Comparisons of Reading Scores in Two Tennessee Elementary Schools Between Students Receiving and Not Receiving Specialized Training in Phonemic Awareness.

Raymond Lee Hatfield
East Tennessee State University

Follow this and additional works at: https://dc.etsu.edu/etd

Part of the Educational Assessment, Evaluation, and Research Commons

Recommended Citation
Comparisons of Reading Scores in Two Tennessee Elementary Schools Between Students Receiving and Not Receiving Specialized Training in Phonemic Awareness

A dissertation
presented to the faculty of the
Department of Educational Leadership and Policy Analysis
East Tennessee State University

In partial fulfillment
of the requirements for the degree
Doctor of Education

by
Raymond Lee Hatfield II
May 2003

Dr. Terrence Tollefson, Chair
Dr. Nancy Dishner
Dr. Denee Mattioli
Dr. Russell Mays

Keywords: Phonological Awareness, Phonemic Awareness, Direct Instruction,
Change, Leadership, Educational Reform
ABSTRACT

Comparisons of Reading Scores in Two Tennessee Elementary Schools Between Students Receiving and Not Receiving Specialized Training in Phonemic Awareness

by

Raymond Lee Hatfield II

Phonemic awareness has been identified as an essential precursor to reading. This study was conducted to determine the effectiveness for developing phonemic awareness skills in early readers by using a computer program designed to enhance the phonemic awareness skills of students. During the 2001-2002 school year, students located at two Kingsport elementary schools were administered the Brigance Comprehensive Inventory of Basic Skills pretest and posttest. Based on the results of the pretest and posttest data, it was determined that there were no significant differences between students receiving the specialized phonemic awareness training as compared to a probabilistically equivalent group of students never having received the specialized phonemic awareness training.
ACKNOWLEDGEMENTS

Life has meaning only in its struggle, our personal victories or defeats rest solely in the hands of God --- so let us celebrate the struggle. I would like to share my “personal victory” with all of those Appalachian people who have faced hardships in their lives. Josephine Hinds Hatfield was one of these people; she struggled to raise a family of five by herself during the years of the Depression and literally worked herself to death. For the sixteen years that I knew her she never once complained. My grandmother taught me how to celebrate the “struggle.”
# CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>2</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>3</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>6</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>7</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>8</td>
</tr>
<tr>
<td>Statement of the Research Problem</td>
<td>11</td>
</tr>
<tr>
<td>Testing</td>
<td>11</td>
</tr>
<tr>
<td>Definition of a Low-Performing School</td>
<td>14</td>
</tr>
<tr>
<td>Using Skills-Based or Whole-Language Reading Programs</td>
<td>18</td>
</tr>
<tr>
<td>Research Questions</td>
<td>19</td>
</tr>
<tr>
<td>Definitions</td>
<td>21</td>
</tr>
<tr>
<td>2. REVIEW OF LITERATURE</td>
<td>28</td>
</tr>
<tr>
<td>Background of Whole-Language and Phonics</td>
<td>28</td>
</tr>
<tr>
<td>Conflict between Phonics and Whole-Language</td>
<td>30</td>
</tr>
<tr>
<td>Implementing Change</td>
<td>31</td>
</tr>
<tr>
<td>Assessment</td>
<td>37</td>
</tr>
<tr>
<td>Classroom Practices and Student Performance on Tests</td>
<td>38</td>
</tr>
<tr>
<td>Project Follow Through</td>
<td>40</td>
</tr>
<tr>
<td>The Process of Language</td>
<td>46</td>
</tr>
<tr>
<td>Phonemic Awareness</td>
<td>50</td>
</tr>
</tbody>
</table>
3. METHODS AND PROCEDURES ................................................................. 57
   Research Methodology and Design ....................................................... 59
   Research Questions .............................................................................. 59
   Variables ............................................................................................... 61
   Population and Sample of Subjects ....................................................... 62
   Collection of Data ................................................................................ 62
   Data Analysis ....................................................................................... 64
   Hypotheses ........................................................................................... 66
4. DATA ANALYSIS AND INTERPRETATION ............................................. 68
   Data Description .................................................................................. 68
   Description of Sample ......................................................................... 69
   Data Preparation .................................................................................. 70
   Probabilistic Equivalence Table Summaries ........................................ 70
   Two-Group Experimental Design Table Summaries ......................... 74
5. CONCLUSIONS, RECOMMENDATIONS, AND SUMMARY ................... 79
   Conclusions ......................................................................................... 79
   Recommendations ............................................................................... 80
   Summary .............................................................................................. 81
REFERENCES ............................................................................................ 82
APPENDICES ............................................................................................ 95
   Appendix A: Normal Distributions of Brigance Subtests ................. 96
   Appendix B: Permission for using Diagrams ................................. 112
   Appendix C: Institutional Review Board ............................................. 113
   Appendix D: Permission for using Data ............................................. 114
VITA ............................................................................................................ 115
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Probabilistic Equivalency Grade 1</td>
<td>71</td>
</tr>
<tr>
<td>2. Probabilistic Equivalency Grade 2</td>
<td>72</td>
</tr>
<tr>
<td>3. Probabilistic Equivalency Grade 3</td>
<td>73</td>
</tr>
<tr>
<td>4. Two-Group Posttest-Only Randomized Experiment Grade 1</td>
<td>75</td>
</tr>
<tr>
<td>5. Two-Group Posttest-Only Randomized Experiment Grade 2</td>
<td>76</td>
</tr>
<tr>
<td>6. Two-Group Posttest-Only Randomized Experiment Grade 3</td>
<td>77</td>
</tr>
<tr>
<td>7. Legends for Tables</td>
<td>78</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project Follow Through Research Project</td>
<td>42</td>
</tr>
<tr>
<td>2. Parts of the Brain Involved in Reading</td>
<td>48</td>
</tr>
<tr>
<td>3. Arcuate Fasciculus</td>
<td>49</td>
</tr>
<tr>
<td>4. Brigance Subtest D1 for all Students In-Group A</td>
<td>96</td>
</tr>
<tr>
<td>5. Brigance Subtest D1 for all Students In-Group B</td>
<td>97</td>
</tr>
<tr>
<td>6. Brigance Subtest G1 for all Students In-Group A</td>
<td>98</td>
</tr>
<tr>
<td>7. Brigance Subtest G1 for all Students In-Group B</td>
<td>99</td>
</tr>
<tr>
<td>8. Brigance Subtest F1 for all Students In-Group A</td>
<td>100</td>
</tr>
<tr>
<td>9. Brigance Subtest F1 for all Students In-Group B</td>
<td>101</td>
</tr>
<tr>
<td>10. Brigance Subtest F2 for all Students In-Group A</td>
<td>102</td>
</tr>
<tr>
<td>11. Brigance Subtest F2 for all Students In-Group B</td>
<td>103</td>
</tr>
<tr>
<td>12. Brigance Subtest M1 for all Students In-Group A</td>
<td>104</td>
</tr>
<tr>
<td>13. Brigance Subtest M1 for all Students In-Group B</td>
<td>105</td>
</tr>
<tr>
<td>14. Brigance Subtest M2 for all Students In-Group A</td>
<td>106</td>
</tr>
<tr>
<td>15. Brigance Subtest M2 for all Students In-Group B</td>
<td>107</td>
</tr>
<tr>
<td>16. Brigance Subtest I1 for all Students In-Group A</td>
<td>108</td>
</tr>
<tr>
<td>17. Brigance Subtest I1 for all Students In-Group B</td>
<td>109</td>
</tr>
<tr>
<td>18. Brigance Subtest J3 for all Students In-Group A</td>
<td>110</td>
</tr>
<tr>
<td>19. Brigance Subtest J3 for all Students In-Group B</td>
<td>111</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

Due to the Tennessee Department of Education’s five-year plan for school improvement and the 48 schools that have been placed on the State Board of Education’s list of lowest performing schools in the year of 2000 (Tennessee Comptroller of the Treasury, 2001), the academic freedoms that schools have had in the past may no longer be viable for school administrators or teachers. Individual schools and school systems must prepare themselves to meet new accountability standards set forth by the state. Severe consequences may be meted out to school systems if they fail to meet these standards.

With new accountability measures becoming the driving force behind education, educators are scrambling for instructional methods that may help to improve test scores. Tennessee teachers and principals are now required to meet high accountability measures imposed by the state. Therefore, it is reasonable to allow teachers and principals to have control over which instructional methods they wish to use in their classrooms. Instructional methods, however, must be based on research. Some researchers have found correlations between the use of teacher-directed instructional methods in the classroom and increased student performance on state tests (Becker & Engelmann, 1978; Cawelti, 1999; Umbach, Darch, & Halpin, 1989).

Lyon (1998) stated that teaching children to read was the most fundamental responsibility of educators. At least 30% to 40% of children have
difficulty learning to read. Dropping out of school, retention, and special education referrals may be attributed to the poor reading skills of students. Lyon also stated that by using effective prevention and early intervention programs, poor readers could increase their reading skills by 85% to 95%.

Project Follow Through, an educational study conducted in the 1970s, clearly gave the edge to teacher-directed instructional programs (refer to figure 1, p. 42) over other educational programs designed to improve achievement test scores in reading, language, and math. Many researchers have stated that by using a teacher-directed instructional model for those schools that have a disproportionate number of disadvantaged children may significantly improve their test scores (Becker & Engelmann, 1978; U.S. Department of Education, 2002; Umbach et al., 1989).

Fullan and Stiegelbauer (1991) stated that, with the introduction of new educational innovations, educators must think differently, forcing some to change their educational ideologies entirely (Goldman & O'Shea, 1990). This is one area of teacher-directed methodology that requires diligence on the part of the program’s administrators. Using teacher-directed programs that use either whole-language or phonics programs to teach students to read will require the teacher to be open and willing to accept new strategies that he/she can accept and feel comfortable using in his/her classroom. According to recent research, properly implemented teacher-directed programs have been shown to dramatically increase student performance on achievement tests (Adams, 1996; Appfel, Kelleher, Lilly, & Richardson, 1975; Branwhite, 1983; Brent, DiObida, & Gavin,
Two popular approaches used to teach children to read are the whole-language and phonics methods. Both instructional methods may be used effectively to teach children to read. Some children have the ability of learning to read using the whole-language approach while some children have difficulty using this method. Those children who have difficulty learning to read using the whole-language methodology may be more successful using the phonics method. Phonological awareness is a key component of the phonics method.

Griffith and Olson (1992) defined phonological awareness as the ability for readers to distinguish and manipulate the smallest sounds in the English language that can change meaning. The concept of the smallest recognizable speech sounds in language is called phonemes. Phonemes create syllables that can be put together to create words. As an example, “ox” is made up of three phonemes- /æl/, /k/, and /s/. The English language contains a varying amount of phonemes, which is contingent upon the dialect of the user. Griffith and Olson recommend that educators include phonological awareness skills within their instruction when using both the whole-language and phonics philosophies.
Statement of the Research Problem

The problem to be addressed in this study is to compare reading scores in two Tennessee elementary schools between students receiving and not receiving specialized phonemic awareness training. The specialized training consisted of the FastForword computer program. A sample from the two elementary schools included 54 students participating in the control group and 55 students participating in the treatment group. The students were tested using the Brigance Diagnostic Comprehensive Inventory of Basic Skills. Pre- and posttests were given during the 2001-2002 school year. A t-test analysis was used to ascertain differences between the control and treatment groups.

Testing

The office of public and governmental affairs at CTB/McGraw-Hill (2002) emphasized the vital role that testing plays in education today. They also stated that testing often shapes the public’s perception about the quality of schools. Testing is used for many purposes; policy makers use the results from testing to evaluate schools. Teachers use test results to help improve teaching and to evaluate the effectiveness of newly implemented programs. Testing is also used to generate the data on which policy decisions are based. State mandated accountability measures have set the educational standards for innovation, higher standards, and educational excellence within the State of Tennessee (Tennessee Department of Education, 2001).
The advocates for testing have said that testing is one of the most important methods used to make schools systems become more accountable. The adversaries for testing have a different perspective. Graves (2002) stated that because of the federal government’s efforts to implement high stakes testing, educational standards would be lowered. Graves uses an example of how an elementary principal challenged parents and council members to take one of the mandated tests. Because of problems with poor test writing and vague answer choices, the parents and council members became so angry that they challenged the members of the State Board of Education to take the test. Graves explains how standardized testing has the potential to squelch the creative processes in children with the following passage.

Most all of the assignments require an answer from multiple-choice options on timed tests. This is the thinking equivalent of the five-meter sprint. Currently, we are testing what we value, quick thinking. But what about long thinking? Can we discern thinkers like Thomas Jefferson, Albert Einstein, and Charles Darwin, who were self-professed long, slow thinkers? Can we identify and encourage the children who can formulate a question, find the information, structure an evaluation design, and know if they have answered their original question? The problems of a democracy are not solved through single answers, but by tough-minded thinkers who sustain thought on one problem for days, months, or years (p. 8).

The North Carolina Citizens for Democratic Schools (NCCDS) provided a list of problems that might result from high stakes testing. The NCCDS is a group of parents, students, teachers, and other community members hoping to raise public awareness about standardized learning and high stakes testing. North Carolina Citizens for Democratic Schools (2002) has issued a list of problems that may result from high stakes testing.
1. Tests are developed by a small group of government officials with hardly any public involvement. As a result, parents and the public rarely know what questions are asked or what the “right” answers are.

2. Because tests tell us how a child answers a small number of questions on a single day, tests only give parents and schools a limited picture of what a child really knows. For example, they do not tell parents whether a child can write a good research paper or debate a topic.

3. High stakes tests result in teachers “teaching to the test.” Because teachers use large amounts of classroom time for students to take “practice tests,” they are forced to conform to a rigid curriculum that gives little time or credit to imagination, creativity or the ability to solve problems.

4. The current tests given to elementary and middle schools do not test important subjects like science, art and social studies. With all the significance given to the statewide tests, non-tested subject areas are often neglected in the classroom.

5. Tests are based on the assumption that “one size fits all.” However, children have different learning styles and they develop at different rates.

6. Test questions may have racial or cultural biases that favor a particular group of students. Because parents and the public generally do not see the test questions, there is no way to be sure that tests do not discriminate against students based on their race or social status.

7. Tests are not 100% accurate. All tests have a built in “margin of error” which means that if your child took the test on another day or answered a different set of questions, she or he may get a different score on the test. That difference in the test score might mean the difference between your child passing or failing a grade.

8. State tests are taken at the end of the school year and are hardly ever used to diagnose student-learning problems. Thus, tests are not used to improve a student’s education when it really counts —during the school year.

9. Some students who are very knowledgeable, who have done their homework, and who have good grades simply do not perform well on tests. Thus testing can discourage persistence and hard work.

10. Using the tests to make high stakes decisions is not fair to students because all schools, classrooms and teachers are not equal. There are big differences in the quality of a child’s education depending on the resources available to a school or the skill of the classroom teachers. In addition, because of natural disasters such as hurricanes, some students may not receive all the instruction they need to do well on state tests (p. 6).

Because much depends on the outcomes of testing, educators and policy makers have been challenged to prepare students with the necessary tools to
perform better on tests. However, this study is not focused on “teaching to the test,” the purpose of this study is to provide educators with information about phonemic awareness that may help them make better decisions prior to implementing new reading programs. Research findings suggest that teacher-directed programs are successful when used in low-performing schools. School administrators have been viewing many teacher-directed instructional methods to help meet accountability mandates governed by the state of Tennessee (Adams, 1996). Many school administrators, engaged within an era of reform, are using any innovative measures that will prevent their schools from being placed on The State of Tennessee’s head’s up list. The ability of administrators to implement reform will be the most critical factor for those schools demonstrating a need for improvement (Lane & Epps, 1992; Miles & Louis, 1990; Mundry & Hergert, 1988). Lane and Epps have recommended that specialized training should be provided to administrators to help them to implement change within their schools.

The Italian public official, Machiavelli (1532) stated, “There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead in the introduction of a new order of things (para. 7).”

**Definition of a Low-Performing School**

Administrators should consider every educational program available to help meet students’ needs and the State of Tennessee’s accountability mandates. However, these programs should be thoroughly tested and evaluated
prior to their implementation within Tennessee’s educational system. The Tennessee State Board of Education has established accountability indicators and performance goals for each school system within the state of Tennessee (TCA 49-1-601). Beginning with the school year 2000-01, the State Department of Education began to collect and analyze data from each school across the state and has developed a list for the commissioner of education that places low-performing schools on a “heads-up list”. The “heads-up list” identifies schools not meeting the accountability indicators set by The Tennessee State Board of Education. Schools on the list may be put on notice (TCA 49-1-602). The Department of Education (DOE) and Office of Assessment and Evaluation (OAE) jointly study the schools and make recommendations for improvement. The commissioner may require school improvement plans to include the recommendations made by the DOE and OAE (TCA 49-1-602).

The commissioner may place schools on probation if they fail to meet the standards set by the DOE and OAE (TCA 49-1-602). From this point, the commissioner may restrict the discretionary powers of the director or local board (TCA 49-1-602). If school improvement does not occur and after two consecutive years of the school being on probation, the commissioner is authorized to recommend to the SBE the removal of the director and local school board (TCA 49-1-602). The five-year plan for improvement began in the school year 2000-01 with targeted schools being placed on the “heads-up” list. During the next two years (2001-02/2002-03) Tennessee schools failing to meet the standards set by the DOE and OAE will be placed on probation. In the fifth year (2004-05) schools
may be taken over by the state. The Tennessee Department of Education has identified 68 schools “making adequate progress” in the school year 2001-02, and 67 schools “failing to make adequate improvement” and recommended for probation for the 2002-03 school year (Tennessee Department of Education, 2002).

Each low-performing school in Tennessee will be identified based on two criteria: average cumulative achievement data per school for the past two years in conjunction with value added scores for the past two years (Ted Beech, personal communication, November 13, 2000).

Specifically, any school with an achievement/attainment pattern of less than 45% in addition to a value-added score of less than 34% for the past two years is identified as a low-performing school (Ted Beech, personal communication, November 13, 2000).

There are two criteria for schools’ being placed on the “heads-up list.” They are the attainment levels measured by Normal Curve Equivalency (NCE) scores and value-added scores. Value-added scores reportedly represent the actual academic growth of the students. Reading, language arts, and math scale scores are the cognate areas used in determining whether schools are placed on the list. The level of academic attainment is expressed as the average student attainment calculated using grade levels, subject areas, and the number of years selected for this process. The NCE scores for each school include grade level, subject area, and test years averaged to produce a single average NCE that indicates the overall academic attainment levels for each school serving one or
According to a representative from the Tennessee Department of Education, there were several factors that negatively affect school performance on achievement tests: 1. lack of focus as demonstrated by teachers and school administrators, 2. having a large number of disadvantaged children, 3. being a rural or inner city school, 4. having a large turnover of teachers, 5. high absenteeism on the part of students and or teachers, 6. lacking parental involvement, and, 7. having a high number of student turnovers (Ted Beech, personal communication, November 13, 2000).

In an effort to avoid being placed on the State of Tennessee’s heads-up list and in order to meet the mandated accountability standards, it is important for administrators to choose educational programs that will improve the achievement scores of students. With thousands of expensive educational innovations being offered to school systems, often guaranteed by vendors to improve the achievement scores of students, decisions to implement new programs should be based on non-biased research. The U. S. Department of Education has supported programs that: “are scientifically based on reading research, provide an effective intervention that help low performing schools close the achievement gap, have been scientifically proven to produce measurable gains as assessed by independent third-party pre- and post-tests, and support accountability in the classroom” (a. Scientific Learning, 2002, para. 3).
Using Skills-Based or Whole-Language Reading Programs

The primary educational theories for teaching reading in schools have come from two schools of thought. The “emersion” (reading for context) whole-language and synthetic phonics approaches (a skills-based program) have been the two methods most widely used to teach children to read for the last century.

Hutchins (2003) describes Mabel B. Wesley Elementary School as one of the top ranked school in Huston, Texas. Considering the fact that the elementary school is poor, and consists mostly of a black student population, Mabel B. Wesley ranked in the top 13 out of Huston’s 182 schools. Hutchins attributes the school’s success to teachers’ using a skills-based reading program. Rhea Ashmore, an associate of Hutchins, explains that direct instruction is not as one-sided as it appears. Even though direct instruction may be considered a skills-based program, books and literature are still an important part of the curriculum. The controversy over which reading program is best to teach children to read still remains. Because of the success of Wesley, advocates for skills-based reading programs say this is the best method to teach children how to read. The whole-language advocates will argue that children will need to develop the love for learning in order to develop a well-rounded education.
Research Questions

This research will address the following questions:

1. Do the “word recognition” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the word recognition assessment is to determine if the student can recognize common and crucial words that frequently appear in print.)

2. Do the “word analysis” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the Brigance word analysis assessment is to determine if students can identify initial consonants in spoken words, are able to substitute initial-consonant sounds, substitute short-vowel sounds, substitute long-vowel sounds, substitute final-consonant sounds, substitute initial-blend and initial-diagraph sounds, read words with common endings, read words with vowel digraphs and diphthongs, read words with phonic irregularities, read suffixes and prefixes, and be able to divide words into syllables).

3. Do the “vocabulary comprehension” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the vocabulary comprehension assessment is to determine the highest grade level at which the student can read and comprehend vocabulary words.)
4. Do the “comprehension of passages” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the comprehension of passages assessment is to determine the highest grade level at which the student can read and comprehend reading selections.)

5. Do the “computational and problem-solving skills” of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the math grade placement assessment is to estimate the student’s computational and word problem-solving skills.)

6. Do the “spelling” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the spelling assessment is to determine the highest grade level at which the student can spell with at least 60% accuracy and their ability to identify basic word-analysis skills.)

7. Do the “sentence writing” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the sentence writing assessment is to determine the legibility of the student’s handwriting, to determine the student’s skill for providing personal data in writing, to determine the student’s skill in mechanics, and to determine the student’s letter-writing skills.)
Definitions

Most of the definitions within this section are used to describe the educational programs and philosophies that were used in the Project Follow Through research project (reference p. 42).

The Partnership for Reading (2003) defines word analysis as:

Word analysis instruction is commonly thought of as phonics instruction, especially with children. Beginning phonics focuses on simple one-letter graphemes representing consonants (b, c, d, f, g, h, and so on) and vowels (a, e, i, o, u) and blending them together to make simple words (sat, met, and so on). While phonics instruction, viewed narrowly, is restricted to teaching grapheme-phoneme (letter-sound) correspondences, word analysis instruction may also include other methods that students can use to figure out words. One of these, sight word recognition, is taught along with phonics. Common and irregularly spelled words (was, want, to) are taught to be recognized on sight as whole words rather than being analyzed into graphemes and phonemes and then blended. Other word analysis techniques that are taught are the use of context, knowledge of prefixes, suffixes, and their stems, and dictionary skills (para. 1).

Direct instruction is a teacher-centered instructional method that focuses on cognitive learning, concepts, propositions, strategies, and operations (e.g., solving problems and writing essays) It involves the analysis of knowledge, the analysis of teacher-student communication, and the analysis of student behavior (Bereiter & Engelmann, 1966). Effective direct instruction uses teacher modeling followed by teacher guided student practice. Student learning results from a regimen of tasks that become more complex and difficult with the progression of time. When problems occur, reteaching is used to direct the students toward success. As the proficiency levels of the student increases, the teacher provides
more independent activities to improve the student’s skill application opportunities.

The Parent Education Model is designed to strengthen and educate parents so that they are able to facilitate the development of caring, competent, and healthy children (Smith et al., 1994).

Behavior modification usually consists of changing the consequences of behavior, removing consequences that have caused trouble, or arranging new consequences for behavior that has lacked strength. Humans are malleable creatures of their environment (Skinner, 1987).

Bilingual/bicultural education prepares teachers to work in multicultural educational settings, thereby enhancing the achievements of language minority students in the classroom (Becker & Gersten, 1982; Legarreta, 1979).

Developmental-interaction uses a child-centered educational approach that focuses on individual development. Learning goals are predetermined for individual children as well as groups of children (Epstein, Schweinhart, & McAdoo, 1996).

Responsive education begins with educators, families, community members, social service providers, and older students working together to understand the need for fundamental change, “bottom up” language experience (Ashton-Warner, 1963).

High/Scope cognitive curriculum, based on Piaget’s theories of cognition, teaches children to become active learners (Piaget, 1972). The teacher acts as a facilitator of knowledge who sets up the classroom in such a way that the student
is provided with the opportunity to learn math, science, reading, art, music, social studies, and movement. Students determine what they wish to study or work with, but the teacher is expected to be available to answer any questions and clarify any misunderstandings that students may have. The High/Scope cognitive curriculum is a method used for the organization and management of the classroom environment. The instructional methodology includes instructional activities to help at-risk students improve their school achievement and literacy skills by giving them opportunities to initiate and engage in learning activities that contribute to their cognitive, social, and physical development (Epstein, Schweinhart, & McAdoo, 1996).

Open education is an educational model that involves a child-directed approach toward education. The educational model stresses the idea that humans have a desire for knowledge. The primary objective of the open education model is for the child to direct his or her own learning objectives. This may be accomplished by establishing an "open place", a method and form of study for the creation of educational content based on the basics and fundamentals of learning. The aim is to form the will and develop the ability and attitude of students for continuous learning through life such as developing students' abilities to educate themselves (Piaget, 1970).

Phonics, while having a significant place in the learning-teaching of reading, is not a method of teaching reading. Saxon Publishers (2003) stated that phonics stresses the acquisition of sound-letter correspondences by the student.
The student develops the ability to sound out words while reading. The ability for students to sound out words is called decoding.

Phonemic awareness is not the same thing as phonics. Phonics generally refers to using sound-letter and other rules to sound out words. Students who lack phonemic awareness usually attempt to memorize visual wholes and often do not understand how to use the sound-letter correspondences. Yopp also stated that this accounts for children who will laboriously sound out c-a-t and take a wild guess and say "cheetah" or who produce very unrecognizable words in their invented spelling. Yopp (1995) describes seven levels associated with phonemic awareness. 1. Awareness of rhyming (ages 3-4) is the ability that the student has in identifying or pairing words that rhyme. The student may be assessed by asking him/her which word combinations rhyme such as mail-pail or horse-dog. 2. Awareness of syllables (ages 4-5) is the ability the student has in identifying syllables. The student may be assessed by allowing him/her to clap his/her hands for each syllable sound in a word. 3. Awareness of onsets and rimes-sound substitution (age 6) is the ability for students to identify sounds like /at/ and rhyme it with a new word beginning with the letter /c/. 4. Sound isolation for words with beginning, middle, and ending sounds in words. This may be assessed by asking the student the beginning, middle, and end sounds of words. 5. Phonemic blending (age 6) is the ability for students to hear and then blend phonemes into words. Students may be assessed by providing students with sounds like /cl/, /al/, and /tl/ and then having them to sound out the word by stretching the pronunciation to produce the word. 6. Phoneme segmentation (age
6) is the student’s ability to count the sounds in a word. The student may be assessed by asking him/her what are the sounds in the word cow? 8. Phoneme manipulation (age 7+) is the student’s ability to omit or substitute phonemes to make new words. The student may be assessed by demonstrating the ability to omit the sound-letter “s” in the word sour to produce the word our. In addition, the student could change the sound-letter “t” in tail to “m” producing the word mail.

The meaning-emphasis approach emphasizes the importance of using meaningful contexts to learn how to read (whole-language). "Whole-language" addresses a different philosophy about teaching, learning, and how children learn language in the classroom. It suggests that children should use language in ways that relate to their own lives and cultures. The whole-language classroom stresses the processes of learning. Children are encouraged to decode words by their context. Whole-language advocates point out that the average first grader has already acquired a vocabulary of ten thousand words and assimilated many of the rules of grammar without formal schooling (Smith, 1971).

Synthetic phonics refers to a planned method to develop skills in students. It is the process used to introduce students to letter-sound correspondences that can be used to blend sounds into words. This strategy is different from the whole-language approach because the students are not encouraged to use word identification strategies. These whole-language strategies include the memorization of words, guessing from pictures or context, guessing by using the first letter or from the shape of a word (The California Reading First Plan, 1999).
There are other reading programs that may be considered as teacher-directed programs. Reading programs like Scott Foresman and Reading Mastery emphasize the phonemic awareness component of reading. However, some programs may use the implicit phonics approach versus the explicit phonics approach.

The implicit (whole to smallest part) phonics approach is the most widely used program. It includes coding, word associations. It may also include over 200 sound-letter correspondences. According to Cunningham (1990) and Wasik (2001), this can be overwhelming to beginning readers, and it lacks the appropriate implementation of orthography (the art of writing words with the proper letters, according to accepted usage; correct spelling).

The explicit (smallest part to whole) phonics approach may use 40 or fewer sound-letter correspondences. According to Cunningham and Wasik, by using the explicit approach, the reading skills of children are more likely to improve. Special considerations are given to orthography, which enhances the students spelling ability. Reading programs such as Scott Foresman (Pearson Education) and Reading Mastery (McGraw/Hill) most likely conform to the teacher-directed instructional model. Most other “whole-language” basal readers use the Implicit Approach for teaching reading skills to children. Scott Foresman and Reading Mastery are code-based programs. These two reading programs give special consideration to the code-based program and use a high percentage of words composed of letter-sound correspondences that have actually been taught to the students prior to their use. Most basal readers lack appropriate
sound-letter correspondences, this interferes with the acquisition skills of students causing reading to suffer (Cunningham, 1990; Wasik, 2001).

Gersten and Keating (1987) stated that by using a direct instructional model, the needs of the student could be strategically planned. Becker et al. (1982) explained that scripting allows students to progress at their own rates without interruption. By using a scripted program, teachers can readily track the progress of their students. If the student moves from one school to another, assuming similar programs are used, he/she may have an easier time integrating into the reading program.

Change may be traumatic for children. Quite often elementary teachers will leave the classroom for months at a time (Gersten & Keating, 1987). Because of the high structure that direct instruction programs offer (i.e. scripting, lessons, and other components), the trauma caused by the teacher’s leaving is minimized. Students retain the familiarity of the program regardless of who delivers it.

Rice University (2002) defined the arcuate fasciculus as:

Part of the superior longitudinal fasciculus that interconnects Wernicke’s area that is the posterior part of the superior temporal gyrus and is involved in the interpretation of the spoken language. The Wernicke’s area works in conjunction with the Broca’s area, which is involved with speech and hearing and is found in the posterior part of the inferior frontal gyrus. The arcuate fasciculus is an essential area of the brain required for normal speech and language function. The arcuate fasciculus also interacts with the optic radiation, which includes the inferior longitudinal fasciculus. The optic radiation interconnects the superior, middle, and inferior temporal gyri with the occipital lobe and the optic radiation fibers that are required for vision (para. 1).
CHAPTER 2

REVIEW OF LITERATURE

Background of Whole-Language and Phonics

Whole-language is a term that was developed by educators. Goodman and Goodman (1981), Harste and Burke (1977), and Watson (1989) began using the term whole-language to reference how English-speaking children learn to read. They have stated that language is whole and that it should not be fragmented into parts, hence the name whole-language. They also said that using phonics, grammatical patterns, vocabulary lists and other educational theories actually destroys the concept of language. Harste and Burke describe three different theories of reading: the first theory includes Goodman’s (1967) description of whole-language which defines reading as a psycholinguistic process where the reader interacts with texts; the second theory is called phonics, which describes reading as turning letters into sounds; and the third theory is called skills, which includes phonics, word recognition, and comprehension skills. Harste and Burke stated that readers interacting with texts (using the whole-language theory) are able to predict words in text by using sample cues from the semantic, syntactic, and graphophonic systems, and along with their worldly knowledge of language are able to derive meaning from context.

Samuels and Kamil (1984) suggested that whole-language was introduced as an effort to supplant the traditional phonics method for teaching children to read. Whole-language allowed the classroom teacher to teach large groups of children to read based on the concept of immersion (Venezky, 1984).
During the mid-to-late 1970s, Goodman’s (1992) insights into reading as a psycholinguistic process spurred the interest of other reading specialists for whole-language. Also, during the 1970s Goodman (1989) and Watson (1989) started a whole-language teacher support group called Teachers Applying Whole-Language.

According to Vail (1991), prior to the introduction of whole-language, the traditional phonics method was used. The phonics method requires intensive one-on-one instruction and was not considered a feasible option for accommodating large class sizes. During the 1950s, the Dick and Jane readers and books such as Dr. Seuss’s *The Cat in the Hat* were based on the whole-word theory. The goal of these books was to get children to become familiar with a limited set of simple words. The book *Why Can’t Johnny Read*, written by Flesh (1955), changed the direction from whole-language back to phonics. Flesh, who was not an educator much less a reading specialists had limited effect on reading instruction. However, Flesh’s book stirred the interest for many Americans and brought the processes of reading into question. Again, during the 1980s the whole-language ideology began to resurface, replacing the phonics approach and has remained until present day. Lemann (1997) has stated that because of state-mandated “assessment,” the pendulum has begun to swing back to the traditional phonics approach. Lemann also stated that children trained in phonics perform better on assessment tests.
Conflict Between Phonics and Whole-Language

Some phonics advocates would consider whole-language to be in direct conflict with the phonics approach for learning to read. Phonics-based programs require students to “decode” unfamiliar words by sounding them out. Whole-language advocates suggest that the phonics programs teach letter-sound associations that are separate from meaningful context and this requires a large amount of time and training for both students and teachers (Lemann, 1997).

The whole-language philosophy emphasizes whole-word recognition skills. Vail (1991) suggests that the typical whole-language kindergarten classroom may involve a teacher’s reading aloud to his or her students while pointing to oversized versions of children’s books. The teacher points to each of the printed words as he or she reads to the children and after several readings from the same book, students begin to recite the words with the teacher. Using whole-language, children begin to recognize words in context versus the phonics approach, which requires children to be able to decode text. The whole-language approach also incorporates literature “across the curriculum;” whereas, the phonics approach isolates literature into separate language arts programs.

Vail (1991) suggests that the followers of both ideologies believe that children have the natural ability to understand spoken language, and the concept of phonological awareness may be the common thread that has the greatest effect on student achievement. The ability for children to translate auditory sounds via the arcuate fasciculus (an area within the human brain responsible for connecting all of the regions of the brain that are involved in language
processing) into language, and then derive understanding from this process may be the critical factor that bridges the whole-language and phonics ideologies together (Crick, 1994).

Vail (1991) explains that reading has always been a critical component to consider when school leaders are attempting to improve the overall test scores of their students. With new technologies now available, educators have a wealth of innovative programs that they can use in the classroom to supplement instruction. These programs may provide an opportunity for educators to settle the argument about which educational ideology should be used to teach reading. Is it possible for educators to overcome their differences and embrace both whole-language and synthetic phonics? Vail stated, "Proponents of both whole-language and phonics want children to read and write easily, accurately, and joyfully..." Vail also stated, "The goal is too important to be compromised by factionalism. We need to move from rival turf to common ground."

Implementing Change

O'Hara and O'Hara (1998) have stated that the then current focus in American education, driven by state accountability standards, was for educators to adopt reform strategies for school improvement. O'Hara and O'Hara also recommended the adoption of programs that align with the findings of research. Because of the newly imposed accountability standards, schools will begin to assess their status and determine if change will be required. It has been necessary for leaders to provide strong leadership through these changes and to
establish the protocol for implementing changes. Clemens and Mayer (1987) suggested that school leaders should avoid the managerial monologue and attempt to engage in dialogue with stakeholders that share equally in the challenge to solve problems. Clemens and Mayer have stated that good leaders are those who continually learn, listen, and question.

It was the opinion of Owens (2001) that successful schools exemplified an effective school formula that included the following characteristics:

- Strong leadership by the principal; high expectations for student achievement on the part of teachers and other staff members; an emphasis on basic skills; an orderly environment; frequent and systematic evaluation of students; and increased time on teaching and learning tasks (p. 125).

Ochitwa (2001) stated that teacher attitude was an important factor for successful change to occur within a school environment. He said it was important for administrators to re-examine their own attitudes and methods if they wish to promote innovation within their schools. Ochitwa also recommend that school administrators should establish and maintain a cooperative dialogue with teachers, especially while exploring alternative methods for school improvement.

School districts have been given the role of communicating policies, curriculum, and professional development to their schools, and the burden of accountability has been placed squarely on the shoulders of principals. Reform, for principals, is no longer an option; it is a condition of their employment. According to Chubb and Moe (1990) principals must be able to demonstrate leadership abilities to communicate a clear achievable vision; inspire others to set high standards for themselves and maintain those standards; create strong
organization within the school; and develop a culture that provides mutual respect and regard for each other (Carnegie Foundation, 1988; Chubb & Moe, 1990). Decisions concerning reform issues should be driven by research (Glickman, 1993; Hess, 1994; Lane & Epps, 1992; Odden & Wohlstetter, 1995; Wohlstetter & Odden, 1992).

According to Goldman and O’Shea (1990) convincing stakeholders (students, parents, teachers, administrators, community members, and others) of the need for educational reform may be the largest barrier to overcome. The stakeholders considered most affected by educational reform are the administrators, teachers, students, and the community. Merely the mention of reform within a school has been said to cause paranoia that rampages through a school and usually with damaging effects. With the implementation of educational reform, negative attitudes begin to emerge and resistance to change begins to build. This resistance may hamper the opportunity for school improvement. Statements like “they won’t let me do it,” or “there they go again,” or “I knew things hadn’t changed,” are said to be typical indicators of resistance (Goldman & O’Shea, 1990).

Corbet, Dawson, and Firestone (1984) have said that administrators who have difficulty implementing change in the past may have difficulty meeting the new accountability requirements imposed by the state. It can be very arduous for administrators to sell the idea of reform to his/her constituents. Most teachers are concerned about the practicality of change and how it will affect them. Those teachers who have experienced past failures reportedly have become cynical or
apathetic toward new efforts for change, and this adds to the difficulty for implementing new reform efforts (Fullan & Stiegelbauer, 1991).

Fullan and Stiegelbauer (1991) have stated that little research has been performed that gauges students’ attitudes toward change. Fullan and Stiegelbauer also stated that by allowing students to become actively engaged within the change process, the students would benefit by their participation. Cuban (1990) said that the community’s attitude toward school improvement may affect new implementation attempts, and whether they will expect satisfaction among their constituents as to what may be appropriate for their schools.

Johnson (1998) told a story about four characters portrayed by mice and little people demonstrating the need for and the pitfalls associated with change. Two of the characters, portrayed by mice, remained in a constant state of flux and became very successful in their maze because of their ability to adapt to change. However, the two little people were portrayed as being reluctant to change.

The story begins with the two little people (unwilling to change) enjoying a large supply of cheese found in a section of the maze in which they reside. Both of the little people became complacent with their current location within the maze until their cheese supply begins to dwindle away. When the cheese began to run low, one of the little people feels the need to explore the maze in effort to find more cheese. Reluctantly, the little person is forced to leave the other little person behind. He continually returns to the little person, who is reluctant to change, bringing him food. The little person who is willing to accept change
attempts to convince the other reluctant little person that he must leave in order to survive. The little person (who has accepted change) begins to experience the same successes as the other two mice (who have remained in a constant state of flux) and makes a decision to leave his friend behind because of his new founded success in finding food. This story illustrates well all of the complexities involved with, and how to cope with change.

Hall and Hord (1987) have said that change is not an easy task by any means; it takes time and requires diligence on the part of those who are trying to implement changes. However, if considerations are given to meet the needs of individuals, change may occur smoothly. Policy makers and administrators must understand that their support is an essential component for change to occur. According to Hall and Hord and Schneider, Brief, and Guzzo (1996), having a lack of administrative support, portraying a lack of interest, or having an indifference to recommended changes is paramount to failure. Planning for change must involve all stakeholders and it should be well planned and managed. Rutherford et al. (1982) have said that the need for a widely shared sense of purpose and vision is essential and must be encouraged by the leadership (Stace, 1996). Miles and Louis (1990) have recommended that leaders should develop norms that involve continuous introspection, continuous improvement, and involvement by all stakeholders. If these factors are considered during the decision-making processes, then change may become routine. It is also very important to understand that the ultimate objective for change is to benefit students, not just to “convert” the staff (Cook, 1991; Cuban,
In an effort to help people cope with change, Mundry and Hergert (1988) stated:

To make a change is to understand a process, to comprehend building a bridge from idea to action to use. Changes are so common that individuals are asked to make and adapt to them every day; and yet, as creatures of habit, we resist change. In organizational settings, people rarely pay attention to the best way to make changes occur, or to consider if there are ways to make changes smoother, more efficiently, or with more sensitivity toward those people who will be affected by the change (p. 1).

It is important to predict the climate for change within a school environment prior to the introduction of new instructional strategies, and it is important to understand the school environment where the change will occur. Owens (2001) defined organizational climate as, “The study of perceptions that individuals have of various aspects of the environment in the organization (p. 150).” Owens has said that the first step required to implement change in a school environment was to identify problems that might exist.

Before change can occur, it is important to identify problems. President George W. Bush has introduced new legislation that will address problems that exist in our public schools. The No Child Left Behind Desktop Reference (2002) stated:

“Professional development, instructional programs, and materials used by a state education or school district must focus on the five key areas that scientifically based reading research has identified as essential components of reading instruction: phonemic awareness, phonics, vocabulary, fluency, and reading comprehension. Some schools use
unreliable and untested methods that can actually impede academic progress” (p. 11).

In order to meet the conditions set forth by the No Child Left Behind Act, schools should use evidence-based practices and materials.

Many researchers seem to support the benefits that may result from using some form of teacher-directed instruction. Many research studies support the idea of using the synthetic phonics-based programs through teacher-directed programs. Their research also recommended using direct instruction programs to assure that state curriculum standards are covered while preparing students for achievement tests. Their research has overwhelmingly supported the use of direct instruction programs that include synthetic phonics-based programs (Adams, 1996; Appffel et al., 1975; Branwhite, 1993; Brent et al., 1986; Darch & Kameenui, 1987; Kaiser et al., 1989; Lewis, 1982; Lloyd et al., 1980; Richardson et al., 1978; Sexton, 1989; Snider, 1990; Stein & Goldman, 1980; Summerell & Brannigan, 1977; Umbach et al., 1987).

For some schools, failing educational models may need to be replaced or revamped. Heathers (1967) has said that to reduce the risk of failure, it is important to provide educational innovations that have been fully developed, implemented, and evaluated.

**Assessment**

The State of Tennessee uses the Tennessee Comprehensive Assessment Program (TCAP) as a tool to evaluate schools across the state. The TCAP
measures the state’s accountability standards, TerraNova is a bank of test items developed by CTB McGraw Hill to replace Forms A-H of the TCAP achievement tests. The test includes the cognate areas of reading/language arts, mathematics, science, and social studies. The Tennessee state legislature requires the use of non-redundant items for each year that the TCAP achievement tests are administered. Tennessee chose the TerraNova test as the primary testing instrument for schools because of the test’s high degree of alignment with the state’s educational curriculum. The test uses a visual format full of color and graphics. The mathematics portion involves more problem-solving questions that require greater reading comprehension skills. The reading/language portion uses higher quality, authentic literature and articles from magazines and newspapers designed to capture student interest. The TerraNova reportedly requires a much higher level of reading comprehension for students to produce higher test scores (McGraw-Hill, 2002; Tennessee Comprehensive Assessment Program, 2001).

Classroom Practices and Student Performance on Tests

Many classroom practices may affect student performance on tests. A recent study financed by the Rockefeller Foundation found that the following classroom practices improved the academic performance of students: parental involvement, graded homework, direct teaching, aligned time on task, tutoring, cooperative learning, mastery learning, and teaching of learning strategies (Cawelti, 1999).
Direct Instruction programs may be basic, as explained by Stahl and Fairbanks (1986), or extreme as described by Cawelti (1999). According to Stahl and Fairbanks, using teacher-directed instructional programs (direct instruction) might have an influence on student achievement. In addition, Stahl and Fairbanks illustrated the simple concept of direct instruction, based on their research, by teaching specific items correlated to testable content items increases student achievement. To illustrate an example of direct instruction, imagine having two different students with equal abilities. The students have been asked to read and understand new information. Student A has been given a list of 12 new vocabulary words to learn each week. The teacher has explained these words and has periodically tested student A to determine if the student has acquired the new vocabulary terms. Student B, on the other hand, has received no instruction. Assume that both students are given a test based on the new content. Student B scores at the 50th percentile and student A scores at the 70th percentile. It may be concluded that student A outperformed student B, because student A received the systematic vocabulary instruction prior to being tested. Therefore, based on this example of direct instruction, it makes sense to provide students with the content that they are likely to encounter during testing (Jenkins, Stein, & Wysocki, 1984; Stahl & Fairbanks, 1986).

Cawelti (1999) recommends using a controversial direct-instruction program called Reading Mastery. Reading Mastery has been shown to improve the achievement scores (especially for disadvantaged children) through a program developed by Engelmann and Bruner during the late 1960s. Research,
beginning with Project Follow Through (Becker & Engelmann, 1978), has shown a consistent pattern of success (if properly administered) for the Reading Mastery program. Primarily a teacher-centered program, Reading Mastery leads children down a specific path providing them with pre-established and specific abilities for decoding text (Groff, 1976; Hochberg, 1970). Groff stated that teachers trained in teaching beginning readers how to read, using phonological awareness strategies, produce children with well-developed reading and comprehension skills. Cawelti’s explanation of the Reading Mastery program (a direct-instruction approach), is an extensive reading program designed to provide the classroom teacher with all of the necessary training, materials such as scripted lessons and specialized books, assessments, and other items to teach children to read.

**Project Follow Through**

Project Follow Through, an educational study conducted in the 1970s, included 79,000 children in 180 communities and examined a variety of educational programs and philosophies to learn how to improve the education of disadvantaged children (U.S. Department of Education, 2002).

Project Follow Through was launched in response to the observation that Head Start children were losing the advantages from Head Start by third grade. The National Head Start Association (2002) briefly describes their program in the following passage.
Children born into families in poverty start at a marked disadvantage to their peers in middle-income and wealthy families. Studies suggest that they do not have the richness of books in the home, proper nutrition, access to a continuum of health services, but do have a wide array of at-risk factors for low-income families. Programs like Head Start were initiated to address these issues --- improving the richness of the early learning experience for not only young children but for their parents as well. In fact, it is Head Start’s focus on families and fighting poverty in a comprehensive manner that has led to the program’s success in getting the skills needed to become their child’s first and best teacher (p. 2). 

Desired positive outcomes included basic skills, cognitive skills ("higher order thinking"), and affective gains (self-esteem). Multiple programs were implemented over a 5-year period and the Stanford Research Institute (SRI) and ABT Associates (Cambridge, MA) analyzed the results. The various programs studied could be grouped into the three classes described above (Basic Skills, Cognitive-Conceptual, and Affective-Cognitive). 

The instructional model that produced the best results (see Figure 1, p. 42), from all other models tested, was the direct instruction model (Becker & Engelmann, 1978). Students who received direct instruction demonstrated a 30% gain in their math, language, and spelling scores; the same students had a 20% gain in their reading scores. Becker and Engelmann have stated that children receiving direct instruction were much more likely to graduate from high school, to be accepted into college, and to show long-term gains in reading, language, and math scores. Becker and Engelmann also said that other modern educational model types such as "holistic," "student-centered learning," "active learning," "learning-to-learn," "cooperative education," and "whole-language"
were not as effective. The results from Project Follow Through (considering the fact that the children were considered to disproportionately disadvantaged) supports the fact that those students receiving education through a directed instructional model tend to score higher than those in all other programs when tested in reading, arithmetic, spelling, and language (Gersten & Keating, 1987).

Figure 1. Project Follow Through Research Project. This chart reflects a comparison between nine major models used in the Project Follow Through research project (Becker & Engelmann, 1978). This chart was created from data retrieved from the Project Follow Through research project. Note. The 20th
percentile represents the usual level of performance of the disadvantaged children who comprised the target group of Project Follow Through. Therefore, all the percentile scores are referenced to the 20th percentile. Those bars extending to the right show improvement over the normally achieved levels. Those bars extending to the left show a reduced level of performance.

A question concerning the improvement of self-esteem within students has also been challenged. Jones (1995), while making a reference to the Project Follow Through study, said that contrary to common assumptions, using a direct instruction model improves cognitive skills dramatically relative to the control groups and also showed the highest improvement in self-esteem scores compared to control groups. Jones also went on to say that students participating in the study, where self-esteem was the primary goal, scored lower than control groups in that area. According to Jones:

The inescapable conclusion of Project Follow Through is that kids enrolled in educational programs, which have well-defined academic objectives, will enjoy greater achievement in basic skills, thinking skills, and self-esteem. Self-esteem in fact appears to derive from pride in becoming competent in the important academic skills (p. 51).

Cawelti (1999) and Juel (1994) have implied that most educators ignored the results of the Project Follow Through study and continued with their preferred models of instruction. This is a typical example demonstrating the unwillingness of some educators to accept research results and to consider changing their educational strategies. For example, teachers for the most part are unwilling to consider changing their ideologies to accommodate both the
whole-language and phonics strategies together or separately. This "both/and" rather than "either/or" position has been confirmed by responsible researchers who speak in reasonable voices. Juel stated, "The debate that has occurred over these two positions (phonics and whole-language) is an artificial one... No matter how bright, creative, and knowledgeable about oral language and the world a child may be, he or she cannot read and write well unless the code of written English is known. No matter how well the code is known, a child will not want to read or write well unless the child has been under the spell of a wonderful story or seen the value of communicating in writing" (p. 135).

Juel (1994) concluded by saying that she only had found that schools were spending more and more to implement forms of "affective" and "cognitive" educational programs, while continuing to turn away from a directed instruction program. Clearly, this has not resulted in improved basic skills, improved thinking, or improved self-esteem.

According to Nadler (1998), Wesley Elementary School in Houston, Texas, had all the demographic markers of a school bound for failure. Over 80% of the students qualified for free or reduced lunches. Since the introduction of Reading Mastery (a highly controversial direct instruction program), it now ranks among the best schools of Houston, with first-graders placing at the 82nd percentile level in reading tests.

From Stahl and Fairbanks (1986) simplistic analogy of aligning content to testable items and Cawelti’s (1999) recommendation for using the controversial Reading Mastery program, the direct instruction ideology offers a plethora of
teaching models that are designed to prepare students to meet Tennessee’s accountability standards. The two leading ideologies that are currently used to teach children to read are the whole-language and synthetic phonics. Lemann (1997) stated that learning to read using whole-language was considered a natural process. Whole-language is a method of instruction based on the theory that students can learn reading and writing as effortlessly as they can learn the spoken language. Lemann also used the term “immersion” to describe whole-language. Immersion alludes to the idea that children should be able develop reading naturally by simple exposure to written text.

The spoken language is made up of discrete words, words that are made up of syllables, and syllables are made up of the smallest units of sounds called phonemes. Griffith and Olson (1992) said that phonemic awareness was the most critical factor for children learning to read. Stanovich (1993) suggested that some children have the ability to master phonemic awareness with the traditional “whole-language” immersion in a print-rich environment and, conversely, many children are left behind. There is a substantial amount of research that supports teacher-directed instruction (teachers understanding the concept of phonemic awareness and applying strategies to their curricula for students to acquire these skills) as being one of the leading instructional methods used to insure that all children acquire the crucial element of developing phonemic awareness (Becker & Engelmann, 1978; Cawelti, 1999).
The Process of Language

In order to understand the relationship between whole-language and synthetic phonics, one should understand how language processes work. Proponents of the whole-language theory say that learning to read is a natural process. Seldom does anyone question the fact that humans are genetically predisposed to developing language skills naturally. Learning is not fixed throughout life; it remains in constant development as a person learns and grows. To help us to understand the physiological process involved with learning how to read, it will be important to understand what occurs in the brain when a person reads. Language involves three basic components hearing, speaking, and sight (Aukerman, 1972; Crick, 1994; Gordon, 1995; Livermore, 1996; Neimark, 1995; Parnell, 1996).

Sound travels through the air as vibrations. The vibrations are transformed into electrical impulses. From here, language information passes through the arcuate fasciculus, a pathway that connects a large network of interacting brain areas involved in language processing. This allows a person to hear sounds. Some of these areas integrate auditory information with other sensory information. Parts of this pathway connect language areas with other areas involved in cognition, association, and word meaning (Aukerman, 1972; Crick, 1994; Gordon, 1995; Livermore, 1996; Neimark, 1995; Parnell, 1995).

Unprompted words start as thoughts and involve many different brain areas responsible for memory, emotion, and associations. These thoughts converge around the Broca’s area through which we recall the memory of how to
pronounce words and grammatical information. A message is then sent to the motor cortex, which controls all voluntary muscle movements. Then, a signal is sent to the tongue, lungs, and larynx to produce spoken words (Aukerman, 1972; Crick, 1994; Gordon, 1995; Livermore, 1996; Neimark, 1995; Parnell, 1996).

When a person reads a word, light bounces off the page and enters the eye, initiating a process through which light is transformed into electrical impulses. Electrical signals are passed through the brain (refer to Figure 2, p. 48) to the primary visual cortex, where information about space, orientation, form, and color, is analyzed. From the visual cortex, information is sent to the Wernicke’s area where language is understood and processed. After the Wernicke’s area, the signal is sent to the Broca’s area through the arcuate fasciculus. The Broca’s area is the part of the brain that processes speech. From the Broca’s area, information is then sent to the primary motor cortex where specific information about letterforms is passed on to other areas of the cortex for the integration of visual and auditory information (Chudler, 2003; Crick, 1994).

The arcuate fasciculus (refer to Figure 3, p. 49) is a pathway that connects a large network of interacting brain area (including the Wernicke’s and Broca’s areas) involved in language processing. This complicated process permits the reading of words to occur (Aukerman, 1972; Crick, 1994; Gordon, 1995; Livermore, 1996; Neimark, 1995; Parnell, 1995).
Parts of the arcuate fasciculus pathway connect language areas involved in cognition, association, and word meaning. From infancy, the human brain begins to develop neural pathways for language skills that include speaking, hearing, and reading (Aukerman, 1972; Crick, 1994; Gordon, 1995; Livermore, 1996; Neimark, 1995; Parnell, 1996).

Reading should be a natural process; it should require the use of context in matching phonic representations of words from the child’s own oral language. This gives the child better meaning from reading sentences, thereby enhancing reading comprehension skills. This also demonstrates the relationship between the Whole-language and phonics philosophies. The difference between the two
leading approaches is children with a phonics background derive meaning from language by decoding words and the whole-language reader derives meaning from context around the words (Adams, 1990; Fletcher et al., 1994; Shaywitz et al., 1992; Stanovich, 1986; Stanovich & Siegal, 1994; Vellutino & Scanlon, 1987; Wagner & Torgeson, 1987).

Teachers may use many forms of direct instruction to focus on programming the human brain to better process language. Bereiter and Engelmann (1966) developed direct instruction during the mid 1960s. This process incorporates many of the brain-based functionalities to improve the language areas of the brain. It focuses on cognitive learning concepts, propositions, strategies, and operations (e.g., solving problems and writing essays). This directed instruction model focuses on the analysis of knowledge, the analysis of teacher-student communication, and the analysis of student behavior.

**Phonemic Awareness**

Over the past several years, phonemic awareness has been linked to successful outcomes when used to teach beginning readers. Hatcher, Hulme, and Ellis (1994) have given examples of other words used to describe phonemic awareness, they include names such as phonological awareness, acoustic awareness, phonetic awareness, auditory analysis, sound categorization, phonemic segmentation, phonological sensitivity, and phonemic analysis.
Bryant (1990) has categorized several developmental stages for phonological awareness that include: recognition that sentences are made up of words; recognition that words can rhyme and then be produced; recognition that words can begin with the same sound and then produced; recognition that words can end with the same sound and reproduced; recognition that words can have the same medial sound(s) and then reproduced; recognition that words can be broken down into syllables and then reproduced; recognition that words can be broken down into onsets and rimes and then reproduced; recognition that words can be broken down into individual phonemes and reproduced; recognition that sounds can be deleted from words to make new words and reproduced; the ability to blend sounds to make words; and finally the ability to segment words into constituent sounds.

Stanovich (1986) defined phonemic awareness as the “conscious access to the phonemic level of the speech stream and some ability to cognitively manipulate representations at this level” (p. 362). Stanovich further explained the meaning behind awareness and conscious access. He stated that awareness and conscious access could not be easily defined and recommended using phonological sensitivity as the term to use in describing the progression from shallow to deep sensitivity. Stanovich wanted the term to recognize and include the wide range of tasks used for assessing the sensitivity of students. Read (1991) recommended using the term dichotomy in place of awareness. Read stated that in this situation the term awareness implies a dichotomy rather than a continuum. It is clearly understood that the term “phonemic awareness” will
continue to be used, but the definition will be limited and most importantly the
term has and will continue to receive a great deal of attention.

Phonemic awareness is about the structure of words rather than their
meaning and phonemic awareness has been identified as an essential precursor
to reading. Grossen (2001) has stated that phonemic awareness may be
enhanced in early readers by classroom teachers’ employing the following
example of an instructional technique. This instructional technique may include
starting with something that all children can do, an example would be saying
drawn out words fast (Grossen, 2001).

Teacher: "Listen. Ham Say it fast, Hamburger," (p. 4).
Then later the task becomes more focused on blending phonemes:
Teacher: "Listen. ssss Say it fast, Slam," (p. 4).

In addition, children learn to isolate, blend, and discriminate all the
phonemes before they begin to identify the letters for each phoneme. This
consistent development of phonemic awareness has a positive effect on reading
acquisition and spelling, rhyming, auditorially discriminating sounds that are
different, blending spoken sounds into words, word-to-word matching, isolating
sounds in words, counting phonemes, segmenting spoken words into sounds,
and deleting sounds from words (Ball & Blachman, 1991; Byrne & Fielding-
Barnsley, 1990; Cunningham, 1990; Lundberg et al., 1998; Smith et al., 1995;
Vellutino & Scanlon, 1987; Yopp, 1988). Children lacking phonemic awareness
skills, or never having the opportunity to develop phonemic awareness, have
more difficulty learning to read (Adams, 1990; Fletcher et al., 1994; Shaywitz et al., 1992; Stanovich, 1986; Stanovich & Siegal, 1994; Vellutino & Scanlon, 1987; Wagner & Torgeson, 1987).

Sherman (1998) has stated that by using a direct instructional model, the teacher has the ability to focus on specific learning tasks such as reading comprehension, phonemic awareness, or other learning tasks. It is the potential for the teacher-directed learning component that will accelerate specific components of instruction that gives it the potential to become a powerful program. However, the bottom line objective for using a teacher-directed instructional program is to align curriculum to the state’s achievement tests. Currently, state mandated assessment methodologies require high-level comprehension skills to produce good results.

Additionally, teacher-directed instructional models might be designed to introduce or to enhance the learning skills of students. Teachers may allow special attention to be given to specific learning processes that include the auditory, kinesthetic, and visual modalities. As an example, by including these modalities within instruction, the teacher can provide instructional methods that will improve the beginning reader’s brain to decode text. Decoding is the ability to translate actual print into language, a process that is often referred to as “using phonics” (Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1990; Cunningham, 1990; Lundberg et al., 1998; Smith et al., 1995; Vellutino & Scanlon, 1987; Yopp, 1988). Students trained in the synthetic phonics approach develop the ability to derive meaning from decoding words. Whole-language learners develop the
ability to derive word meaning from context. Both terms (decoding and context) are critical during the development of phonemic awareness and is the basic principal for both schools of thought.

Some researchers have suggested that beginning readers fail to form conclusions from context without sufficient evidence (Ceraso & Provitera, 1971; Grossen, 1991; Grossen & Carnine, 1990; Grossen et al., 1995; Simpson & Johnson, 1996). Teachers have the ability to modify instruction in a way that will turn the processes of learning to read into a language (Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1990; Cunningham, 1990; Lundberg et al., 1998; Smith et al., 1995; Vellution & Scanlon, 1987; Yopp, 1988). Normally, when a person reads there is no hesitation in brain function while processing the meaning of the context. Most children will develop this naturally, simply using the traditional “whole-language” approach to reading instruction. Children from socially and economically disadvantaged backgrounds appear to be particularly vulnerable in strictly whole-language classrooms because they do not receive as much informal sound-letter instruction at home as compared to their middle-class peers. The affected children, never having had the opportunity to establish this important language skill (identifying sound-letter), must pause during the reading process to allow for reflection. These children, in part due to the lack of being able to practice language skills at home, have developmental problems with the “whole-language” approach. These children are stuck in the stop then reflect, stop then reflect, reading cycle causing comprehension to falter. The use of a program to improve the phonemic awareness skills of students may correct these
error patterns by strengthening specific areas of the brain, and build a foundation that may help students make rapid gains in thinking, communication, and reading skills (Grossen & Carmine, 1990; Grossen et al., 1995).

Scientific Learning has developed a computer-based program that directly trains students to distinguish among phonemes. Greenwald (1999) said that many children suffer from a condition called central auditory processing disorder. Students suffering from this disorder have difficulty distinguishing between phonemes and particularly between consonants like b, d, and p, which can pass by in milliseconds during normal conversation. Approximately 4 million U. S. students suffer from this condition. Greenwald (1999) explains that the Fast ForWord program trains the student’s brain giving them the ability to distinguish between phonemes. The Fast ForWord training is intense, students work with the program between 90 to 100 minutes per day over a period of four to eight weeks.

Bryant (1990) stated that rhyme recognition should be the entry point to phonemic awareness for most students. If students have the ability to understand that words have similar end-sounds, then they have reached an important step in metalinguistic understanding (ignoring the meaning of a word to understand its internal structure). Bryant said that by doing this the students might develop the ability to develop and understand a new word classification system, an example would be using the end-sounds of words to help the students better understand the meaning of words. Bryant also said that preschool children can determine when words rhyme and when those words begin with the same sound, this ability
is called alliteration. Bryant stated that for students to have sensitivity to rhyme would contribute to learning to read.

Lamb and Gregory’s (1993) study showed that students who were able to discriminate musical pitch scored higher on tests of phonemic awareness. Liberman, Cooper, Shankweiler, and Studdert-Kennedy’s (1967) research supported the concept that pitch change may be a critical component in the speech signal. Their study stated that the sensitivity to the smallest frequency changes that are involved with phonemic recognition might be an important component for successful reading. Lamb and Gregory have suggested that music training may improve the student’s reading ability. The Fast ForWord program language module addresses Lamb and Gregory’s idea for providing students with the necessary skills to that may help them to be able to distinguish among the most discrete phonemes.

The primary goal for developing the phonemic awareness skills in children is to establish and solidify those dendrites in the brain to allow for reading to become just as natural a process as conversation. It is the strengthening of the arcuate fasciculus and other neurological infrastructures that allows for the smooth transaction of data within the language areas of the brain. Consequently, by enhancing the phonemic awareness skills in children, their reading comprehension skills should improve considerably which should give them the ability to increase their performance on achievement tests (Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1990; Cunningham, 1990; Lundberg et al., 1998; Smith et al., 1995; Vellutino & Scanlon, 1987; Yopp, 1988).
CHAPTER 3
METHODS AND PROCEDURES

This study was conducted to determine the effectiveness of educators developing phonemic awareness skills in two Tennessee schools. Educators may have an opportunity to improve the overall achievement scores of their students by including strategies designed to enhance their phonemic awareness skills. This may be accomplished using the whole-language or synthetic phonics models separately or in conjunction within their schools. Researchers have stated that disadvantaged children have special problems learning to read. This may be attributed to the lack of instruction received at home and may be corrected by implementing strategies designed to increase the phonemic awareness skills of students. Research supports the idea that disadvantaged students participating in synthetic phonics programs obtain higher achievement scores. (Adams, 1990; Fletcher et al., 1994; Vellutino & Scanlon, 1987; Wagner & Torgeson, 1987; Shaywitz et al., 1992; Stanovich, 1986; Stanovich & Siegal, 1994).

During the 2001-02 school year, Kingsport City Schools implemented a computer program Fast ForWord within two of its elementary schools (b. Scientific Learning, 2002). The Fast ForWord program has been designed to enhance the phonemic awareness skills of students. In the same school year, the school system adopted the Brigance Diagnostic Comprehensive Inventory of Basic Skills (Brigance, 1999) as the primary tool to assess student achievement.
for kindergarten through third grades. Because this was the first year for the implementation of the Brigance Comprehensive Inventory of Basic Skills and the Fast ForWord program, an opportunity presented itself to use existing data (pretest and posttest data for the 2001-02 school year) to evaluate the effectiveness of the newly implemented Fast ForWord program. This may be accomplished by using the Brigance Comprehensive Inventory of Basic Skills as the pretest and posttest assessment tools. The Brigance pretest and posttest may be used to evaluate the effect that phonemic awareness has on students participating in this research.

Both schools used the same strategies to teach children to read. Teachers use balanced portions of whole-language, phonics, and skills-based methods to teach children to read. The only difference that occurred during the 2001-2002 school year was the introduction of the Fast ForWord computer program to a select group of students from both schools.

The predictor variable for this experiment is a software program specifically designed to train the language, listening, and learning skills of beginning readers by enhancing the subjects’ phonemic awareness. Fast ForWord, developed by Scientific Learning located in Oakland, California, is a computer program designed to strengthen specific areas of the brain and to build a foundation that may help students make rapid gains in thinking, communication, and reading skills. This is accomplished by students’ listening through headphones and using the computer’s mouse to interact with game-like exercises on a computer.
Research Methodology and Design

This study may be compared to a true experimental design and will be used to investigate educational issues (Fraenkel & Wallen, 1996; Gall, Borg, & Gall, 1996). This particular design will make use of quantitative methodologies. Two-Group experimental designs have been used for many years with widespread credibility and acceptance. Kingsport City Schools implemented the Fast ForWord phonemic awareness program and administered the Brigance pretest and posttest assessment during the 2001-2002 school year. For the purposes of this study, preexisting data were collected and disaggregated from the two schools that participated in the Brigance assessment and the Fast ForWord phonemic awareness-training program. After the desegregation of data, the Brigance pretest and posttest data were analyzed to determine if the Fast ForWord program (students gaining enhanced phonemic awareness skills) had an impact on student achievement.

Research Questions

This research will address the following questions:

1. Do the “word recognition” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the word recognition assessment is to determine if the student can recognize common and crucial words that frequently appear in print.)
2. Do the “word analysis” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the Brigance word analysis assessment is to determine if students can identify initial consonants in spoken words, are able to substitute initial-consonant sounds, substitute short-vowel sounds, substitute long-vowel sounds, substitute final-consonant sounds, substitute initial-blend and initial-diagraph sounds, read words with common endings, read words with vowel digraphs and diphthongs, read words with phonic irregularities, read suffixes, prefixes and able to divide words into syllables).

3. Do the “vocabulary comprehension” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the vocabulary comprehension assessment is to determine the highest grade level at which the student can read and comprehend vocabulary words.)

4. Do the “comprehension of passages” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the comprehends passages assessment is to determine the highest grade level at which the student can read and comprehend reading selections.)
5. Do the “computational and problem-solving skills” of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the math grade placement assessment is to estimate the student’s computational and word problem-solving skills.)

6. Do the “spelling” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the spelling assessment is to determine the highest grade level at which the student can spell with at least 60% accuracy and his/her ability to identify basic word-analysis skills.)

7. Do the “sentence writing” skills of students improve by their involvement in a program designed to improve their phonemic awareness skills? (The purpose of the sentence writing assessment is to determine the legibility of the student’s handwriting, to determine the student’s skill for providing personal data in writing, to determine the student’s skill in mechanics, and to determine the student’s letter-writing skills.)

**Variables**

The independent or predictor variables in this study was the type of treatment and the grade levels of the students. The dependent or criterion
variables in this study was the scores received on the Brigance Diagnostic Comprehensive Inventory of Basic Skills.

Population and Sample of Subjects

The groups identified for this study are first, second, and third grade students at two elementary schools located in Kingsport, Tennessee. School A was built in 1929 and has continuously served as a neighborhood school since that time. School A served 197 children in grades K-5 during the 2001-2002 school year (B. Bishop, personal communication, March 22, 2001). School B was originally established in 1923 and has served as a neighborhood school since that time. School B served 331 children in grades K-5 during the 2001-2002 school year (B. Bishop, personal communication, March 22, 2001).

Collection of Data

During the beginning and end of the 2001-2002 school year, Kingsport City Schools administered a Brigance Diagnostic Comprehensive Inventory of Basic Skills pretest and posttest to all of its first through third-grade students. The data were collected by the schools administrators and housed in their administrative offices in locked filing cabinets. The Brigance Diagnostic Comprehensive Inventory of Basic Skills pretest and posttest will be the primary tool used for the comparison of data within this study. Fifty-five first through third grade students were chosen (from both schools) by the school administrators to participate in the Fast ForWord program. The school administrators chose
students based on their deficiencies within the word analysis section of the
Brigance Diagnostic Comprehensive of Basic Skills pretest that they had taken at
the beginning of the school year.

The Word Analysis portion of the Brigance test contains several sub
categories. The Word Analysis Survey has 2 sections, Forms A and B, and both
sections are used to determine if the student is able to distinguish: if pairs of
words sound alike or different, if he/she is able to identify initial consonants, if
he/she is able to substitute sounds, and if he/she can read word parts and divide
words into syllables. There are sections contained within the Brigance test that
assess the student’s ability for auditory discrimination, which is the ability to
distinguish if pairs of words sound alike or different. In addition, there are
sections of the test that may determine if the student is able to identify initial
consonants in spoken words. Additionally, the test determines if the student has
the ability to substitute initial-consonant sounds, short-vowel sounds, long-vowel
sounds, final-consonant sounds, and initial-blend sounds. The test can also
determine if the student has the ability to read words with common endings,
vowel digraphs, and diphthongs. Finally, the Word Analysis portion of the
Brigance test has the potential to access the ability for the student to read
suffixes and prefixes and if he or she has the ability to divide words into syllables.

Both groups of students participating in this program (chosen by school
administrators) scored below the 50th percentile as identified by their raw scores
from the G-1 Word Analysis Survey listed on the CIBS-R Standardized Scoring
Sheet from the 1st, 2nd, and 3rd grade populations of schools A and B. Group A
students did not receive phonemic awareness training. Group B students received phonemic awareness training. Group A students were chosen from the remaining student populations from both schools and were selected using the same criteria as group B students. Prior to data analysis, a t-test was performed to determine if groups A and B had a form of equivalence. Based on the results from the t-test between groups A and B, both groups were probabilistically equal.

Students in-group B received phonemic awareness training from January 2002 through May 2002. This consisted of 90 minutes of individual training per day over a five-month period.

Data Analysis

Data analysis consisted of descriptive measures. A sample with an error range of 5% was determined according to the sampling formula for this survey (Nunnery & Kimbrough, 1971). Statistical t-tests were performed to test for the significance of criterion variables between groups A and B. The p value from a t-test returns the probability of falsely concluding that two distributions have the same mean. Therefore, a two-tailed t-test was performed to determine if group A or group B have an equal variance.

For the purposes of this research, the data analysis consisted of descriptive measures. Initially, students were chosen to participate in this study based on their G-1 word analysis grade test quotient scores received on the Brigance Diagnostic Comprehensive Inventory of Basic Skills. All other data analysis included the use of raw scores. Raw scores are not inherently meaningful because different assessments have different numbers of items.
Therefore, a student’s raw scores across assessments cannot be compared. Raw scores fail to factor in the impact of age and experiences, typically we expect older students to know more. The conversion of raw scores to standard scores overcomes both of the above problems. The inspection of raw scores is sometimes helpful when testing the same students twice over a period of time (e.g. one year or more). Each subtest of the Brigance requires very different total numbers of raw scores to get the same result. For example, on D-1 Word Recognition, a student age 6-0 to 6-5 needs 14 points to get a quotient of 100, while the same student needs only two raw score points on M-1 to get a quotient of 107, and only two raw score points on M-2 to get a quotient of 101.

Raw scores were used to determine if students have demonstrated gains within specific areas of the Brigance Diagnostic Comprehensive Inventory of Basic Skills test. The two groups of students used the same subtests, D-1 word recognition grade-placement test, G-1 word analysis survey, F-1 reading vocabulary comprehension grade placement test, F-2 comprehends passages, and G-1 word analysis grade placement test, and no comparisons across subtests were used. This study compared first graders to first graders, second graders to second graders, and third graders to third graders. Diagrams including the normal distributions, mean averages, and standard deviations for the Brigance subtests have been included in Appendix A (page 94).
Hypotheses

The following hypotheses were tested at the .05 level of significance and are stated in the null form:

1. There is no difference in the “word recognition” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.

2. There is no difference in the “word analysis” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.

3. There is no difference in the “vocabulary” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.

4. There is no difference in the “comprehension of passages” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.

5. There is no difference in the “computational and problem-solving” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.
6. There is no difference in the “spelling” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.

7. There is no difference in the “sentence-writing” achievement scores between students receiving advanced phonemic awareness training and those not receiving training.
This study compared the achievement levels between two probabilistically equivalent groups of elementary school students. The first group of students (group A) did not receive phonemic awareness training and were chosen from the student populations from two elementary schools located within Kingsport City Schools. The second group of students (group B) received phonemic awareness training. Group B students were also chosen from the same student populations as group A. All students chosen to participate in this study scored below the 50th percentile on the word analysis section of the Brigance test administered at the beginning of the 2001-2002 school year.

**Data Description**

The independent or predictor variables in this study are the type of treatment and the grade levels of the students. The dependent or criterion variable in this study is the scores received on the Brigance Diagnostic Comprehensive Inventory of Basic Skills. Percentile or quotient scores may not be acceptable to use when measuring gains in whole groups or classes. If percentile or quotient scores were used it would be difficult to measure the growth between the pretest and posttest. Therefore, raw scores are used in this study because they may show the actual growth between the pretest and posttest. Raw scores used within this research are the numbers of items that the
student successfully completed. Raw scores are not inherently meaningful because there are different subtests within the Brigance assessment. Thus, a student’s raw scores across subtests should not be compared. Because of this, each of the subtests within this study is compared individually between groups. In addition, raw scores fail to factor in the impact of age and experiences. Therefore, subtests are compared by grade level.

**Description of Sample**

The sample consisted of 109 students, 54 students (group A) did not receive phonemic awareness training and 55 students (group B) completed phonemic awareness training. Group A consisted of 15-first-grade students, 23-second-grade students, and 16-third-grade students. Group B consisted of 14-first-grade students, 25-second-grade students, and 16-third-grade students. The school administrators from the two participating elementary schools selected students to participate in the Fast ForWord phonemic awareness training based on their scores received on the word analysis section of the Brigance test that was administered at the beginning of the 2001-2002 school year. Students were chosen from a total population of 528 students (the total student population for both elementary schools) and were selected because they had scored below the 50th percentile on the word analysis section of the Brigance pretest.
Data Preparation

For the purposes of this study, data were collected using the raw score results from the Brigance Diagnostic Comprehensive Inventory of Basic Skills pretest and posttest that were given at the beginning and end of the 2001-2002 school year.

Probabilistic Equivalence Table Summaries

To increase the internal validity of the experiment the Brigance pretest data were evaluated to determine if both the control and treatment groups were probabilistically equivalent. A statistical t-test was performed to determine if both groups had similar mean scores across all of the Brigance subtests by grade levels. No significant differences were indicated between groups in grade 1; therefore, indicating that both of the 1st grade groups are probabilistically equivalent (reference Table 1, p. 71). No significant differences were indicated between groups in grade 2; therefore, indicating that both of the 2nd grade groups are probabilistically equivalent (reference Table 2, p. 72). No significant differences were indicated between groups in grade 3; therefore, indicating that both of the 3rd grade groups are probabilistically equivalent (reference Table 3, p. 73). For this purposes of this study, it may be concluded that the control group is probabilistically equivalent to the experimental group for grades 1, 2, and 3.
Table 1.

**Probabilistic Equivalency Grade 1.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9</td>
<td>13</td>
<td>13</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td>14</td>
<td>6</td>
<td>20</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>19</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>14</td>
<td>2</td>
<td>17</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>20</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Average**

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>P-value = 0.89</th>
<th>P-value = 0.67</th>
<th>P-value = 0.70</th>
<th>P-value = 0.59</th>
<th>P-value = 0.87</th>
<th>P-value = 0.48</th>
<th>P-value = 0.83</th>
<th>P-value = NA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.07</td>
<td>6.86</td>
<td>10.07</td>
<td>9.36</td>
<td>0.67</td>
<td>0.79</td>
<td>0.67</td>
<td>0.93</td>
</tr>
</tbody>
</table>
Table 2.

Probabilistic Equivalency Grade 2.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>35</td>
<td>34</td>
<td>31</td>
<td>25</td>
<td>5</td>
<td>7</td>
<td>35</td>
<td>35</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>22</td>
<td>35</td>
<td>29</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>41</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>17</td>
<td>23</td>
<td>25</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>53</td>
<td>55</td>
<td>44</td>
<td>43</td>
<td>6</td>
<td>7</td>
<td>26</td>
<td>25</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>12</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>26</td>
<td>29</td>
<td>9</td>
<td>3</td>
<td>24</td>
<td>32</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>9</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>19</td>
<td>22</td>
<td>20</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>36</td>
<td>38</td>
<td>40</td>
<td>0</td>
<td>1</td>
<td>28</td>
<td>18</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>47</td>
<td>36</td>
<td>39</td>
<td>9</td>
<td>5</td>
<td>33</td>
<td>29</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>21</td>
<td>17</td>
<td>15</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>28</td>
<td>43</td>
<td>31</td>
<td>8</td>
<td>5</td>
<td>41</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>20</td>
<td>19</td>
<td>25</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>40</td>
<td>40</td>
<td>37</td>
<td>2</td>
<td>6</td>
<td>15</td>
<td>27</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>39</td>
<td>28</td>
<td>31</td>
<td>22</td>
<td>5</td>
<td>4</td>
<td>16</td>
<td>27</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>24</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>22</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>35</td>
<td>25</td>
<td>38</td>
<td>4</td>
<td>0</td>
<td>38</td>
<td>28</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>10</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>28</td>
<td>4</td>
<td>28</td>
<td>8</td>
<td>7</td>
<td>1</td>
<td>27</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>5</td>
<td>21</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>39</td>
<td>23</td>
<td>31</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>16</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>30</td>
<td>18</td>
<td>28</td>
<td>2</td>
<td>6</td>
<td>25</td>
<td>22</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>24</td>
<td>42</td>
<td>25</td>
<td>8</td>
<td>0</td>
<td>34</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>19</td>
<td>21</td>
<td>13</td>
<td>5</td>
<td>3</td>
<td>24</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>39</td>
<td>26</td>
<td>45</td>
<td>9</td>
<td>6</td>
<td>24</td>
<td>24</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>12</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>30</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>30</td>
<td>4</td>
<td>27</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade 2 P-value = 0.85 P-value = 0.65 P-value = 0.20 P-value = 0.16 P-value = 0.90 P-value = 0.77 P-value = 0.52 P-value = 0.60

Average 29.17 28.52 28.57 27.24 4.22 3.20 21.57 16.44 2.52 2.56 2.39 2.48 7.87 7.36 0.87 0.72
Table 3.

**Probabilistic Equivalency Grade 3.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>17</td>
<td>16</td>
<td>22</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>23</td>
<td>50</td>
<td>22</td>
<td>7</td>
<td>5</td>
<td>34</td>
<td>4</td>
<td>8</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>59</td>
<td>35</td>
<td>23</td>
<td>40</td>
<td>8</td>
<td>4</td>
<td>35</td>
<td>24</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>62</td>
<td>17</td>
<td>51</td>
<td>27</td>
<td>10</td>
<td>0</td>
<td>20</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>37</td>
<td>57</td>
<td>21</td>
<td>46</td>
<td>8</td>
<td>9</td>
<td>25</td>
<td>35</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>51</td>
<td>48</td>
<td>50</td>
<td>9</td>
<td>8</td>
<td>34</td>
<td>32</td>
<td>4</td>
<td>10</td>
<td>4</td>
<td>4</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>34</td>
<td>49</td>
<td>38</td>
<td>10</td>
<td>5</td>
<td>28</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>47</td>
<td>48</td>
<td>41</td>
<td>44</td>
<td>4</td>
<td>3</td>
<td>32</td>
<td>0</td>
<td>5</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>32</td>
<td>29</td>
<td>31</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>14</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>55</td>
<td>17</td>
<td>44</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>44</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>40</td>
<td>32</td>
<td>41</td>
<td>6</td>
<td>5</td>
<td>31</td>
<td>27</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>38</td>
<td>50</td>
<td>41</td>
<td>48</td>
<td>6</td>
<td>7</td>
<td>29</td>
<td>29</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>49</td>
<td>30</td>
<td>48</td>
<td>5</td>
<td>7</td>
<td>34</td>
<td>29</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>14</td>
<td>34</td>
<td>15</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>41</td>
<td>11</td>
<td>40</td>
<td>5</td>
<td>6</td>
<td>25</td>
<td>27</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>45</td>
<td>20</td>
<td>42</td>
<td>2</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>15</td>
</tr>
</tbody>
</table>

Grade 3: P-value = 0.98, P-value = 0.41, P-value = 0.59, P-value = 0.39, P-value = 0.54, P-value = 0.56, P-value = 0.34, P-value = 0.50

Average: 38.06, 37.94, 32.44, 36.25, 5.69, 5.13, 21.44, 17.00, 4.94, 5.50, 2.63, 2.88, 9.50, 11.44, 1.00, 0.69
Two-Group Experimental Design Table Summaries

Tables 4, 5, and 6 represent subtest data collected from the Brigance posttest for the control and experimental groups across grades 1, 2, and 3. No significant differences were indicated for the “word recognition” (D-1), “word analysis” (G-1), "vocabulary comprehension” (F-1), “comprehends passages” (F-2), “computational skills” (M-1), “math problem-solving skills” (M-2), “spelling” (I-1), and “sentence writing” (J-3) posttests between the control or experimental groups in 1st grade (reference Table 4, p. 75). No significant differences were indicated for the “word recognition” (D-1), “word analysis” (G-1), "vocabulary comprehension” (F-1), “comprehends passages” (F-2), “computational skills” (M-1), “math problem-solving skills” (M-2), and “spelling” (I-1), posttests between the control or experimental groups in 2nd grade (reference Table 5, p. 76). A significant difference was indicated for the “sentence writing” (J-3) posttest by the paired t-test in the 2nd grade group (reference Table 5, p. 76). Therefore, the null hypothesis for the 2nd grade “sentence writing” subtest was rejected. It is also important to note that the control group outperformed the experimental group. No significant differences were indicated for the “word recognition” (D-1), “word analysis” (G-1), "vocabulary comprehension” (F-1), “comprehends passages” (F-2), “computational skills” (M-1), “math problem-solving skills” (M-2), “spelling” (I-1), and “sentence writing” (J-3) posttests between the control or experimental groups in 3rd grade (reference Table 6, p. 77).
Table 4.

Two-Group Posttest-Only Randomized Experiment Grade 1.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>16</td>
<td>31</td>
<td>17</td>
<td>3</td>
<td>2</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>7</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>36</td>
<td>39</td>
<td>47</td>
<td>43</td>
<td>6</td>
<td>5</td>
<td>29</td>
<td>23</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>32</td>
<td>29</td>
<td>30</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>21</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>20</td>
<td>35</td>
<td>24</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>34</td>
<td>36</td>
<td>42</td>
<td>3</td>
<td>7</td>
<td>19</td>
<td>27</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
<td>33</td>
<td>31</td>
<td>44</td>
<td>3</td>
<td>4</td>
<td>13</td>
<td>19</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>30</td>
<td>33</td>
<td>31</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>13</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>40</td>
<td>39</td>
<td>37</td>
<td>7</td>
<td>5</td>
<td>24</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>41</td>
<td>45</td>
<td>47</td>
<td>3</td>
<td>7</td>
<td>15</td>
<td>26</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>37</td>
<td>33</td>
<td>44</td>
<td>25</td>
<td>7</td>
<td>3</td>
<td>22</td>
<td>16</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>30</td>
<td>31</td>
<td>30</td>
<td>3</td>
<td>5</td>
<td>18</td>
<td>20</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>28</td>
<td>11</td>
<td>37</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>20</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>22</td>
<td>28</td>
<td>20</td>
<td>35</td>
<td>2</td>
<td>2</td>
<td>11</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>42</td>
<td>49</td>
<td>6</td>
<td>27</td>
<td>3</td>
<td>1</td>
<td>11</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Grade 1: P-value = 0.69  P-value = 0.84  P-value = 0.94  P-value = 0.84  P-value = 0.40  P-value = 0.59  P-value = 0.39  P-value = 0.21

Average: 30.00  31.08  33.20  34.00  3.87  3.92  16.87  17.38  2.80  3.08  2.80  3.62  7.40  6.77  1.60  2.08
Table 5.

Two-Group Posttest-Only Randomized Experiment Grade 2.

<table>
<thead>
<tr>
<th>Grade</th>
<th>D1</th>
<th>ff_D1</th>
<th>G1</th>
<th>ff_G1</th>
<th>F1</th>
<th>ff_F1</th>
<th>F2</th>
<th>ff_F2</th>
<th>M1</th>
<th>ff_M1</th>
<th>M2</th>
<th>ff_M2</th>
<th>I1</th>
<th>ff_I1</th>
<th>J3</th>
<th>ff_J3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>62</td>
<td>47</td>
<td>53</td>
<td>52</td>
<td>9</td>
<td>8</td>
<td>46</td>
<td>28</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>17</td>
<td>8</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>33</td>
<td>50</td>
<td>41</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>25</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>44</td>
<td>5</td>
<td>27</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>30</td>
<td>52</td>
<td>40</td>
<td>11</td>
<td>3</td>
<td>15</td>
<td>26</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>17</td>
<td>9</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>41</td>
<td>44</td>
<td>52</td>
<td>51</td>
<td>6</td>
<td>4</td>
<td>24</td>
<td>24</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>11</td>
<td>13</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>52</td>
<td>11</td>
<td>28</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>56</td>
<td>47</td>
<td>46</td>
<td>12</td>
<td>8</td>
<td>27</td>
<td>26</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>16</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>37</td>
<td>53</td>
<td>51</td>
<td>9</td>
<td>4</td>
<td>28</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>16</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>41</td>
<td>42</td>
<td>49</td>
<td>51</td>
<td>9</td>
<td>7</td>
<td>25</td>
<td>25</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>35</td>
<td>48</td>
<td>27</td>
<td>4</td>
<td>6</td>
<td>23</td>
<td>19</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>46</td>
<td>10</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>38</td>
<td>9</td>
<td>51</td>
<td>3</td>
<td>9</td>
<td>5</td>
<td>31</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>82</td>
<td>50</td>
<td>47</td>
<td>7</td>
<td>12</td>
<td>28</td>
<td>27</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>22</td>
<td>16</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>21</td>
<td>50</td>
<td>29</td>
<td>12</td>
<td>2</td>
<td>11</td>
<td>25</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>18</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>63</td>
<td>40</td>
<td>50</td>
<td>6</td>
<td>12</td>
<td>19</td>
<td>11</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>9</td>
<td>18</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>41</td>
<td>47</td>
<td>41</td>
<td>6</td>
<td>7</td>
<td>39</td>
<td>29</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td>12</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>47</td>
<td>35</td>
<td>53</td>
<td>25</td>
<td>6</td>
<td>4</td>
<td>26</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>15</td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>35</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>40</td>
<td>42</td>
<td>49</td>
<td>8</td>
<td>8</td>
<td>26</td>
<td>26</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>17</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>43</td>
<td>46</td>
<td>50</td>
<td>7</td>
<td>9</td>
<td>27</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>11</td>
<td>11</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>48</td>
<td>8</td>
<td>27</td>
<td>7</td>
<td>4</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>46</td>
<td>46</td>
<td>6</td>
<td>29</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>41</td>
<td>52</td>
<td>6</td>
<td>24</td>
<td>6</td>
<td>5</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade 2: P-value = 0.09  P-value = 0.35  P-value = 0.58  P-value = 0.30  P-value = 0.12  P-value = 0.14  P-value = 0.27  (P-value = 0.04)

Average: 48.95  41.90  46.68  43.90  7.63  7.15  23.89  20.70  6.05  5.15  4.11  3.35  12.58  10.95  3.16  2.30

76
Table 6.

Two-Group Posttest-Only Randomized Experiment Grade 3.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>D1 31</td>
<td>ff_D1 39</td>
<td>G1 26</td>
<td>ff_G1 42</td>
<td>F1 5</td>
<td>ff_F1 24</td>
<td>F2 23</td>
<td>ff_F2 3</td>
<td>M1 6</td>
<td>ff_M1 3</td>
<td>F1 2</td>
<td>ff_F2 6</td>
<td>M1 6</td>
<td>ff_M1 3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>47 46</td>
<td>33 11</td>
<td>6 28</td>
<td>8 12</td>
<td>2 7</td>
<td>2 20</td>
<td>11 4</td>
<td>0 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>90 52</td>
<td>33 8</td>
<td>4 24</td>
<td>14 12</td>
<td>6 5</td>
<td>5 25</td>
<td>8 4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>81 52</td>
<td>48 14</td>
<td>6 39</td>
<td>29 12</td>
<td>8 7</td>
<td>6 20</td>
<td>11 3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>26 28</td>
<td>0 13</td>
<td>8 4</td>
<td>6 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>67 53</td>
<td>50 52</td>
<td>10 8</td>
<td>35 30</td>
<td>9 10</td>
<td>3 5</td>
<td>18 24</td>
<td>2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>86 58</td>
<td>50 51</td>
<td>8 7</td>
<td>29 28</td>
<td>11 6</td>
<td>4 5</td>
<td>20 20</td>
<td>4 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>39 52</td>
<td>42 51</td>
<td>5 6</td>
<td>23 26</td>
<td>6 10</td>
<td>2 7</td>
<td>6 12</td>
<td>1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>26 54</td>
<td>22 52</td>
<td>8 12</td>
<td>19 29</td>
<td>4 7</td>
<td>2 4</td>
<td>5 9</td>
<td>0 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>46 51</td>
<td>7 34</td>
<td>6 3</td>
<td>17 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>48 76</td>
<td>52 50</td>
<td>6 8</td>
<td>29 28</td>
<td>5 11</td>
<td>3 4</td>
<td>12 13</td>
<td>2 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>34 33</td>
<td>49 33</td>
<td>5 0</td>
<td>25 25</td>
<td>9 6</td>
<td>6 5</td>
<td>12 7</td>
<td>2 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>44 46</td>
<td>36 50</td>
<td>8 28</td>
<td>33 3</td>
<td>4 1</td>
<td>4 17</td>
<td>12 5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>64 48</td>
<td>48 8</td>
<td>6 5</td>
<td>15 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 3</th>
<th>P-value = 0.27</th>
<th>P-value = 0.96</th>
<th>P-value = 0.11</th>
<th>P-value = 0.12</th>
<th>P-value = 0.38</th>
<th>P-value = 0.34</th>
<th>P-value = 0.27</th>
<th>P-value = 0.72</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>53.58</td>
<td>45.67</td>
<td>43.67</td>
<td>43.47</td>
<td>8.00</td>
<td>6.13</td>
<td>27.25</td>
<td>22.20</td>
</tr>
<tr>
<td></td>
<td>8.17</td>
<td>7.07</td>
<td>3.83</td>
<td>4.47</td>
<td>14.50</td>
<td>11.93</td>
<td>2.33</td>
<td>2.13</td>
</tr>
</tbody>
</table>
Table 7.

*Legends for Tables*

<table>
<thead>
<tr>
<th>Ref</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Control Group Word Recognition Grade-Placement Test</td>
</tr>
<tr>
<td>ff_D1</td>
<td>Treatment Group Word Recognition Grade-Placement Test</td>
</tr>
<tr>
<td>G1</td>
<td>Control Group Word Analysis Survey</td>
</tr>
<tr>
<td>ff_G1</td>
<td>Treatment Group Word Analysis Survey</td>
</tr>
<tr>
<td>F1</td>
<td>Control Group Reading Vocabulary Comprehension treatment Group Grade-Placement Test</td>
</tr>
<tr>
<td>ff_F1</td>
<td>Reading Vocabulary Comprehension Grade-Placement Test</td>
</tr>
<tr>
<td>F2</td>
<td>Control Group Comprehends Passages</td>
</tr>
<tr>
<td>ff_F2</td>
<td>Treatment Group Comprehends Passages</td>
</tr>
<tr>
<td>M1</td>
<td>Control Group Computational Skills Grade-Placement Test</td>
</tr>
<tr>
<td>ff_M1</td>
<td>Treatment Group Computational Skills Grade-Placement Test</td>
</tr>
<tr>
<td>M2</td>
<td>Control Group Math Problem-Solving Grade-Placement Test</td>
</tr>
<tr>
<td>ff_M2</td>
<td>Treatment Group Math Problem-Solving Grade-Placement Test</td>
</tr>
<tr>
<td>I1</td>
<td>Control Group Spelling and Grade-Placement Test</td>
</tr>
<tr>
<td>ff_I1</td>
<td>Treatment Group Spelling and Grade-Placement Test</td>
</tr>
<tr>
<td>J3</td>
<td>Control Group Sentence-Writing Grade-Placement Test</td>
</tr>
<tr>
<td>ff_J3</td>
<td>Treatment Group Sentence-Writing Grade-Placement Test</td>
</tr>
</tbody>
</table>

Blank cells indicate the loss of data, this may be caused by the student(s) leaving the school system or other similar factors.

Group A are those students not receiving phonemic awareness training.

Group B are those students completing phonemic awareness training.

*(P-value = 0.40)* Indicates a significant difference
This study evaluated the effectiveness of a program designed to improve the phonemic awareness of elementary school children in grades 1, 2, and 3. The effect of the program was analyzed using raw scores obtained on various subtests from the Brigance Diagnostic Comprehensive inventory of Basic Skills achievement test. These subtests included, word recognition skills, word analysis skills, vocabulary comprehension skills, comprehension of passages, computational and problem-solving skills, spelling skills, and sentence writing skills. The results from this study were evaluated and may be used to determine the direction for future research.

Conclusions

Statistical data were collected and examined in order to make a statistical inference about a computer program designed to improve the phonemic awareness skills of students. The data were collected from a Brigance pretest and posttest administered during the 2001-02 school year. A statistical t-test was performed on these data to determine if the Fast ForWord computer program had an effect on the experimental group’s achievement scores. The only statistical significance between groups occurred in the second grade sentence-writing grade placement test (reference table 5, p. 76). The second grade control group outperformed the second grade experimental group within the sentence-writing category of the Brigance posttest.
Based on the outcome of the statistical analysis, excluding hypothesis number seven, all other null hypotheses were not rejected (reference Hypotheses, p. 66). Hypothesis 7 was rejected because of the significant difference indicated within the “sentence-writing” achievement scores for second grade students. It is also important to note that the control group outperformed the treatment group within the “sentence-writing” category of the Brigance achievement test.

**Recommendations**

There are many factors to consider while evaluating the outcome of this study. Both statistically equivalent groups had similar backgrounds and demonstrated deficiencies within specific areas of the Brigance Diagnostic Comprehensive Inventory of Basic Skills achievement test. Based on the results from the t-test analysis, the only significant difference between the control and experimental groups occurred within the second grade sentence-writing portion of the Brigance subtest. In this particular instance, the control group outperformed the treatment group. All other categories of the Brigance subtests demonstrated a form of equivalence between the control and treatment groups. This would indicate that there were no differences in achievement between the groups.

Although there seemed to be no significant increases or decreases (other than the second grade sentence-writing subtest) in achievement for those students who received phonemic awareness training, additional research should
be conducted. Future research might include a longitudinal study designed to track student progress throughout elementary, middle, and high schools.

Summary

There are no "silver bullets" or other panacea that will make the educational processes easier. It is important to evaluate new educational programs prior to implementing them into schools. This may be accomplished by using small-scale pilot programs using acceptable nonbiased research methods.

This study was specifically designed to provide a means for educators to evaluate the concept of phonemic awareness and the impact that it might have on student achievement. In the beginning of the 2001-02 school year, Kingsport City Schools implemented an educational strategy designed to improve the phonemic awareness skills of its students. This presented itself as the perfect opportunity to analyze existing data and test the impact that phonemic awareness has on student achievement. Based on the results from this study, those students identified as having deficiencies within specific areas of the Brigance Comprehensive Inventory of Basic Skills test may not receive additional benefits by participating within the Fast ForWord computer program as compared to a probabilistically equivalent group of students who did not receive the phonemic awareness training.
REFERENCES


Figure 4. Brigance Subtest D1 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest D1 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the D1 “word recognition” assessment is to determine if the student can recognize common and crucial words that frequently appear in print.
Figure 5. Brigance Subtest D1 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest D1 for all students in-group B. Group B students received phonemic awareness training. The purpose of the Brigance D1 “word recognition” assessment is to determine if the student can recognize common and crucial words that frequently appear in print.
Figure 6. Brigance Subtest G1 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest G1 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the Brigance G1 “word analysis” assessment is to determine if students can distinguish if pairs of words sound alike or different; identify initial consonants; substitute sounds; reads word parts; and if the student is able to divide words into syllables.
Group B G1

Scores

Students

17.0 to <= 22.0
22.0 to <= 27.0
27.0 to <= 32.0
32.0 to <= 37.0
37.0 to <= 42.0
42.0 to <= 47.0
47.0 to <= 52.0

Normal Distribution
Mean = 41.083
Std Dev = 9.7432
KS Test p-value = .0999

Figure 7. Brigance Subtest G1 for all Students In-Group B.
This chart reflects the normal distribution for the Brigance subtest G1 for all students in-group B. Group B students received phonemic awareness training. The purpose of the Brigance G1 “word analysis” assessment is to determine if students can distinguish if pairs of words sound alike or different; identify initial consonants; substitute sounds; reads word parts; and if the student is able to divide words into syllables.
**Figure 8.** Brigance Subtest F1 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest F1 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the “vocabulary comprehension” assessment is to determine the highest grade level at which the student can read and comprehend vocabulary words.
Figure 9. Brigance Subtest F1 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest F1 for all students' in-group B. Group B students received phonemic awareness training. The purpose of the “vocabulary comprehension” assessment is to determine the highest grade level at which the student can read and comprehend vocabulary words.
**Figure 10.** Brigance Subtest F2 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest F2 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the “comprehends passages” assessment is to determine the highest grade level at which the student can read and comprehend reading selections.
Figure 11. Brigance Subtest F2 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest F2 for all students in-group B. Group B students received phonemic awareness training. The purpose of the “comprehends passages” assessment is to determine the highest grade level at which the student can read and comprehend reading selections.
Figure 12. Brigance Subtest M1 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest M1 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the “math grade placement” assessment is to estimate the student’s computational skills.
**Figure 13.** Brigance Subtest M1 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest M1 for all students in-group B. Group B students received phonemic awareness training. The purpose of the “math grade placement” assessment is to estimate the student’s computational skills.
Figure 14. Brigance Subtest M2 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest M2 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the “math grade placement” assessment is to estimate the student’s problem solving skills.
Figure 15. Brigance Subtest M2 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest M2 for all students in-group B. Group B students received phonemic awareness training. The purpose of the “math grade placement” assessment is to estimate the student’s problem solving skills.
Figure 16. Brigance Subtest I1 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest I1 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the “spelling” assessment is to determine the highest grade level at which the student can spell with at least 60% accuracy and their ability to identify basic word-analysis skills.
Figure 17. Brigance Subtest I1 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest I1 for all students in-group B. Group B students received phonemic awareness training. The purpose of the “spelling” assessment is to determine the highest grade level at which the student can spell with at least 60% accuracy and their ability to identify basic word-analysis skills.
Figure 18. Brigance Subtest J3 for all Students In-Group A.

This chart reflects the normal distribution for the Brigance subtest J3 for all students in-group A. Group A students did not receive phonemic awareness training. The purpose of the “sentence writing” assessment is to determine the legibility of the student’s handwriting, to determine the student’s skill for providing personal data in writing, to determine the student’s skill in mechanics, and to determine the student’s letter-writing skills.
Figure 19. Brigance Subtest J3 for all Students In-Group B.

This chart reflects the normal distribution for the Brigance subtest J3 for all students in-group B. Group B students received phonemic awareness training. The purpose of the “sentence writing” assessment is to determine the legibility of the student’s handwriting, to determine the student’s skill for providing personal data in writing, to determine the student’s skill in mechanics, and to determine the student’s letter-writing skills.
APPENDIX B
PERMISSION FOR USING DIAGRAMS

Raymond:

Yes, you can use these images for your dissertation. Best of luck with your dissertation.

Eric

Eric H. Chudler, Ph.D.
E-mail: chudler@u.washington.edu
URL: http://faculty.washington.edu/chudler/neurok.html

On Fri, 15 Nov 2002, Ray Hatfield wrote:

> May I use the jpg brain images of the "arcuate fasciculus," "speaking
> the heard word," and the "speaking the written word" in my dissertation? These images are found on the http://faculty.washington.edu/chudler/lang.html website. I am working on my dissertation for East Tennessee State University.
> Thank you very much.
> Raymond Hatfield
> 220 Rivermont Court
> Kingsport, TN 37660
> hatfieldr@k12tn.net
APPENDIX C

Institutional Review Board

East Tennessee State University
Institutional Review Board • Box 70665 • Johnson City, Tennessee 37614-1707 • (423) 439-8134 • Fax (423) 232-5650

Wednesday, February 12, 2003

Mr. Raymond L. Hatfield, II
220 Rivermont Court
Kingsport, TN 37660

PROJECT: Comparisons of Reading Scores in Two Tennessee Elementary Schools Between Students Receiving and Not Receiving Specialized Training in Phonemic Awareness

IRB No.: c03-084e

I reviewed the above-referenced study and find that it qualifies as exempt from coverage under the federal guidelines for the protection of human subjects as referenced as Title 45--Part 46.101. You are therefore authorized to begin the research.

It is also understood that the IRB will be immediately notified of any proposed changes that may affect the exempt status of your research project. If you feel it is necessary to call further IRB attention to any aspects of this study, please refer to the above-titled project and IRB number. I appreciate your bringing this project before the IRB for its concurrence of exempt status.

Sincerely,

James J. Fox, III, Ph.D.
Chair
ETSU Campus IRB

Exemption Reference: 45CFR46.101(b)(4)
Kingsport City Schools  
Kingsport, Tennessee

Kingsport Board of Education  
Mrs. Barbara Goodlett, President
Mrs. V.I. Germinario, Vice President
Mr. Tim Dean
Mr. T. Glen Moody
Mrs. Pat Turner

Richard L. Kitzmiller, Ed.D.  
Superintendent of Schools

September 16, 2002

Dr. Terry Tollefson  
Department of Educational Leadership and Policy Analysis  
Post Office Box 70550  
East Tennessee State University  
Johnson City, TN 37614

Dear Dr. Tollefson:

I authorize the use of existing pretest and posttest data (The Brigance Diagnostic Comprehensive Inventory of Basic Skills) that were collected during the 2001-02 school year to Raymond L. Hatfield II. I understand these data may be used for research purposes.

Sincerely,

Richard Kitzmiller, Ed.D.  
Superintendent

RLK/jev
VITA

RAYMOND L. HATFIELD II

Personal Data: Place of Birth: Smyrna, Tennessee

Education: Public Schools: Harlan City Schools, Harlan Kentucky; Randolph Air
Force Base Military School, Texas; Pulaski County Schools,
Somerset Kentucky; Rantoul City Schools, Rantoul Illinois; Harlan
County Schools, Cumberland, Kentucky

East Tennessee State University, Johnson City, Tennessee;
Biology, B.S., 1995
Tusculum College, Greeneville, Tennessee;
M.Ed., 1997
East Tennessee State University, Johnson City, Tennessee;
Master’s +45, 2000
East Tennessee State University, Johnson City, Tennessee;
Ed.D., 2003

Professional Experience:
Self-Employed, Cumberland, Kentucky 1981 - 1991
Student Research Assistant, Quillen College of Medicine, 1992 -
1993
Supervisor, Hawkins County Board of Education, 1997 – 2001
Director of Technology, Kingsport City Schools, 2001 --- Current

Publications: Multiplex Polymerase Chain Reaction for the Detection of HIV 1 and

Honors and Awards: Sammuel F.B. Morse Award 1978
Good Conduct Medal 1979
USAF Inspector General Award 1980
USAF Honor Guard 1980
Ronald McNair Scholar, Summer 1993
Phi Theta Kappa 1991
Phi Kappa Phi 1994
Cum Laude 1995
Outstanding Teacher Award 1997