9	14	14	10
	Girls	14	23	22	23	13	19	19	14

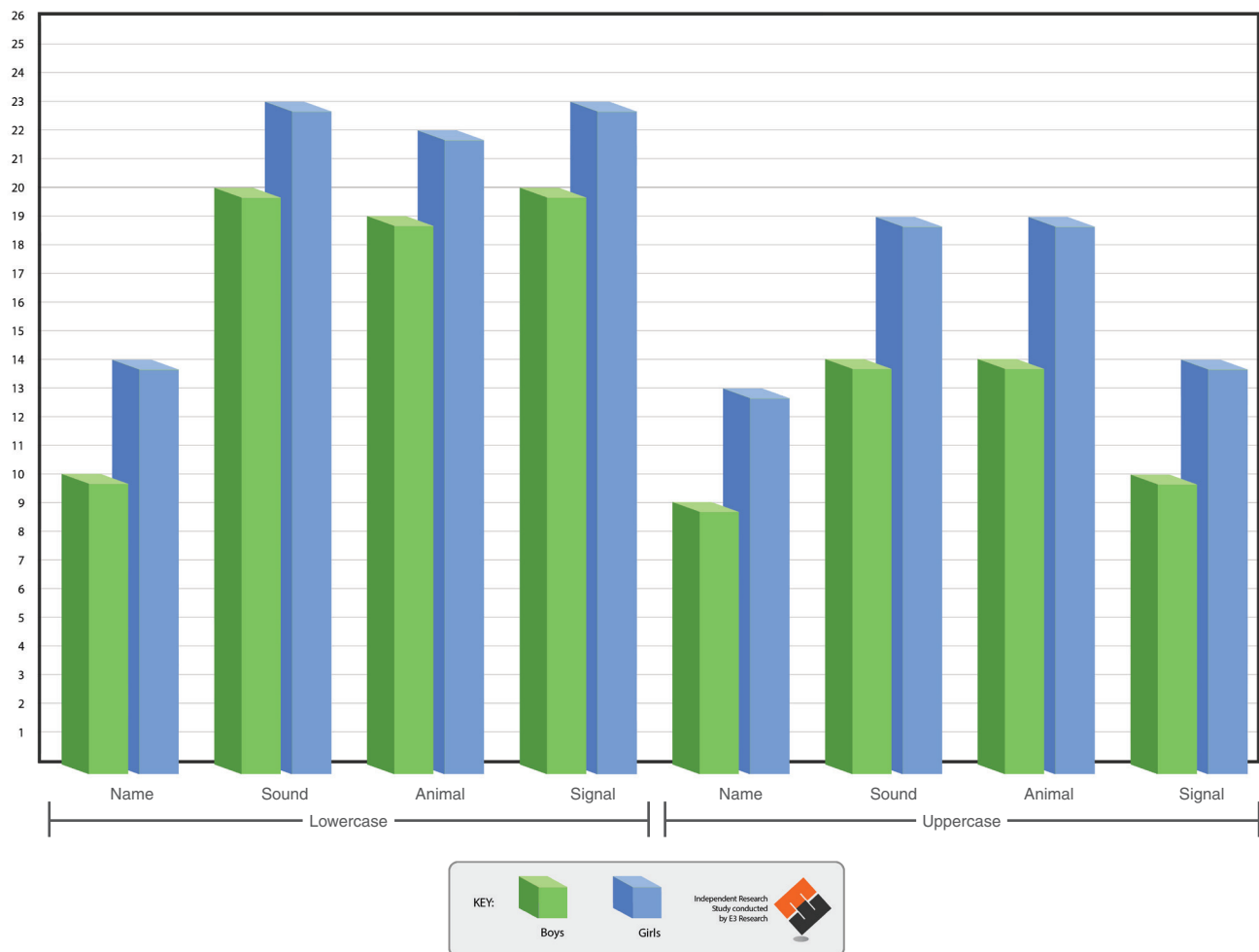
Average lowercase difference between girls and boys across all 4 measures = 3.25 letters (girls' advantage)

Average uppercase difference between girls and boys across all 4 measures = 4.5 letters (girls' advantage)

Average difference between girls and boys for Lowercase Names and Sounds = 2.5 letters (girls' advantage)

Average difference between girls and boys for Uppercase Names and Sounds = 4.5 letters (girls' advantage)

Figure 2. Four-Year-Old Head Start Half-Day Program - Boys and Girls - Alphabetic Proficiency.



This graphs shows year-end alphabetic proficiency using four lower- and uppercase measures.

The four-year-old half-day program saw a 4.3% difference (4.5 letters) between boys and girls across the four variables, slightly favoring girls. As with the three-year-old cohort, uppercase letter information was not emphasized until students had mastery over lowercase letter shapes, sounds, Alliterative Animal Names, and Body Signals.

Table 4 - 4 Year Olds (Full-day Program) – Year-End Proficiency – Number of Letters Known

		Lowercase				Uppercase			
		Name	Sound	Animal	Signal	Name	Sound	Animal	Signal
4 Year Olds Full-Day	Boys	24	25	24	25	24	25	25	23
	Girls	25	25	25	26	24	25	26	24

Average lowercase difference between girls and boys across all 4 measures = 0.75 letters

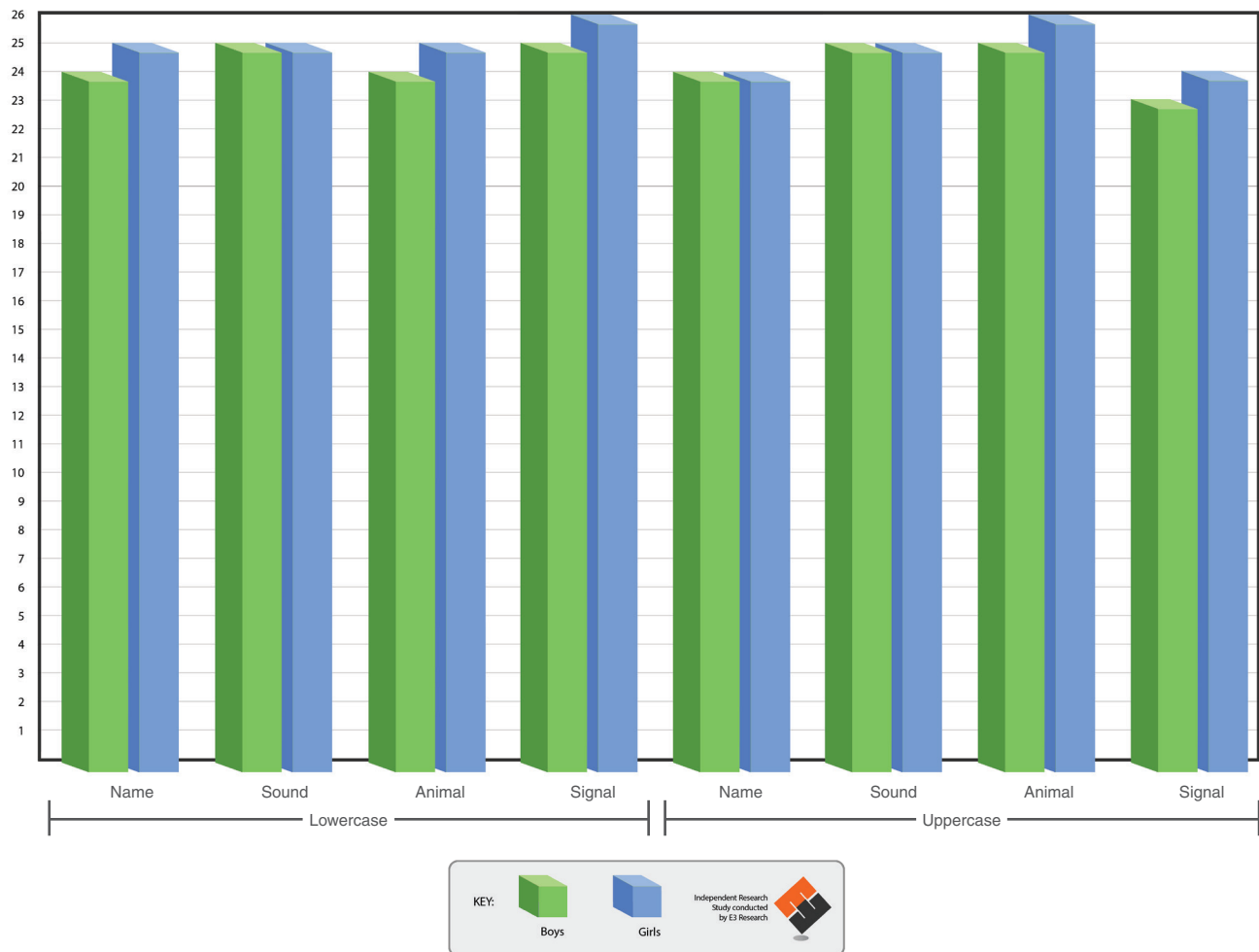
Average uppercase difference between girls and boys across all 4 measures = 1 letter

Average difference between girls and boys for lowercase name and sound = 0.75 letters

Average difference between girls and boys for uppercase name and sound = 0.5 letters

There was no significant advantage for either gender.

Figure 3 - Four-Year-Old Full-Day Program - Boys and Girls - Alphabetic Proficiency.



This graphs shows year-end alphabetic proficiency using four lower-and uppercase measures.

Four-year-old students in the full-day program showed a marked difference in year-end results when compared with the half-day program. The trends of girls performing better than boys is nearly eliminated with less than one letter difference in lowercase and one letter difference across the uppercase variables. Boys and girls effectively performed equally by the end of the year. Upper- and lowercase alphabets, including letter names, were taught, and near-mastery was achieved for almost all students.

Independent Samples t-test Results for Trimester 1

Lowercase Letter Names: In order to test the difference in alphabetic proficiency for lowercase letter names between girls and boys, an independent samples t-test was conducted. The results of this test were found to be statistically insignificant $t(1027) = 1.81, p > .05; d = 0.10$. The effect size for this analysis was found to meet Cohen's (1988) convention for a small effect ($d = .10$). These results indicate that kindergarten girls ($M = 24.14, SD = 4.55$) and kindergarten boys ($M = 23.59, SD = 5.30$) achieved comparable levels of proficiency in lowercase letter names.

Lowercase Letter Sounds: In order to test the difference in alphabetic proficiency for lowercase letter sounds between girls and boys, an independent samples t-test was conducted. The results of this test were found to be statistically insignificant $t(1047) = 1.05, p > .05; d = 0.12$. The effect size for this analysis was found to be small. These results indicate that kindergarten girls ($M = 24.61, SD = 3.73$) and kindergarten boys ($M = 24.36, SD = 4.04$) achieved comparable levels of proficiency in lowercase letter sounds.

Uppercase Letter Names: In order to test the difference in alphabetic proficiency for lowercase letter names between girls and boys, an independent samples t-test was conducted. The results of this test were found to be statistically insignificant $t(997) = 1.94, p > .05; d = 0.01$. The effect size for this analysis was found to be very small. These results indicate that kindergarten girls ($M = 24.15, SD = 4.55$) and kindergarten boys ($M = 23.59, SD = 5.30$) achieved comparable levels of proficiency in uppercase letter names.

Uppercase Letter Sounds: In order to test the difference in alphabetic proficiency for lowercase letter names between girls and boys, an independent samples t-test was conducted. The results of this test were found to be statistically insignificant $t(970) = 1.91, p > .05; d = 0.12$. The effect size for this analysis was found to be small. These results indicate that kindergarten girls ($M = 24.20, SD = 4.83$) and kindergarten boys ($M = 23.57, SD = 5.54$) achieved comparable levels of proficiency in uppercase letter sounds.

A Levene's test for equality of variances between samples was conducted for each variable and was not found to be violated for the present analysis. The two groups in this cohort were very similar.

Table 5 - Kindergarten - Proficiency-Trimester 1 - Number of Letters Known

		Lowercase				Uppercase			
		Name	Sound	Animal	Signal	Name	Sound	Animal	Signal
Kindergarten	Boys	24	24	24	24	24	24	24	21
	Girls	24	25	24	25	24	25	25	23

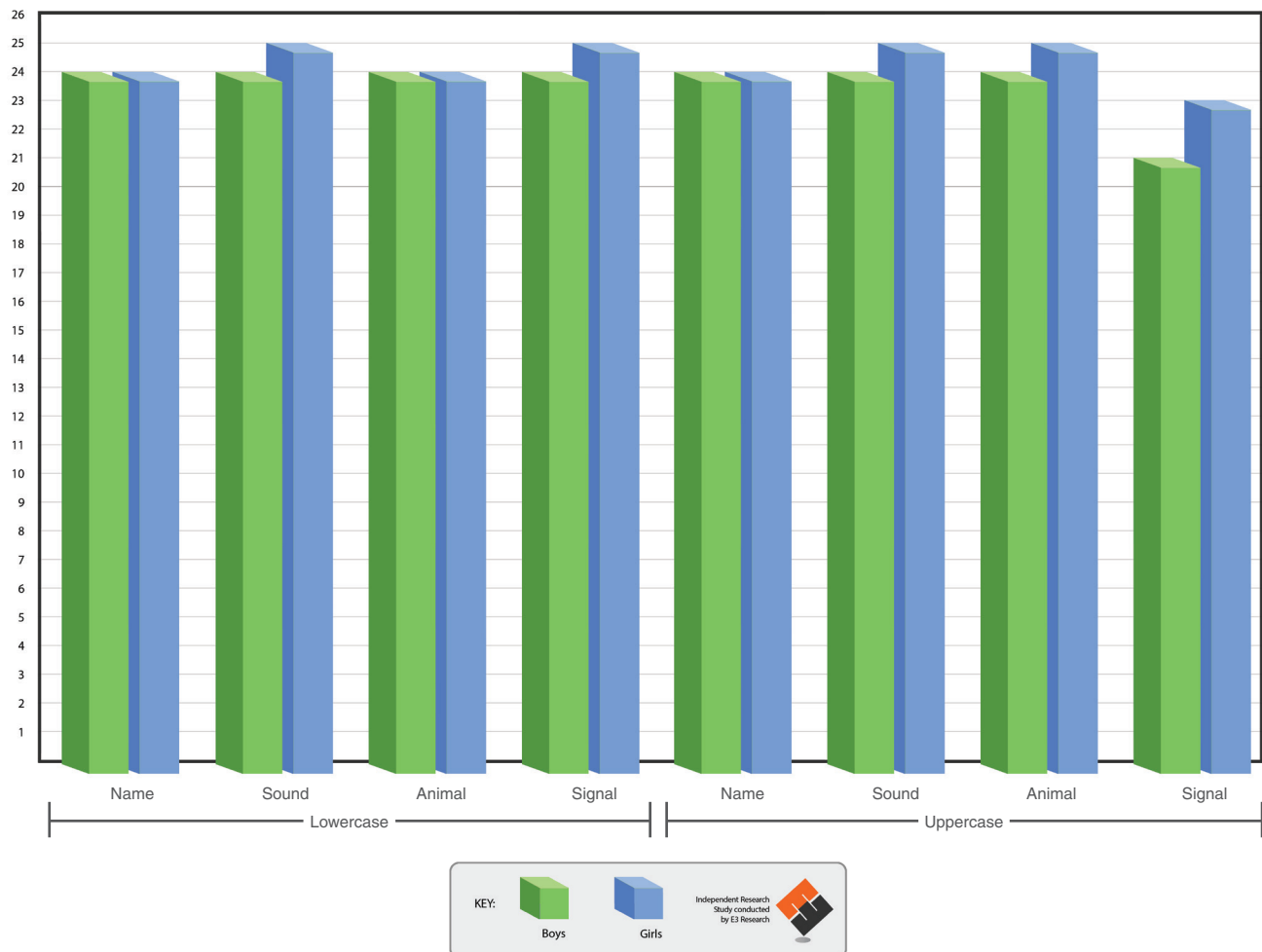
Average lowercase difference between girls and boys across all 4 measures = 0.5 letter

Average uppercase difference between girls and boys across all 4 measures = 1.0 letter

Average difference between girls and boys for Lowercase Name and Sound = 0.5 letters

Average difference between girls and boys for Uppercase Name and Sound = 0.5 letters

Figure 4 - Kindergarten - Boys and Girls - Alphabetic Proficiency.



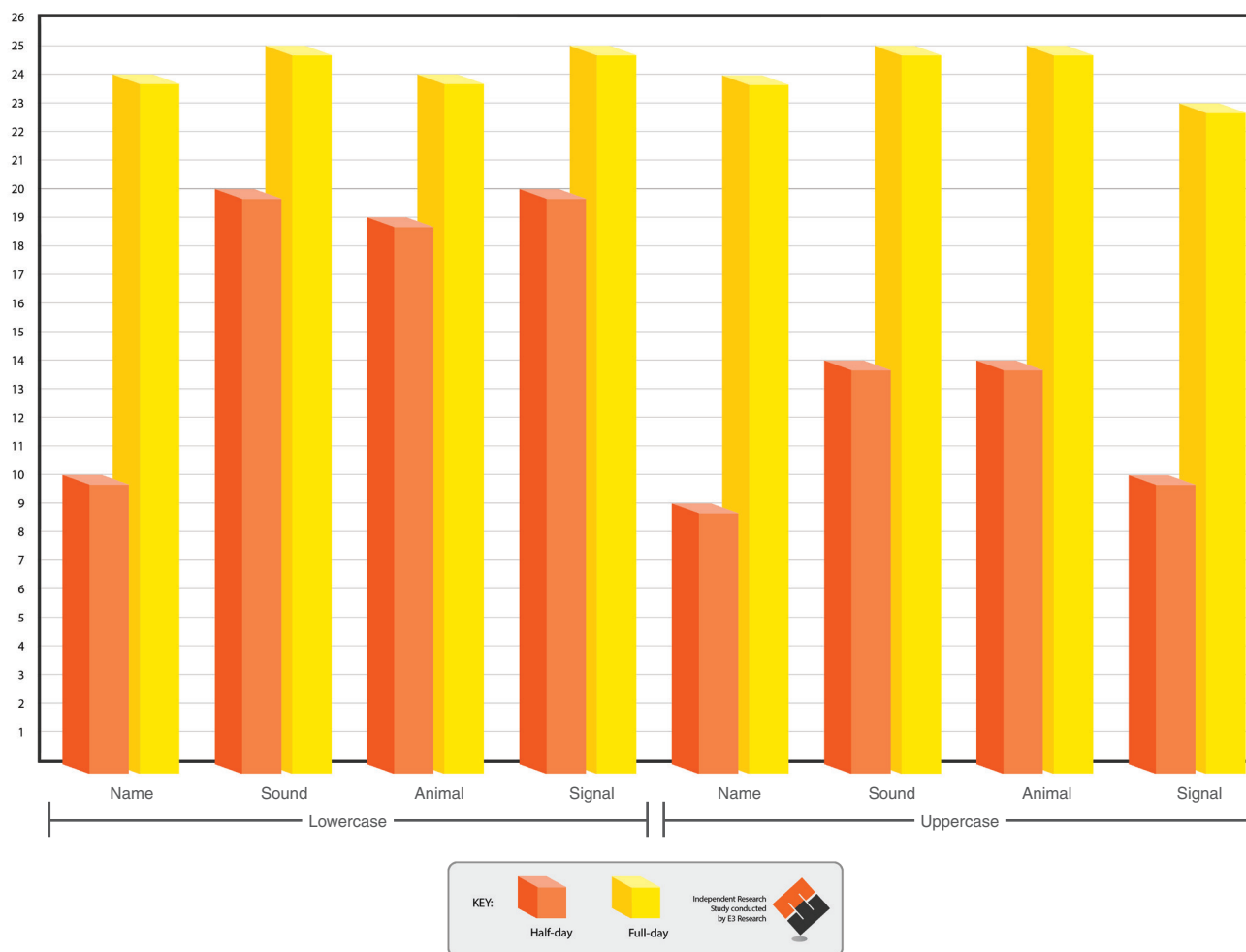
This graphs shows year-end alphabetic proficiency using four lower- and uppercase measures in the first-trimester.

In the first-trimester (November) of the kindergarten, the differences in alphabetic performance between boys and girls were minimal. Less than one letter separates the two groups across all measures. Additionally, since all students in the study population were included, a case can also be made that by the end of the first trimester in kindergarten, all students, no matter what their gender, SES, ethnic background or other demographic characteristics, quickly learned the alphabet through the *Zoo-phonics Multisensory Language Arts Program*.

Half-day and Full-day Comparison

Boys. When a half- and full-day program comparison was made for four-year-old boys, clear differences arose. **End-of-year full-day mean scores matched first trimester kindergarten scores.** Full-day students achieved the same proficiency levels as their older counterparts, while the half-day students did not. Importantly, the half-day students showed a similar pattern for each variable but reached proficiency levels of about 2/3 of the full-day students in lowercase letters and about half in uppercase letters. Notably, the letter name proficiency level trailed in the half-day program because letter names were not taught until students had mastery with the lowercase letters (shapes, sounds, Alliterative Animal Names and Body Signals).

Figure 5 - Four-Year-Old Boys – Half- and Full-day Program Comparison.

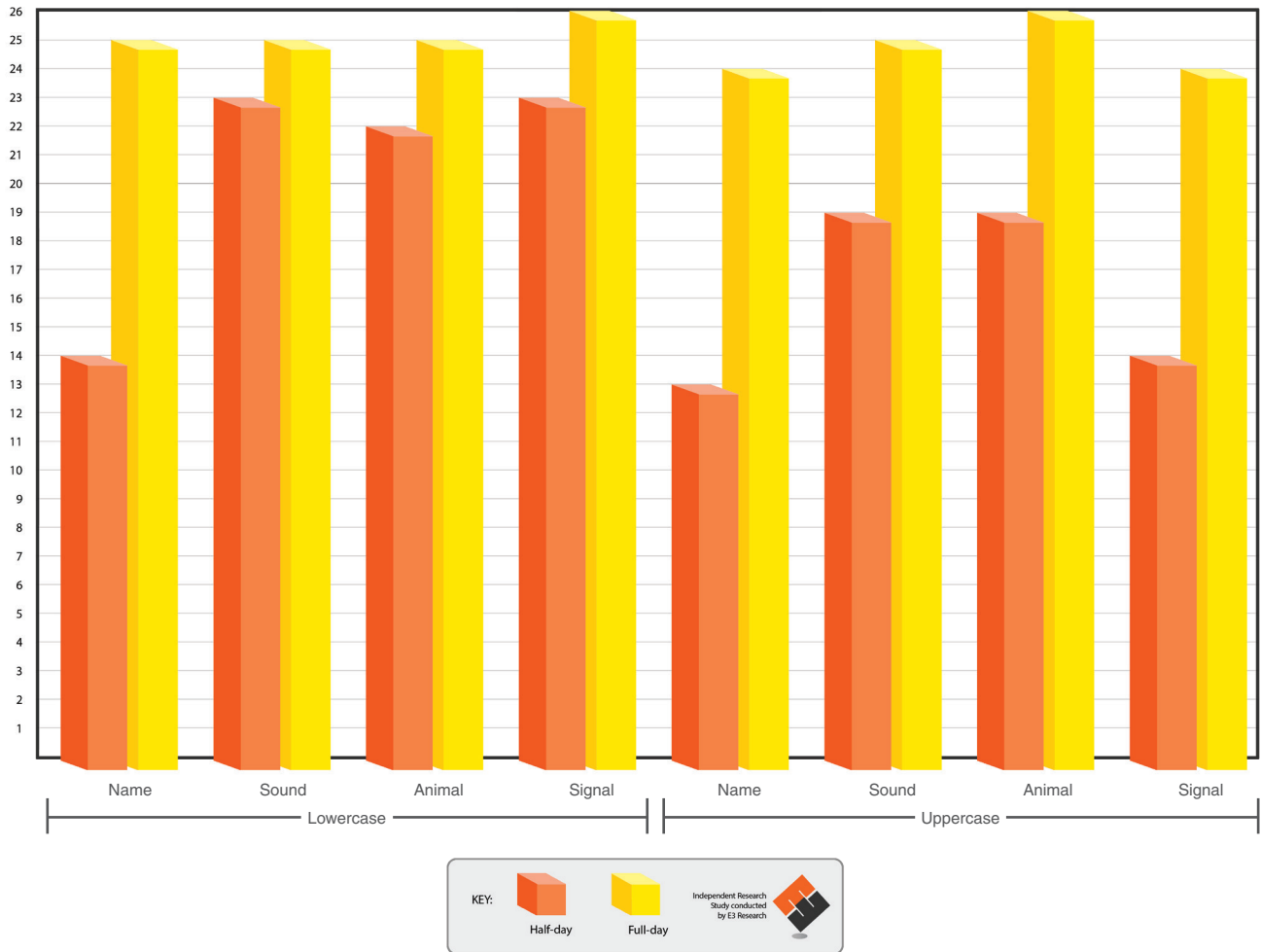


This graph compares the relative proficiency levels of four-year-old boys after completing either the half-day or the full-day preschool program.

Girls. The same pattern was found between half- and full-day four-year-old girls as with boys. Both reached high levels of proficiency with the girls attaining about one letter higher than boys in the full-day program. In the half-day program, girls performed well in lowercase letters and, as expected, achieved less in uppercase letters because they are not emphasized yet.

Our data indicated that girls were performing better than boys in the half-day program, but these differences narrow to insignificance in the full-day programs.

Figure 6 - Four-Year-Old Girls – Half- and Full-day Program Comparison.

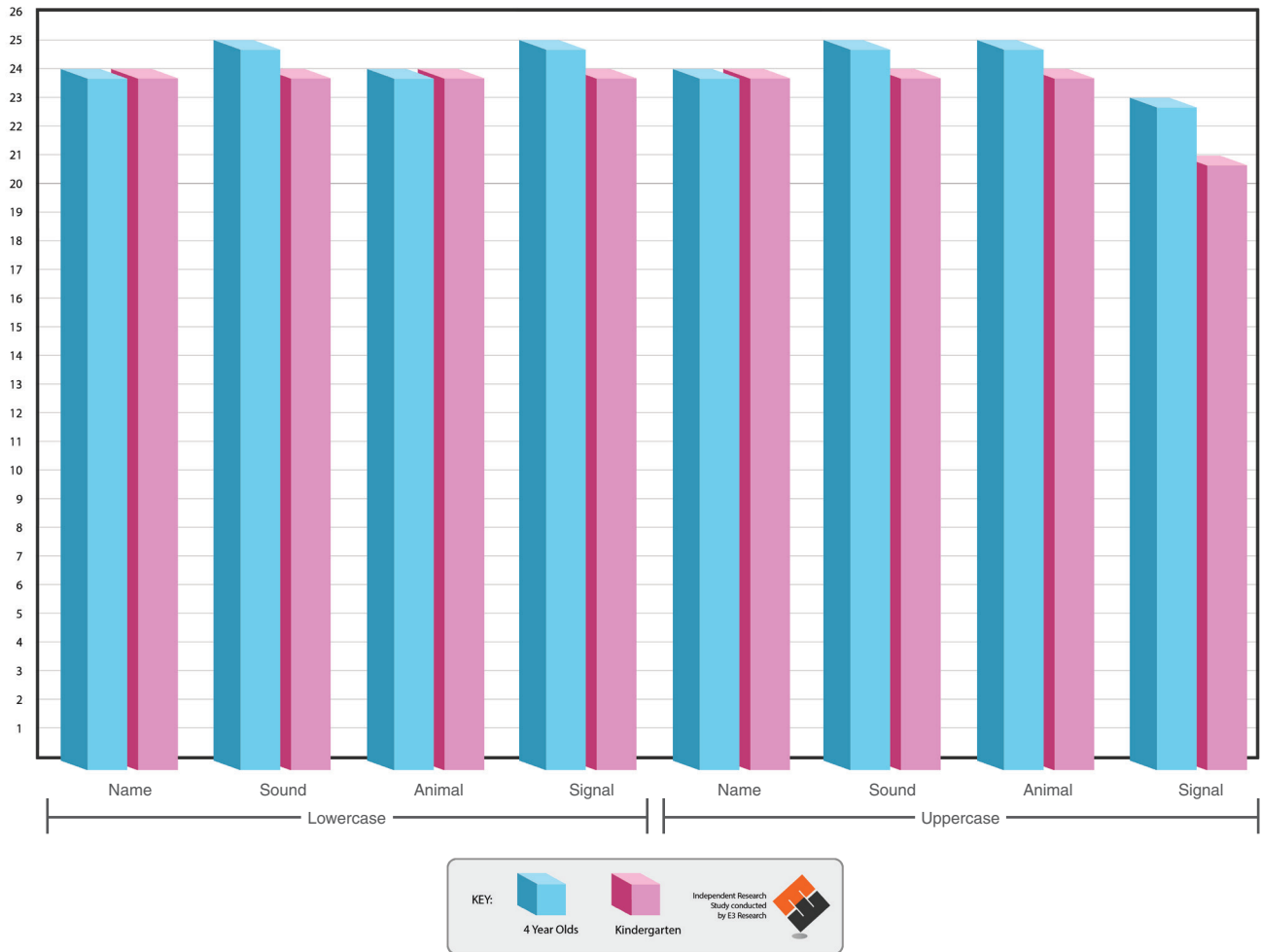


This graph compares the relative proficiency levels of four-year-old girls after completing either a half-day or full-day preschool program.

Full-Day Preschool and Kindergarten:

Boys. Four-year-old boys in a full-day program were compared with kindergarten boys. Interestingly, the four-year-old cohort slightly outperformed their older counterparts. One key factor was that the four-year-olds received *Zoo-phonics* for an entire school year, while the kindergarten students were assessed at the end of the first trimester. Additionally, the analysis included all students in each cohort without regard to previous alphabetic learning, demographics or individual learning needs.

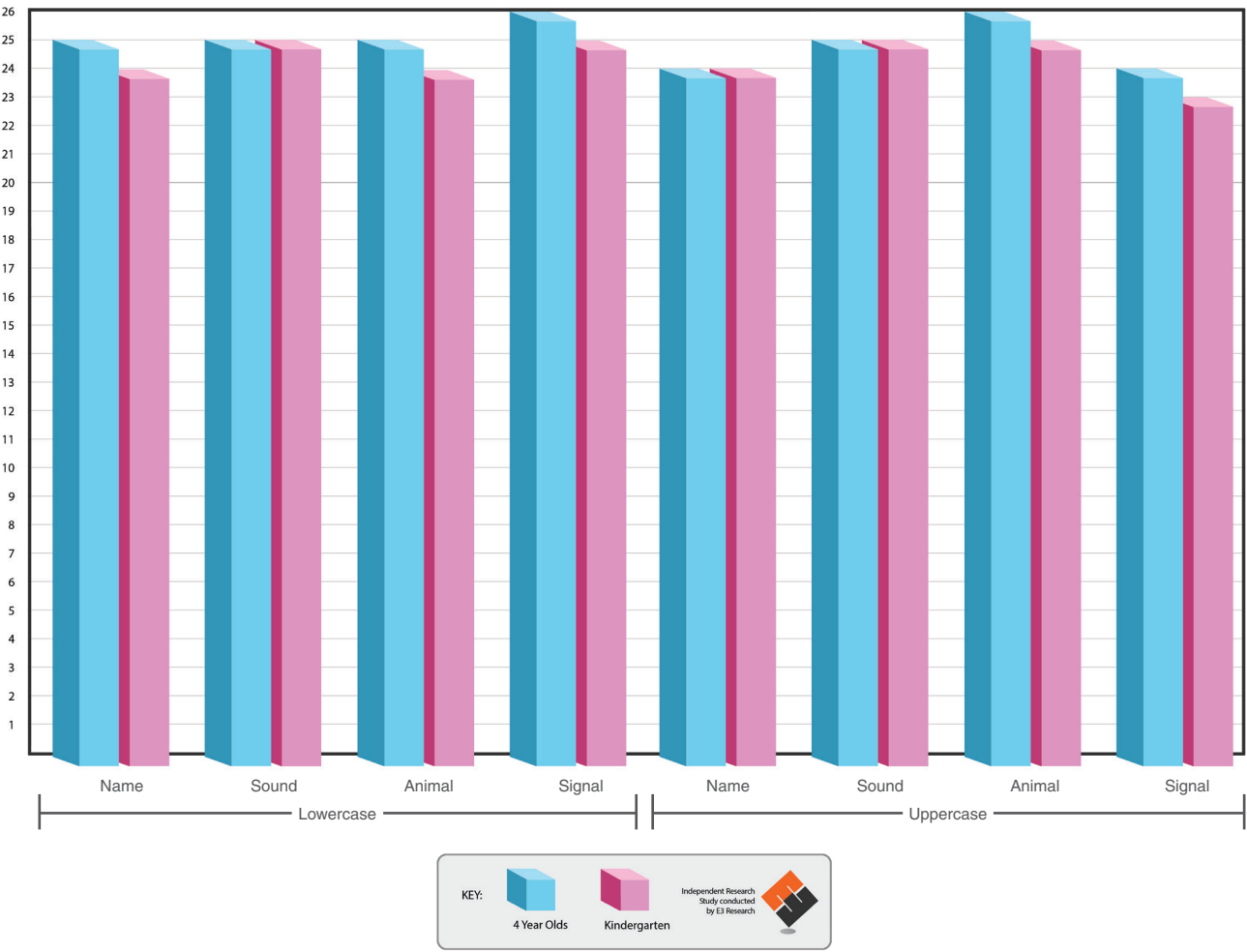
Figure 7 - Four-Year-Old Boys' and Kindergarteners' Comparisons.



This graph compares the relative year-end proficiency levels of boys in full-day preschool programs with the first trimester scores of kindergartners.

Girls. Four-year-old girls showed the same pattern as boys when compared with kindergarten students. Both groups showed strong achievement in both lowercase and uppercase alphabetic knowledge. While the four-year-old girls are slightly more proficient, their advantage can be attributed to a longer time to learn the same material. The four-year-old cohort had a full school year to learn the alphabet while the kindergarten students were assessed at the end of the first trimester. Both conditions are important: four-year-olds were given a full year in a full-day program to achieve what kindergarteners achieved in about three months. Program intensity and student readiness are both key factors to strong and rapid learning in the alphabetic domain.

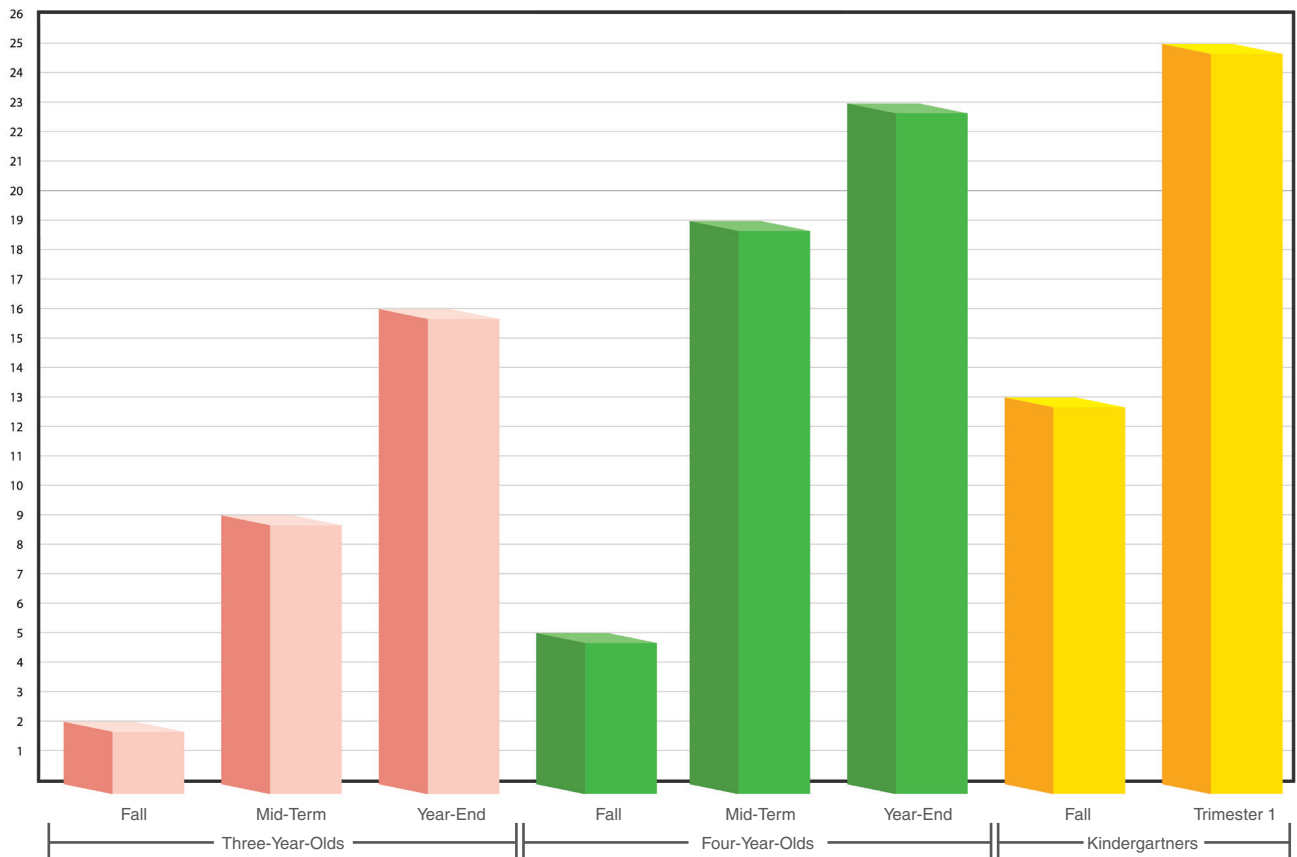
Figure 8 - Four-Year-Old Girls' and Kindergarteners' Comparisons.



This graph compares the relative year-end proficiency levels of girls in full-day preschool programs with the first trimester scores of kindergartners.

Knowledge gains. Aggregated data was used to determine the gains in alphabetic knowledge between the pre-and post-tests for each cohort. Gain scores were used to determine whether there were gender differences in the rate of growth as well as the overall mean proficiency level for each cohort. Additionally, a comparison between the post-test scores from one cohort and pre-test scores for the next grade level was conducted to determine the impact of new students entering a cohort who may not have reached the mean proficiency level of the cohort at the beginning of each year.

Figure 9 - Proficiency Level by Term and Grade Level.



This graph shows sequential growth in alphabetic proficiency for three ages and grade levels.

When one cohort's year-end scores were compared to the pre-test scores of the next cohort, a dramatic drop in alphabetic proficiency occurred. An analysis of the data demonstrates that this drop in proficiency is not due to loss of knowledge but rather to the impact of adding students who have not had previous *Zoo-phonics* training. This is confirmed by other studies (Griffith, 2015). When an analysis of students without *Zoo-phonics* instruction and those with previous *Zoo-phonics* instruction was conducted, the results indicate that for four-year-olds and kindergartners, this impact is significantly reduced or eliminated by the end of the first trimester. It is clear that kindergarten students new to the *Zoo-phonics* program rapidly gain knowledge and skills in the alphabetic domain to the point of matching their peers within one trimester of study.

Conclusions

Alphabetic Proficiency Levels - Boys and Girls:

Conclusion 1: There was no significant difference between kindergarten boys' and girls' alphabetic knowledge level by the end of the first trimester when the *Zoo-phonics Multisensory Language Arts Program* is used.

Three-year-old preschool girls showed slightly greater proficiency than boys in letter name recognition but not in letter sounds, Alliterative Animal Names, or Body Signals. The difference in proficiency was not significant.

Small but significant differences occurred between four-year-old girls and boys in both half and full-day programs. This was especially true for half-day students, with girls slightly outperforming boys in most lower- and uppercase measures.

By the end of the first trimester in kindergarten, the differences between boys and girls were between .03 and .71 letters. At this point, there was no difference on any of the measures and mean scores ranged between 24 and 25 letters, indicating near mastery of both lower- and uppercase alphabet letters and sounds for all students.

Three-Year Olds: Three-year-old girls performed slightly better than three-year-old boys in early alphabetic knowledge. At the end of their first school year, three-year-old girls showed a 2.0 letter greater understanding of alphabet names and sounds than boys. When Alliterative Animal Names and Signals are added, girls averaged 2.5 letters above boys in lowercase letters but showed no difference for the four uppercase variables and only .05 for uppercase letters.

Four-Year-Olds in a Half-day Program: The half-day preschool programs participating in the study showed a significant difference between boys and girls on all alphabetic indicators. Good progress was made in learning both lower- and uppercase alphabets by both groups, with girls advancing more quickly than boys. Girls outperformed boys by an average of 2.5 lowercase letter names and sounds and 4.5 uppercase letter names and sounds by the end of the school year.

Two factors compared favorably to these differences: (1) full-day preschool programs using *Zoo-phonics* reached near alphabet mastery levels for both groups by the end of the year, and (2) gender differences were essentially eliminated by the end of kindergarten when *Zoo-phonics* was used. This indicates that the differences in performance and overall knowledge are removed by the end of the first trimester in kindergarten.

Four-Year-Olds in a Full-day Program: Four-year-old boys and girls who attended full-day preschool programs that used the *Zoo-phonics Program* showed significant growth during the school year. The gap between boys and girls narrowed to less than one letter. Notably by the end of their school year, this cohort slightly outperformed first-trimester kindergarten students. The level of alphabetic knowledge is significantly higher for full-day *Zoo-phonics* programs when compared with half-day programs.

Kindergarten Students: By the end of the first trimester in kindergarten, there is no statistical difference between boys' and girls' alphabetic knowledge. Lowercase letter names and sounds varied by 0.5 letters and by 1 letter for uppercase letters and sounds. These differences were measured over more than 1000 students (544 boys, 520 girls) and a wide range of student demographics.

Our conclusion is that the use of the *Zoo-phonics Multisensory Language Arts Program* for kindergarten jumpstarts the alphabet for *all* students, enabling them to begin to sound blend, read, and spell words earlier than expected. Even though a plethora of studies suggest the opposite, it supports boys and girls and all demographic groups equally and effectively.

Gains in Alphabetic knowledge

Conclusion 2: All students showed significant gains in alphabetic knowledge during the course of the *Zoo-phonics Multisensory Language Arts Program*.

Conclusion 3: By the end of the school year, four-year-old students enrolled in a full-day *Zoo-phonics Multisensory Language Arts Program* perform as well as kindergarten students at the end of their first trimester. Both cohorts have reached near-mastery of lower- and uppercase letter names and sounds in addition to *Zoo-phonics'* Alliterative Animal Names and Signals.

Conclusion 4: Four-year-olds enrolled in a full-day *Zoo-phonics Multisensory Language Arts Program* significantly outperformed their contemporaries enrolled in half-day programs. Full-day program boys and girls ended the year statistically matched in alphabetic knowledge and achievement while half-day girls significantly outperformed boys on both measures.

Full-day preschool programs where the *Zoo-phonics Multisensory Language Arts Program* is used produce significantly higher levels of alphabetic achievement and eliminate demographic characteristics (poverty, language, and ethnic groups), including gender.

Discussion

Research over the decades, from the United States and from researchers in other parts of the world, have shown a decline in male test scores in language arts as well as successful participation in school, especially with low SES students. Many studies demonstrate that this disparity manifests itself in preschool and kindergarten and follows students throughout their school careers. NAEP data consistently demonstrate poor reading performances over the past thirty years with the majority of students falling below the proficient level in both 4th and 8th grades. During this period, the gender gap has slowly widened in favor of girls. The goal of this study was to challenge the status quo by testing students in the early stages of literacy skills development.

The key questions in this study were to determine whether males could reach the same levels of proficiency in alphabetic knowledge and learn this as quickly as their female counterparts. Our data demonstrated that

males do reach proficiency as quickly as females when learning the alphabet through the *Zoo-phonics Program*.

We chose to focus on low SES learners who traditionally and frequently perform in the "Below Basic" category. Knowing where gender differences emerge and how to address them may give rise to new and more effective instructional practices. The study used the *Zoo-phonics Multisensory Language Arts Program* because our earlier research showed this program to be efficacious across all demographic characteristics such as gender and age, and worked well for second language learners, special needs students, and low SES students.

In answering our research question about gender performance, our data demonstrated that three year old males gained proficiency at a slightly slower pace than females when learning the alphabet through the *Zoo-phonics Multisensory Language Arts Program*. However, by the

end of the first trimester in kindergarten cohort mean scores on our four measures demonstrated that there were essentially no differences between boys and girls. They gained more ground as four year olds reached full mastery at year's end if they attended a full day preschool. Mean scores for over 1000 kindergarteners show near-mastery of the sounds and shapes of lower- and uppercase alphabets during the first trimester of school. From that point on, they then had the both alphabets to utilize for decoding, encoding, reading and writing. Furthermore, data showed no differences in any other demographic, language or SES characteristics.

When full-day preschool and kindergarten programs were compared, it was clear that full-day programs provided stronger support than half-day programs. Student readiness, maturity and time-on-task with the various components of the *Zoo-phonics* integrated curriculum clearly impacted the rate at which students mastered the alphabet. Even though slight differences were seen in 3-year-olds and ½ day programs, proficiency gains were significant and the differences between genders were small. Boys and girls in preschool and kindergarten cohorts preformed equally, leading us to conclude that the overall poor reading performance of our nation's students can be effectively addressed by beginning the reading process using a multi-sensory approach such as *Zoo-phonics*.

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