

How a Neurologically Integrated Approach Which Teaches Sound-Symbol Correspondence and Legible Letter Formations Impacts At-Risk First Graders

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Abstract: *The setting of this study took place in an inner city. The purpose was to determine the effectiveness of a neurologically integrated approach in teaching 43 at-risk pre-first graders their letter sounds and formations during 45-50 hours of summer school. There were four sequential phases to teaching this alphabetic approach: imagery, auditory, integration and sound blending, and motor plan. Students received three pre- and posttests: sound, letter formation, and phonic knowledge as assessed through alphabet exercises and the Early Reading Screening Instrument. Repeated measures and descriptive statistics of the three assessments were used to measure growth. Results indicate that despite an average attendance of 84%, significant changes occurred in the students' knowledge of letter sounds, letter formations, and their ability to write words (phonics). It is recommended to explicitly teach at-risk children their alphabet knowledge through a neurologically integrated approach that mirrors brain development.*

Introduction

The setting of this study took place in an inner-city school district during summer school. The school environments were not welcoming. One school was known to have the most drive-by shootings in the city. Another school had mice in the classrooms, a secretary who kept a baseball bat by her side in case parents wanted to fight, and there was a sign outside the school that read, "Don't shoot me. I want to grow up." The targeted students were pre-first graders. A five-year-old child came to school with a switchblade and five condoms in his pocket, another student had never been heard to speak a word, and a little girl was a crack-cocaine baby whose adopted mother came to school with her every day. These real-life facts present the background picture of this research.

The academic achievement of students in like inner-city schools has been a concern for many years. Research has shown that students' success in school is related to their early reading achievement (Juel, 1988). When academically-deficient primary-grade students do not get necessary assistance, their achievement gap widens from successful peers because the struggling students' academic self-beliefs diminish and they disengage from the learning process (Alexander & Entwisle, 1988; 1996). These students are then at an increased risk for academic failure and school dropout. Unfortunately, the three portrayed students and 40 additional students were not able to satisfactorily learn their alphabet skills during their kindergarten year. They needed to receive instruction during the

summer months to prepare them for the literacy tasks required of them in first grade. During summer school, these 43 students received instruction in a neurologically integrated approach to early literacy that simultaneously taught letter sounds and formations. Therefore, the major purpose of this study was to determine the effectiveness of using this approach in teaching at-risk pre-first grade students their letter sounds and formations during a short-term intervention.

Review of the Literature

To meet the goals of this study, it is of value to understand the research on alphabet knowledge, as well as the needs and challenges of at-risk learners. Information about the neurological approach will also be presented.

Alphabet Knowledge

Alphabet knowledge is fundamental to skilled reading and writing (McBride-Chang, 1999). Bramlett, Rowell, and Mandenberg (2000) found that letter recognition in kindergarten was the best predictor for reading achievement in first grade. Prerequisite to the development of formal literacy skills is the auditory understanding that words are made of sounds. Results of extensive research continue to provide evidence that phoneme awareness remains a strong predictor of reading ability and that children who lack in this phonemic awareness remain poor readers (Blachman, 1984; Høien, Lundberg, Stanovich, & Bjaalid, 1995; Wagner et al., 1997). "Getting started in alphabet reading depends

critically on mapping the letter and spellings of words into the speech units they represent” (Snow, Burns & Griffin, 1998, p. 6).

For beginning readers and writers, there is much to learn about letters. Letters have names, sounds, and shapes and the three are not logically connected. For example, the letter name for “c” is pronounced “see,” its pure phoneme should be correctly pronounced /k/ and its shape is an almost-closed “o.” To complicate matters, only eight letters of the alphabet have names from which the sounds can be derived (e.g., *b, d, j, p, t, k, v, z*) and numerous letter names are similar. For instance, *b, e, p, d, t, c, g, v,* and *z* all have the “ee” as the final sound in their name (Bear, Invernizzi, Templeton & Johnston, 2004). Additionally, several letter names begin with a short /e/ sound (e.g., *f, m, n*). Many letters make more than one sound (e.g., *c, g*) depending on surrounding letters. Each of these factors interferes with phonemic awareness and sound recall. When learning a letter’s shape, there are vertical, horizontal, and diagonal intersections and up-down and circular movements to coordinate (Bear et al., 2004). Alphabet knowledge is complex, yet integral to the development of advanced literacy skills.

“Most mainstream, middle-class children take five years to acquire this alphabet knowledge at home and in preschool” (Bear et al., 2004, p.107). Distinctive alphabet knowledge is best learned through a naturalistic, fun, and game-like manner (Delpit, 1988). This claim is further supported by Hannaford (1995) who asserts that by age five, children’s logical hemisphere of their brain has not matured sufficiently for them to learn their letters through a linear, logical process with few mnemonic images. As children grow, their brain and body develop in a certain sequence. The gestalt hemisphere usually has a dendrite growth spurt between ages four and seven, whereas the logical hemisphere typically grows rapidly between seven and nine years of age. Therefore, young children who have been taught to learn their numbers and letters in a linear, logical fashion with few images may experience high levels of stress. Logical instruction defies natural development of brain functions, and children have to work very hard at learning alphabet knowledge. Children need to learn letters through association, image, emotion, and spontaneous movement (Hannaford, 1995). Bear et al. (2004) stated that children should learn through “active exploration of the relationships between letter names, the sounds of the letter names, their visual characteristics, and the motor movement involved in their formation” (p.107). Adams (1990) recommended that children learn the visual shapes of individual letters through a keyword/picture display before learning the sounds of the letters. Moreover, she believed that children should learn to print the letters as soon as they were introduced. Writing allows access to the kinesthetic pathway, which is a strong, reliable learning channel for children (Sheffield, 2003; Zaporozhets & Elkonin, 1971).

At-Risk Learners

The term “at risk” may elicit several connotations. For example, at risk may refer to students who are of minority status, who have a learning disability, whose first language is not English, or who are economically disadvantaged. Even though these are the four most commonly identified aspects, there may be other factors, or there may be multiple factors that impact a student (Foster, 2004). For the purpose of this manuscript, we will focus specifically on minority status and economically disadvantaged youth.

African American and Hispanic American students tend to show poor academic achievement in comparison to students who are European American (Foster, 2004). Academically, African Americans have tended to perform approximately two years behind their white peers (Comer, 1997). Reasons for this disparity may be due to little home support for literacy (Baumann & Thomas, 1997), limited oral language skills, dialectal variations, and differing teacher expectations (Washington, 2001).

Another variable is family income, which is one of the important predictors of academic achievement (Roscigno, 2000). Although children cannot control their parents’ economic status, they are influenced by it. Statistics reveal disparities between ethnic groups. 32.7% of African American children under the age of 18 live in poverty while only 12.9% of white children live in poverty (Youth Indicators, 1999). Allington (1991) stated, “It is the children of poverty who are most likely to have literacy-learning difficulties” (p. 237). Roscigno and Ainsworth-Darnell (1999) found that socioeconomic status variables accounted for 53% of the students’ reading grade. Smith and Dixon (1995) investigated the impact of socioeconomic status on 64 Head Start students’ early print knowledge. They studied the function (e.g., environmental print, purpose of print) and form (e.g., letter identification, letter sound identification) of print. Socioeconomic status did not appear to affect print function; however, it did affect print form. The findings indicated that young children of limited socioeconomic status were twice as likely to start school with limited knowledge about print forms, which placed them at risk for reading and writing challenges. At-risk children require more instructional time learning to read (Hanson & Farrell, 1995) and often need to receive letter-sound instruction that is longer in duration and more explicit and more intense (Blachman, 2000).

Barone (2002) studied teacher’s instruction and children’s activities in two kindergarten classrooms in a school that was labeled at risk. She observed three teachers (two teachers worked part-time) and followed 16 focal children. Since alphabet and letter-sound knowledge are main concepts for kindergarten learners, the majority of reading instruction was devoted to learning these concepts by listening to alphabet songs, identifying letters in students’ names, and generating words that begin with a targeted letter. The teachers expected that “children in other schools will know the sounds of the letters, the children here may know a few, and those will be our best students” (p. 428). When the focal students were posttested on letter identification, “many could not display this knowledge without support from teachers . . . [and] students were not able to write letters that matched the initial consonants in words” (p. 431). As Barone analyzed her data and pondered why 11 of the 16 children left kindergarten without knowing their alphabet and letter knowledge, she attributed the lack of student success was due to the teachers’ limited view of literacy and their subsequent instruction, and the children’s lack of meaningful experiences with reading and writing.

It is imperative that educational systems identify young children with risk factors who possess an inadequate gap in their knowledge and skills before they enter formal education. Not only must this gap be identified early, but intervention needs to address the inadequacies through developmentally appropriate activities that are well designed and focused (Heibert & Taylor, 2000). Children who complete kindergarten without possessing the knowledge necessary for reading

success should be given support throughout the summer and during the first grade year (Allen, 2003). A summer program prior to first grade provides at-risk children an opportunity to strengthen their foundation, prevent loss of information during the summer months, and decrease the possibility of first grade reading failure (Alexander & Entwisle, 1996).

A New Integrated Alphabet Approach

This integrated alphabet approach is a practical, instructional methodology that simultaneously teaches phonemic awareness, letter sounds, and letter formations. It was created on the principles of developmental and neurological mechanisms of learning in young children (Dennison & Dennison, 1989; Hannaford, 1995). The alphabet system was developed by a teacher who was challenged by learners who possessed good visual processing abilities but struggled with auditory and motor learning. After studying brain research, she asked herself a question, "Would it be possible to appeal to the right visual gestalt hemisphere in a manner that would stimulate the temporal and frontal lobes, and thereby illicit auditory recall of the letter sound and a motor movement for writing?" To accomplish this, she realized it was necessary to transform each abstract symbol into a picture that started with the correct phoneme and had a similar shape so the letter sound and formation could be taught simultaneously.

The created method goes a step beyond multisensory learning (the actions of seeing, saying, and doing) to a term that can be coined "intersensory" because seeing, saying, and doing cannot be separated. The integrated alphabet approach serves as an intersensory feedback process that triggers visual/auditory/motor responses that aligns neurologically with children's brain development. It integrates the intersensory responses into a holistic approach that results in the integration of reading-writing-spelling because the skills are not separated. This methodology utilizes carefully selected visual images in conjunction with precisely crafted stories as a springboard to *transform* abstract symbols into meaningful letters which elicit specific consonant and short vowel sounds and integrated hand movements for writing.

This intersensory learning is taught in four phases. First, imagery is used to introduce students to a mnemonic symbol that represents both a sound and a letter. This means that the object's beginning sound and its shape are identical to the letter sound and letter shape, respectively. During the second phase, students learn the correct phoneme for each picture. Third, students join together the abstract letter with the sound to make a sound-symbol correspondence, followed by blending sounds into words. During the fourth phase, students are subsequently taught how to integrate the written elements. Throughout these phases, visual-auditory-motor learning works together. The new alphabet system does not isolate the phases, so phonics and handwriting cannot be separated. This integration of learning takes the new alphabet system beyond the multisensory to make it intersensory.

The principle of multifaceted learning exposure is applied to each letter of the alphabet. Each letter of the alphabet has its own device, which is comprised of stationary and movable parts; notched cardboard and acetate slide back and forth, left and right. How and when these parts are moved determines how the information is disseminated during the four phases. This alphabet concentrates on the pure

phoneme associated with consonants and the short vowels, which typically are the most difficult for children to master. Therefore, the 26 letter set is essential and complete for students to learn beginning reading/writing/spelling skills.

Purpose

The new integrated alphabet approach was designed to teach children alphabet knowledge based on their developmental and neurological needs. The teaching of phonemes (smallest unit of sound), graphemes (letters), and motor movement has been integrated into one approach that is neurologically sound. It was developed to assist all students, including those at risk, in gaining alphabet skills to avoid their falling behind in their academic achievement. Therefore, the purpose of this study was to determine the effectiveness of this neurologically integrated approach in teaching at-risk pre-first grade students their letter sounds and formations during a short-term intervention. Guiding questions included:

1. To what extent would at-risk pre-first grade students be able to correctly recall all 26 letter sounds after receiving neurological intervention?
2. To what extent would at-risk pre-first grade students be able to properly write all 26 letter forms after receiving neurological intervention?
3. To what extent would at-risk pre-first grade students be able to apply phonic knowledge?

Method

Elementary Participants

The learner population was comprised of African American students who came from economically disadvantaged homes. The students had completed kindergarten and were identified as at risk by school professionals because they were unable to recall the 26 alphabet sounds or form lowercase letters of the alphabet. They had previously been taught using traditional analytic phonics approach and ball-stick handwriting. One hundred twenty at-risk children were pretested in May; 59 enrolled in the summer school program with parental permission and 43 of the students remained for the duration of the program and were posttested at the conclusion of summer school. The students attended summer school at their local elementary, of which there were five schools. The five schools were all located within three to four square miles in a confined geographically similar area. Students were instructed in the alphabet approach three hours per day, four days a week for five weeks. The total possible duration of instructional time the students received was 51 hours. However, due to absenteeism, the average number of hours any student attended during summer school was 43 hours.

Teachers

The summer school teachers were all employed by the public school district. Teacher A (matches School A) had been a kindergarten teacher for 18 years. Teacher B taught for 29 years, the last 17 at School B. She had several years of kindergarten experience and had taught for 13 years in first grade. School C started with a sixth grade

social studies teacher and then a kindergarten teacher took over the third week of summer school. Teacher D had taught for 12 years, 11 of which were at School D. She had one year of kindergarten experience, five years of first grade, and six years of teaching second grade. Teacher E taught six years as a seventh-grade math teacher.

The teachers spent one full day in training prior to teaching with the instructional method. The day of training started with the founder introducing the theory of the approach. This foundation (the what and why) was followed by hands-on learning of correct pronunciation of sounds, how to correctly form the letters and how to work the devices, as well as other concepts. After the training, the teachers were monitored in several ways. The teachers were placed in classrooms with assistants who had extensive training and prior teaching experience with the alphabet system. These assistants were to support the teacher and monitor student learning. The teachers were also given instructional videos to guide their learning and help them deliver the approach. Additionally, the author of the alphabet system traveled to the schools daily to monitor their teaching for reliability and validity purposes.

Assessment Procedures

Students were individually pretested in May and then posttested during the last day of summer school using identical procedures. There were three assessments: sound knowledge, letter formation, and phonics.

To evaluate sound knowledge, the trained tester held a card with one letter on it and asked the child to tell her the sound, not the name of the letter. An example follows. The instructor held a card with *K* on it and said, "Tell me the letter sound, not its name." The child's response was documented. The sound knowledge assessment was scored correct or incorrect. Students received one possible point per letter—either the child knew the correct sound or did not know the correct sound. For example, if the child said "kay" or "s" or any sound other than its pure phoneme or did not know the sound, then the child received a 0 score for that item. There were 26 letters, thus 26 points possible for sound knowledge for each participant. The administration of this test took approximately 5-10 minutes per child.

Next, the students were asked to write each letter of the alphabet in a sequence based on motor plan rather than traditional alphabetical order of *a* to *z*. The teacher gave each child a piece of paper and said, "Write lower case [c]." If a child took longer than five seconds to respond to "Write lower case [c]," the tester asked the child to write the next grapheme in motor plan. *C* was followed by *o*, *a*, *d*. Then the tester would ask the child the next set of graphemes until all 26 letters had been written. The number of errors the students made was counted. Instead of receiving correct/incorrect as they did for letter sounds, students made an error if they did not know how to write the designated lower case letter, or if they capitalized the letter, wrote the wrong letter, or made the letter the wrong size. Even though there were 26 letters, some students made multiple errors per letter so they may have received four points per letter (one point per type of error) for a total of 104 points per child.

Kindergartners' ability to engage in invented spelling is a strong predictor of future literacy achievement (Torgeson & Davis, 1996). Therefore, the Early Reading Screening Instrument (hereafter ERSI) invented spelling subtest (Morris, 1992) was administered to the

students before and after intervention to measure their phonic knowledge. The students were given wide-lined paper with numbers 1-15 already written on the paper for them. The test began with the teacher modeling two practice words, *cat* and *flag*. Then the teacher orally read the word, read the word in a sentence, and the student and teacher said the word together before the child wrote the word. An example follows: "back. Please scratch my back." The child and teacher then said "back." Beside #1 on the paper, the child spelled "back" to the best of his/her ability. Scores were figured by counting the number of correct phonemes that were written. There was a possible total of five points per word. A description of the points is listed followed by the example for "back" in italics at the end of each description.

- 0 points for random string of letters (*ORAI*) or inappropriate letter (*K*)
- 1 point for initial phoneme represented correctly (*B* or *BAOR*)
- 2 points for initial and final phonemes (*BK* or *BTLK*) or initial phoneme and a vowel (*BA* or *BAT*)
- 3 points for the initial and final phonemes and a vowel (*BAC*)
- 4 points for the above plus additional phonemes (This would apply for a word with multiple sounds such as blends/digraphs = *dres* for *dress* or *stic* for *stick*.)
- 5 points for the correct spelling of the word (*BACK*)

Morris developed this instrument to screen beginning pre-first grade readers to see if they needed early intervention. Perney, Morris, and Carter (1997) found that ERSI's four subtests (alphabet knowledge, concept of word, invented spelling, and word recognition for decodable and basal words) have good predictive validity, correlating $r = 0.70$ with the end of first grade achievement. Further analysis through stepwise regression of the four subtests indicated that invented spelling and word recognition had the highest predictive ability (Lombardino et al., 1999). "The C_p value of 1.20, which measures the difference in fitting errors between the full and subset models, is the lowest for these two subtests indicating that it is a good subtest; the R^2 (0.53) and adjusted R^2 (0.52) values show the strength of the linear association between the criterion and predictor variables" (Lombardino et al., 1999, p. 8). ANOVA on spelling and word recognition was significant, $F(2, 88) = 50.40, p < .0001$. The ERSI has a coefficient alpha of .85 (Perney, Morris, & Carter, 1997), which indicates its internal consistency reliability for the total test.

Instructional Materials

Twenty-six individual devices, or cards with overlays, were used to disseminate the information of the 26 letters of the alphabet. Each teaching tool had a picture that began with the sound of that letter. Color illustrations were used to verify the visualized image created by the visual clues and mnemonically assist students in learning the name of the picture and the letter's sound. These visual images, combined with stories, worked in conjunction with directional arrows.

The image and arrows supported students in properly forming the letters by emphasizing the need for the student to start at a specific point and move to cross the midline. The devices included visual clues, color illustrations, and stories combined with directional arrows that stimulated sound recall and letter formation.

There were four sequential phases to teaching this alphabetic approach: imagery, auditory, integration and sound blending, and motor plan. In the first phase, students were introduced through imagery to a symbol that represented both a sound and a letter. This meant that the object’s beginning sound and its shape was identical to the letter sound and letter shape, respectively. During the second phase, students learned the correct phoneme for each picture. Third, students attached the abstract symbol to the sound and began to sound blend. During the fourth phase, students were subsequently taught how to integrate the written elements. The multifaceted learning was applied to each letter of the alphabet.

Instructional Procedures

The main focus of summer school was to teach students to recognize the letters, recall the sound for each letter, and correctly form each letter. The four phases (imagery, auditory, integration and sound blending, and motor plan) of the integrated approach were critical to learning. Due to the fact that summer school was intense (three hours a day, four days a week for five weeks), there was some alteration to the teaching of the final phase (motor plan). Handwriting was taught each day; however, students were not able to learn the correct letter formations as quickly as the imagery of the pictures or sounds of the letters. Therefore, the letters and sounds were introduced sequentially, but the focus of each day’s handwriting necessarily lagged behind the imagery and phoneme learning. At the conclusion of summer school, the four phases had been taught for all the letters, so the letter sound/letter formation learning came together as it would during a regular school year. Students were noticeably ready for sound blending, but time constraints prevented further development of beginning reading skills.

In addition to the traditional dissemination of information through direct instruction, the teachers incorporated learning in creative ways. For example, after learning four letters (*c, o, a, d*), the students played musical chairs. The students were given a card with a key picture on it (e.g., cat, octopus, apple, dog). When the music ended, the students who were holding the cards had to rise and say the proper sound for their picture. Another pleasurable activity was to decorate sugar cookies. On the day they learned “*c*” for cat, the teacher brought cat cookies with glaze and frosting. The students were asked to decorate their cookie to match the picture of the cat. Additional summer school activities included coloring pictures, matching pictures, and tracing around pictures.

Results

The purpose of this study was to analyze the effectiveness of an integrated alphabet approach in teaching at-risk students who had not learned all their letters and sounds by the completion of kindergarten. Due to the fact that poor attendance is one of the earliest and most visible signs of low achievement and school dropout (Rodriguez, 1999), attendance results will be documented across schools. Thereafter, sound recall, letter formation, and phonic assessment results across schools will be reported statistically.

Attendance

Poor attendance often identifies at-risk students and affects students’ achievement. Attendance was fairly consistent across students in four of the five schools. Students in School B attended, on average, 81 % of the time, School C had 82 %, School D had 84 %, and School E averaged 78 %. The exception was School A whose attendance averaged 97 % with only two students. Table 1 displays the number of students who enrolled in each school, the percentage of their attendance individually and collectively. Table 2 also shows the attendance average by school through a mean score. Summer school was conducted for 20 days.

Table 1

Analysis of Attendance

School	N	100 %	94 %	88 %	82 %	76 %	71 %	65 %	56 %	53 %	Max %	Min %	Average %
A	2	1	1	0	0	0	0	0	0	0	100 %	94 %	97 %
B	13	2	2	1	3	2	1	0	1	1	100 %	53 %	81 %
C	4	1	0	1	1	0	0	0	1	0	100 %	56 %	82 %
D	10	1	2	1	2	4	0	0	0	0	100 %	76 %	84 %
E	2	0	2	0	4	3	1	1	1	0	94 %	56 %	78 %

Table 2

Descriptive Statistics for Attendance and Assessments for Each School

Measure	School A			School B			School C			School D			School E			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Attendance ^a	2	16.50	0.71	14	13.50	2.71	5	13.00	4.85	9	14.22	1.48	12	13.33	1.78	42	13.69	2.54
Letter sounds pre ^b	2	7.50	7.78	14	13.29	3.07	5	5.80	5.67	9	6.11	6.90	12	1.58	2.94	42	7.24	6.45
Letter sounds post ^b	2	26.00*	0.00	14	26.00*	0.00	5	26.00*	0.00	9	25.89*	0.33	12	25.83*	0.58	42	25.93*	0.34
Letter form pre ^c	2	44.00	5.66	13	24.77	9.11	4	26.25	21.65	8	37.25	8.22	11	39.09	12.79	38	32.71	13.15
Letter form post ^c	2	1.50*	2.12	13	0.46*	0.66	4	0.50*	0.58	8	2.00*	2.67	11	3.73*	6.02	38	1.79*	3.66
Phonic pre ^d	2	7.00	9.90	5	38.40	13.07	3	10.67	5.77	8	13.00	11.20	11	2.36	2.98	29	12.69	15.08
Phonic post ^d	2	19.50*	16.26	5	48.20*	6.38	3	24.67*	4.72	8	23.13*	17.13	11	17.82*	8.92	29	25.34*	15.43

^aThere were 20 total days of summer school.^bThe students knew this many letter sounds before and after the intervention.^cThe students made this many letter formation errors before and after the intervention.^dThe students were able to write the sounds in words before and after the intervention.

* p < .05

Letter Sounds

We used a repeated measures analysis of variance to test whether there was an improvement in students' knowledge of letter sounds from pre- to posttests. Overall, across schools, there was a significant change in students' ability to produce the correct sound for each letter of the alphabet, $F(1, 40) = 14.46, p = .00$. The interaction effect testing whether attendance affected the students' learning was not significant, $F(1, 40) = .19, p = .665$. Table 2 documents the means for the pre/post sounds by school.

Letter Formations

Likewise, we used a repeated measures analysis of variance to test whether there was an improvement in students' ability to form the correct letters from pre- to posttests. Overall, across schools, there was a significant change in students' ability to correctly form the lower case letters, $F(1, 37) = 9.49, p = .004$. The interaction effect testing whether attendance affected the students' learning was not significant, $F(1, 37) = .43, p = .515$. Table 2 documents the means for the pre-post letters by school. As can be seen, the errors dramatically decreased after intervention, which shows that students learned to correctly form lowercase letters.

Application of Phonic Knowledge

In addition to identifying correct phonemes and graphemes in isolation, students need to apply that knowledge to the writing of words. Thirty-one of the students were given the pre-post Early Readiness Screening Instrument (Morris, 1992). The reason there were only 31 of the 43 students tested on this measure is due to the miscommunication between administration and teachers and parents regarding the last day of summer school.

Reliability analyses of the ERSI using pre-intervention scores showed strong internal consistency with Cronbach's Alpha of .983. Also, post-intervention scores showed strong internal consistency with Cronbach's Alpha of .982.

A repeated measures analysis of variance was conducted to test whether there was an improvement in students' ability to write the correct spelling of words from pre- to posttests. Overall, across schools, there was a significant change in students' ability to correctly write words, $F(1, 28) = 64.17, p = .00$.

Discussion

This study was a short-term intervention posed to help at-risk learners prepare for pre-first grade by providing them with direct instruction in sound and letter formation knowledge. Children who come from disadvantaged homes have experienced less exposure to print and possess weaker alphabet knowledge (Bear et al., 2004). These students had been identified by the school as children who had not successfully learned their letter sounds and formations through traditional methods during the school year. Results of this study indicate positive changes in the students' knowledge of letter sounds, letter formations, and their ability to write words. There are reasons to support why these children, who did not learn their sounds and letters in kindergarten, were able to succeed in summer school despite an average attendance of 84%.

First, this alphabet approach attempts to logically connect the letter sound and shape. After learning the letters through imagery, sounds and motor movements were integrated into a holistic, seamless approach rather than teaching phonics and handwriting as separate subjects. The integration and connection of phonics and handwriting strengthens the reading-writing relationship (Spear-Swerling, 2006).

Second, the approach mirrors children's brain development and provides them with a mnemonic mental hook (Adams, 1990; Hannaford, 1995). A picture accesses stimulation in the right hemisphere and is easier for children to learn than an abstract symbol (Hannaford, 1995). Learning letters and sounds through pictures also supports a fun environment (Delpit, 1988) that engages students and allows them to learn through more playful conditions.

Third, alphabet knowledge was explicitly taught to the students every day. They were shown how to write the letters and say the sounds and given guided practice under supervision of the instructor. Direct instruction of alphabet knowledge has been found to be essential (Ball & Blachman, 1991; Graham, Harris, & Fink, 2000). Snow, Burns, and Griffin (1998) said that reading failure may be prevented by providing explicit instruction in letters and their sounds.

A fourth reason that positive results were made for letter formation is that the alphabet approach supports students' memory development for handwriting in several ways. The first is by providing specific arrow cues (Berninger & Abbott, 1994). Second, students should learn motor plans rather than focus on perfection of size and shape. Third, the most effective way is to teach similarly formed letters together (Spear-Swerling, 2006). In this manner, students succeed in learning how to make basic lines that create multiple letters, such as *c, o, a, d*, whereby each letter builds on previous motions, which develops automaticity.

When comparing this approach to other handwriting approaches, there are some vast differences. In the traditional ball and stick manuscript, students must form abstract symbols using counterclockwise circles and vertical lines, which are not continuous and are often reversed. Moreover, to learn cursive, they no longer use counterclockwise circles. Instead students are required to use diagonal lines that replace vertical lines, and must implement continuous strokes. So they must learn a whole new skill set to be proficient in cursive. When writing both manuscript and cursive D'Nealian, students form abstract symbols using diagonal and continuous lines, but are not taught counterclockwise circles resulting in letter formations which are disintegrated or left open. For the integrated approach used in this study, the author observed, hypothesized, tested, and carefully planned the use of pictures containing counterclockwise circles and diagonal lines with continuous strokes in both manuscript and cursive. Research has shown these three elements are critical for legibility (i.e., directionally correct, integrated letters) and students' success. Young children do not naturally cross the midline until approximately six years of age (Dennison & Dennison, 1989). This neurological approach has carefully and thoughtfully delivered instruction to aid children in bridging their two hemispheres by teaching them to draw pictures containing the counterclockwise circle and the diagonal line which cross the midline, and when combined with a continuous stroke avoids directionality problems and disintegration. This approach goes

beyond handwriting. As students draw pictures, they form legible letters and commit the sound to paper.

In essence, the deliberately planned approach teaches phonics and handwriting through imagery based on sound phonological and handwriting research. This new approach builds on multisensory learning by integrating the visual/auditory/motor (action) learning so the three cannot be separated into individual skills. It is this integration of literacy that provided the students a key to success.

Several limitations of the study need to be addressed. First, this study immersed students in alphabet instruction for three hours a day. Although this is atypical in terms of alphabet instruction in a traditional school day, the results suggest that immersion has potentially positive ramifications. Second, while the gains showed that students improved significantly in their knowledge of sounds and letters, little instruction was given to sound blending or holistic literacy activities, such as storybook reading and writing. This was primarily due to the need to accomplish the identified goals of teaching letter sounds and formations within considerable time constraints. Third, there was great variation among class size, with School A having two participants and Schools B and D having 13 and 10 participants, respectively. Classroom size during the school year often varies from the summer school enrollment and may affect the amount of individual attention given to students. Fourth, a confounding factor is that of maturation, in which children are expected to make progress as a result of instruction over a period of time.

There are several possibilities for future research. It would be worthwhile to conduct a similar study of a short intervention with a control group to determine differences in achievement. Another study should take place in kindergarten classrooms during the course of a school year with control and experimental classrooms. Nationally recognized phonemic awareness, letter identification, and writing assessments could be used to determine the amount of growth and whether it is significant. Ideally, conducting a long-term study, following the students through grade three or four, would provide information about the long-term effects on students' literacy development.

In sum, it was the goal of this new integrated approach to provide students with meaningful, as well as developmentally and neurologically appropriate methods to learn their alphabet. At-risk students who previously had not learned their alphabet were able to master alphabet knowledge in a relatively short amount of time. The new alphabet approach assisted students in their memory retrieval by providing a picture that connected the sound and the letter formation. Further, it was an intersensory approach that integrates visual/auditory/motor responses. In conclusion, this study supports previous research showing the link between letter sound and formation; this knowledge is the foundation for reading and writing.

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