The Relationship of Teacher Knowledge and First-Grade Reading Outcomes in Low-Income Schools

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THE RELATIONSHIP OF TEACHER KNOWLEDGE AND FIRST-GRADE READING OUTCOMES IN LOW-INCOME SCHOOLS

By

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A Dissertation submitted to the Department of Childhood Education, Reading, and Disability Services in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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To Thomas, Elisabeth, and Madelynn.
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ABSTRACT

This study explored the relationships between teacher knowledge and first-grade reading outcomes in low-income schools. Three teacher knowledge measures were adapted to assess alphabetic principle knowledge, comprehensive language knowledge, and vocabulary knowledge. Student phonemic awareness, phonics, fluency, and reading comprehension outcomes were assessed using the DIBELS and SAT/10. Sixty-nine teachers and 1146 first-grade students in 15 low-income schools participated.

Results showed a wide range of scores on the teacher knowledge assessments, indicating a need for some of the participant teachers to improve their knowledge. In addition, teacher knowledge was compared to student outcomes and the significance of these relationships was varied. For all three teacher knowledge tests, student outcomes in phonics were significantly related to initial student differences. Student outcomes in fluency were significantly related to initial student differences for teacher knowledge about the alphabetic principle and comprehensive language knowledge. Student outcomes in reading comprehension were significantly related to initial student differences for teacher comprehensive language and vocabulary knowledge. When controlled for initial student differences, there were significant positive relationships between teacher alphabetic principle knowledge and student comprehension and teacher vocabulary knowledge and student fluency, and a significant negative relationship between teacher vocabulary knowledge and student phonemic awareness. The relationships between teacher alphabetic principle and comprehensive language knowledge and student phonemic awareness were non significant.
CHAPTER 1
INTRODUCTION

Learning to read is critical for success in our society, but some students never learn to read, and still others struggle for many years. According to Rayner, Foorman, Perfetti, Pesetsky, and Seidenberg (2001), “…learning to read presents a paradox. For an adult who is a good reader, reading feels so simple, effortless, and automatic that it is almost impossible to look at a word and not read it” (p. 31).

To successfully teach more children to read, the skills essential for future reading success must be identified. Quantitative research has converged on a single factor: “The central achievement of early reading is learning to read words” (Rayner et al. 2001, p. 43). In an extensive review, Adams (1990) found that “Unless processes involved in individual word recognition operate properly, nothing else in the system can either” (p. 3). Similarly, the biggest problem for children who are at risk for reading problems or are reading-disabled is word recognition (Share and Stanovich, 1995).

Students proficient in word recognition master the alphabetic principle, which is the understanding of the letter-sound associations in the English language (Rayner et al., 2001). Some children master the alphabetic principle through experiences with meaningful literature, but unfortunately many children do not (Rayner et al.; Ehri, 1998, 2002).

The statistics for students’ lack of reading success are alarming. As indicated by National Assessment of Education Progress, first administered in the fourth grade, 37% of fourth-grade students read below basic level; that is, or unable to answer literal reading comprehension questions or below a score of 208 on a scale of 0-500 (National Center for Education Statistics, 2003). For poor and minority students, the situation is even more ominous: 55% of students eligible for free or reduced lunch, 60% of African-American students, and 56% of Hispanic students read below the basic level in fourth grade. Chall, Jacob, and Baldwin (1990) labeled this low rate of reading achievement
as the Fourth Grade Slump. Students’ lack of success in fourth grade, however, does not represent failure during that year alone. In fact, Juel (1988) found that students who leave first grade reading below level have a one in eight chance of catching up for the duration of elementary school.

In recent years, studies on how children learn to read and which type of instruction is more effective have been synthesized into two consensus documents: Preventing Reading Difficulties in Young Children (Snow, Burns, & Griffin, 1998) and Teaching Children to Read (National Reading Panel [NRP], 2000). Put Reading First: The Research Building Blocks for Teaching Children to Read (Armbruster, Lehr, & Osborn, 2001) consolidated the findings into the following conclusions: reading instruction should consist of phonemic awareness, phonics, fluency, vocabulary, and comprehension; all of which should be taught explicitly. Based on this research, researchers have advocated teacher knowledge of the alphabetic principle in order for teachers to effectively deliver instruction in phonemic awareness and phonics, which should lead to improved student outcomes.

Since research has been less thorough about the relationship between teacher knowledge of the various aspects of language and student outcomes in beginning reading, this dissertation examines if any relationships exist. Based on the suggestions of the research summarized in Teaching Children to Read (NRP, 2000), this dissertation will explore the relationship of teacher alphabetic principle knowledge and student outcomes. Additionally, though not as prevalent in the literature, some research has indicated that teachers might need more comprehensive language knowledge to effectively teach reading (Moats, 1999). Comprehensive language knowledge includes understanding the following systems: phonology, the study of the speech sounds in language including syllabication, the segmentation of words into units of pronunciation within words formed around a vowel; orthography, the study of the spelling system of language; and morphology, the study of the “…units of meaning (morphemes) within words” (Moats, 2000, p. 2). Therefore, the relationship between the other aspects of teachers’ comprehensive language knowledge (syllabication, orthography, and morphology) and student outcomes will also be investigated. Finally, since research has found that teacher verbal ability is the factor most strongly associated with student
achievement (Whitehurst 2002), teacher vocabulary knowledge will be compared to student outcomes to examine the relationship between teachers’ vocabulary ability and student outcomes.

The first chapter will include the background of the study, statement of the problem, purpose of the study, research hypothesis, and a brief overview of the methodology. The chapter will end with limitations of the study, definitions of key terms, and an overview of the remaining chapters.

Background of the Study

Significant research has contributed to what students need to know to become proficient word readers and how teachers should instruct students; however, less is known about the connection between teacher knowledge of word recognition and student outcomes. This study builds on previous research regarding teacher knowledge and goes a step further by linking this knowledge to student achievement.

In the early 1980s, Rude (1981) developed the Knowledge Test of Reading for Elementary School Teachers. Using this test and two additional tests, Rupley and Logan (1984) found that teachers with more knowledge about reading instruction were more likely to emphasize decoding-oriented reading outcomes. A decade later, Troyer and Yopp (1990) conducted a survey of kindergarten teachers to assess their knowledge of phonemic awareness and found that only 35% of teachers were familiar with this concept, indicating that contemporary research was not expeditiously delivered to the classroom teacher.

Moats and Lyon (1996) studied teachers’ comprehensive language knowledge and found that teachers, while literate, did not have the knowledge to explicitly teach the spoken and written language to children with reading difficulties. McCutchen et al. (2000) studied teachers’ comprehensive language knowledge and had two findings: there were some positive relationships between teacher knowledge of language and student outcomes in beginning reading, and there was an average score of 45% on a test of language knowledge. Similarly, McCutchen et al. (2002) found that, although teachers had limited language knowledge, they did improve through training. The trained group provided more explicit instruction to their students, and their students showed greater improvement in alphabetic and orthographic fluency. First-grade
teachers receiving the training had students with improved phonological awareness and better scores on all reading and writing measures.

Based on these results, the researchers determined that teachers did not receive adequate training in beginning reading instruction. It is important to note that neither study related teacher knowledge to student achievement in reading (Mather et al.; Bos et al.). Additionally, the researchers reported that the studies were conducted in the southwest without further reference to student demographics. Absent this information, there was no way of knowing whether teachers taught children from high or low socioeconomic backgrounds (Bos et al.; Mather et al.). The student population for this dissertation was students attending schools where the majority of children come from low socioeconomic backgrounds.

Teacher knowledge about language is crucial to literacy learning, but research indicates that many teachers are not adequately informed. The teachers surveyed clearly did not have high levels of knowledge of the alphabetic principle or comprehensive language knowledge. Although comprehensive language knowledge has been associated with student outcomes in reading (McCutchen et al., 2002), alphabetic principle knowledge has not. Therefore, whether this knowledge is a necessary and sufficient prerequisite for improving student reading scores has yet to be determined. Practically speaking, a classroom teacher needs to have content, as well as procedural knowledge for instructing students. Although the present study does not examine methodologies for teaching reading, it does look at whether teacher knowledge of content is a good predictor of reading success.

The Problem Statement

Researchers have determined how children learn to read, what skills students need to be successful readers, and what methods of teaching reading are more effective, but the research is more limited as to what teachers need to know to teach children to read and whether or not they possess this knowledge. McCutchen and Berninger (1999) stated “To teach reading effectively, especially to those children who need considerable scaffolding with the alphabetic principle…[teachers] need to understand the phonology represented in (but independent of) spelling patterns in English…” (p. 219). Furthermore,
…teachers’ own literacy is often a two-edged sword. For most literate adults, knowledge of word sounds and knowledge of spelling patterns are so intertwined that the two are difficult to separate. Teacher confusions between sounds and spellings can result in unintended ‘misinformation’ and needless student confusion or frustration (p. 222).

When studying phonics instruction, the National Reading Panel (Ehri, Nunes, and Stahl, 2001) found few studies that examined the oral and written language knowledge that teachers possessed to teach systematic phonics effectively. This study assembles the teacher knowledge required to explicitly teach the skills repeatedly discussed in the literature (NRP, 2000) and correlates this knowledge with student outcomes. More specifically, this study will explore teachers’ explicit knowledge of the alphabetic principle\(^a\) and correlate this knowledge with student outcomes on beginning reading measures.

Although it has been hypothesized that teachers need mastery of comprehensive language concepts (Moats, 1994) and initial studies have shown a relationship between teacher knowledge of language and student outcomes (McCutchen et al., 2000; McCutchen et al., 2002), the breadth of language knowledge required to explicitly teach children to read has not been established, so this relationship will be further explored. Additionally, vocabulary knowledge will be used to determine whether or not differences in teacher’s verbal ability are associated with student outcomes. Therefore, this study will also compare teachers’ comprehensive language knowledge and vocabulary knowledge to student outcomes in reading.

Purpose of the Study

The purpose of this study is to investigate the following questions:

*Primary Questions*

What is the relationship between teachers’ explicit knowledge of the alphabetic principle and reading outcomes in first-grade students attending low-income schools?

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\(^a\)Since the teachers will be tested using a written test and phonemic awareness is an oral language activity, the test will be considered a measure of knowledge of the alphabetic principle. Phonemic awareness is necessary for understanding of the alphabetic principle.
What is the relationship between teachers’ comprehensive knowledge of language and reading outcomes in first-grade students attending low-income schools?

What is the relationship between teachers’ vocabulary knowledge and reading outcomes in first-grade students attending low-income schools?

Additional Questions
Does number of years teaching positively relate to knowledge about the alphabetic principle, comprehensive language knowledge, vocabulary knowledge, and/or student outcomes in beginning reading?
Does highest degree earned positively relate to knowledge about the alphabetic principle, comprehensive language knowledge, vocabulary knowledge, and/or student outcomes in beginning reading?
Does year when last degree was awarded positively relate to knowledge about the alphabetic principle, comprehensive language knowledge, vocabulary knowledge, and/or student outcomes in beginning reading?
Does number of reading courses taken positively relate to knowledge about the alphabetic principle, comprehensive language knowledge, vocabulary knowledge, and/or student outcomes in beginning reading?

The results of this study could have implications for preservice teacher education and professional development for inservice teachers. If there is a positive relationship between teacher knowledge of the alphabetic principle and/or comprehensive language knowledge and student achievement in reading, the next step might be to consider how this knowledge impacts instruction to affect student achievement.

Research Hypotheses
Based on existing empirical evidence, the following predictions were made:
There is a positive relationship between teachers’ explicit knowledge of the alphabetic principle and their students’ outcomes in beginning reading.
There is a positive relationship between teachers’ comprehensive language knowledge and their students’ outcomes in beginning reading.
There is a positive relationship between teachers’ vocabulary knowledge and their students’ outcomes in beginning reading.
Additionally, there is a positive relationship between the following teacher demographics: more experienced teachers, teachers with advanced degrees, teachers receiving their degrees before 1980 and after 1999, and teachers with more reading courses; and student outcomes, knowledge of the alphabetic principle, and comprehensive language knowledge.

There is a positive relationship between teachers with advanced degrees and vocabulary knowledge.

**Overview of Methodology**

This study was conducted using quantitative methodology. The relationships between teacher knowledge, student outcomes, and teacher demographics were measured using a correlational design. The study was conducted in 15 Reading First Schools in Florida, and the participants were 69 first-grade teachers and 1146 first-grade students.

The teachers were assessed with the Test of Explicit Knowledge of the Alphabetic Principle (TEKAP), which was adapted from the Teacher Knowledge About the Structure of Language Assessment (TKA: SL, Mather, Bos, & Babur, 2001). The test was piloted with 47 preservice and inservice teachers, and the revised test had a reliability of .90 (Cronbach’s coefficient alpha).

Additionally, the teachers were assessed with the Test of Comprehensive Language Knowledge (TCLK), an adaptation of Moat’s Comprehensive Survey of Language (2000). This test was converted from short answer items to multiple-choice items in order to increase reliability and decrease completion time. The TCLK was piloted first with 27 undergraduate and graduate special education majors and had a reliability of .61 (Cronbach’s coefficient alpha). After several changes were made, the test was piloted with 28 undergraduate elementary education majors and the revised test had a final reliability of .82 (Cronbach’s coefficient alpha).

To examine the teacher’s vocabulary knowledge, the teachers were assessed with the Test of Vocabulary Knowledge (TVK). This test was adapted from a vocabulary analogies subtest of the Stanford Achievement Test, Ninth Edition (SAT/9) TASK 3 multiple-choice reading measure (1996), which had a reliability of .93. The test was
piloted with the 28 elementary education majors who also participated in the second TCLK field test. The adapted test had a reliability of .85 (Cronbach’s coefficient alpha).

Student outcomes were measured at the end of the year with the Dynamic Indicators of Basic Early Literacy Skills (DIBELS, Good & Kaminski, 2001a), which included the Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency assessments, and the Stanford Achievement Test, Tenth Edition (SAT/10). The beginning of the year DIBELS measures from the same three tests were used to control for initial classroom differences.

The teacher knowledge and student outcome relationships were analyzed using multiple regression, the teacher knowledge and student outcomes relationships were analyzed using ANCOVA, and the teacher demographic and teacher knowledge relationships were analyzed using ANOVA. The methodology will be discussed in further detail in chapter 3.

Limitations of the Study
Due to the research design, this study has several limitations. Since the relationship between teacher knowledge and student outcomes in beginning reading has not been thoroughly investigated before, the relationship between these two variables was explored before further experimental studies are designed and conducted. Therefore, cause and effect was not determined by this study; however, the results of this study can be used to make further research decisions.

This study focuses on content knowledge, not instruction. Since this study did not consider how teacher knowledge is transformed into overt instruction, further qualitative research is needed to test the co-occurrence of explicit knowledge and accompanying explicit instruction.

Additionally, previous studies have discussed explicit instruction in relationship to students from low socioeconomic environments (NRP, 2000; Snow, et al., 1998) and this study will focus on students attending schools in low socioeconomic communities. The results should not be generalized to teachers who teach other populations of students.

Definitions of Key Terms
The following terms will be used in this dissertation:
Alphabetic principle. The understanding that letters represent sounds in the English language. The alphabetic principle is taught through phonics instruction (Rayner et al, 2001). For the letter-sound correspondence to have meaning, students must also have emerging phonemic awareness.

Alphabetic writing system. A writing system in which each sound is represented by a letter.

At-risk for difficulty. Students with factors that put them at statistical risk for academic difficulty such as being raised by a single parent, four or more children living in the household, parent’s lack of high school diploma or general equivalency diploma, and/or poverty (Moore, Vandivere, & Ehrle, 2000).

Comprehensive language knowledge. Knowledge of language at the word level including phonology, syllabication, morphology, and orthography.

Comprehensive Survey of Language Knowledge. A test that assesses teachers’ comprehensive language knowledge (Moats, 2000).

Consonant blend. The phonics term that describes two adjacent consonants that make two distinct sounds. For example, the \( \text{fl} \) in \text{flower} is a consonant blend.

Consonant digraph. The phonics term that describes two adjacent consonants that make one sound. For example, the \( \text{ch} \) in \text{cheese} is a consonant digraph.

Diphthong. The phonics term that describes two adjacent vowels that make one new sound. For example, the \( \text{oi} \) in \text{boil} is a diphthong.

Direct instruction. The form of instruction where students are taught explicitly. See also explicit instruction.

Dynamic Indicators of Basic Early Literacy Skills (DIBELS). An early literacy assessment that predicts future reading ability (DIBELS, Good & Kaminski, 2001a).

Explicit instruction. A type of instruction in which information is taught directly. See also direct instruction.

Graphemes. The phonics term for a letter or letters that represent one sound (Rayner et al., 2001).

Higher levels of language. The language “…units larger than the word, such as phrases, sentences, and paragraphs” (Moats, 2000, p. 2).
Linguistics. The study of “…the internalized, unconscious knowledge that enables a speaker to produce and understand utterances in his or her own native language” (Parker & Riley, 2000, p. 10). Linguistics is the study of oral, not written language.

Logographic writing system. A writing system in which each word is represented by one symbol.

Low-income school. A school where the majority of students receive free or reduced lunch.

Lower levels of language. The language “…units smaller than the word, such as sounds, syllables, letters, and some morphemes” (Moats, 2000, p. 2).

Morphology. “…the study of word formation” (Parker & Riley, 2000, p. 83). According to Moats (2000), morphology is “The study of meaningful units of language and how they are combined in word formation” (p. 233).

Onset. The consonants that precede the vowel in a word. For example, the bl in black is the onset. The onset is followed by the rime. In some reading programs, onsets and rimes are used to teach word recognition. See also rime.

Orthographic representation. The written representation of a word; its spelling.

Orthography. “A writing system” (Moats, 2000, p. 233). The way language is represented by print.

Phoneme. The smallest unit of sound in the English language. Phonemes are represented by one or more letters (Rayner et al., 2001).

Phonemic awareness. The ability to identify and manipulate sounds into syllables or words (NRP, 2000).

Phonics. The type of instruction that emphasizes deciphering the relationship between letters and sounds (Rayner et al., 2001).

Phonological recoding. The process by which the reader translates the grapheme representation of the word into speech (Share, 1995). See also self-teaching model.

Phonology. “…The study of the sound system of language: the rules that govern pronunciation” (Parker & Riley, 2000, p. 102).

Pseudoword. A group of letters without meaning designed to look like a word. Used to assess students’ knowledge of the alphabetic principle.

Rime. The vowel and following consonants in a word. For example, the *ack* in *black* is the rime. The rime follows the onset. In some reading programs, onsets and rimes are used to teach word recognition. See also onset.

Self-teaching model. In this model, the student translates the grapheme representation of the word into speech, thus developing an orthographic representation of each word (Share, 1995). See also phonological recoding.

Semantics. The study of the meaning of language (Parker & Riley, 2000).

Simple view of reading. An explanation in which reading is the product of word recognition and comprehension (Gough & Tunmer, 1986).

Socioeconomic status (SES). The income and education level of a family. Students from low SES families are statistically more likely to experience difficulties in learning to read (National Center for Education Statistics, 2003).

Stanford Achievement Test. A norm-reference test which measures learning outcomes including reading, mathematics, language, spelling, study skills, science, social studies, and listening (Impara & Plake, 1998).

Students at risk for reading difficulties. Students who are statistically more likely to experience reading difficulties due to demographic factors.

Syllable. “A unit of pronunciation that is organized around a vowel; it may or may not have consonants before and after the vowel” (Moats, 2000, p. 236). For example, *paper* has two syllables: *pa* and *per*.


Teacher knowledge. The knowledge that teachers have about teaching and learning.

Teacher Knowledge About the Structure of Language (TKA: SL). A test that assesses teacher knowledge of language (Mather et al., 2001).

Title I. Funding provided to schools where the majority of students qualify for free or reduced lunch. Title I schools are commonly referred to as low-income schools.
Ensuing Chapters

The study will be detailed in the chapters as follows:

Chapter II contains a review of the literature including teacher knowledge about beginning reading, the cognitive-linguistic base of beginning reading, and a discussion of the characteristics of effective instruction for students at risk for reading difficulties. This will lead to an understanding of what teachers need to know to teach reading to students at risk for reading difficulty.

Chapter III details the methodology used in this study including the school settings, the population, pilot studies conducted for the purpose of adapting three teacher knowledge tests, the tests administered to the teachers and students, assessment procedures, and data analysis.

Chapter IV presents the findings of the study including the description of the final sample and the teacher knowledge and student outcomes assessment results. In addition, the relationships between teacher knowledge and student outcomes, and the relationships between teacher demographics, teacher knowledge, and student outcomes will be presented.

Chapter V contains a discussion of the results and recommendations for further research. The results will be discussed including the assessment results for teacher knowledge and student outcomes, the relationships between the teacher knowledge and student outcomes, and the relationships between the teacher demographics, teacher knowledge, and student outcomes. This discussion will be followed by a presentation of the implications, generalizations, assumptions, and limitations of the study. The dissertation will close with conclusions and recommendations for further research.
CHAPTER 2
REVIEW OF LITERATURE

Introduction

This review of literature will focus on the content knowledge base for teaching beginning reading and will be separated into three sections: teacher knowledge about beginning reading; the cognitive-linguistic base of beginning reading; and effective instruction for students at risk for reading difficulties.

In section 1, teacher knowledge about beginning reading including content knowledge, historical trends in beginning reading instruction, current knowledge of reading instruction, and the present status of teacher knowledge will be discussed.

In section 2, the cognitive-linguistic base of beginning reading, including theoretical foundations of reading, knowledge of language, and linguistic components for successful word recognition including alphabetic knowledge, phonemic awareness, phonics, phonological recoding, and the four stages of word recognition will be discussed. This section will end with a discussion of fluency and reading comprehension as they relate to word recognition.

In section 3, research related to instruction for the population of students at risk for reading difficulties is discussed. It includes current findings in emergent literacy and preventing reading difficulties for at-risk readers. This section concludes with the characteristics of effective teachers.

Teacher Knowledge About Beginning Reading

Labaree (2000) stated, “You [cannot] be a good teacher unless someone is learning” (p. 228), which makes teaching an incredibly complicated task with required knowledge that is difficult to define. Excellent teachers master several types of knowledge, but effectiveness is first hinged on knowledge of content (Shulman, 1987).
Content Knowledge

For at-risk students to succeed in reading, they need knowledgeable educators. Due to the complexity of the teacher-student relationship, it is very difficult to establish exactly what teachers need to know and do to be excellent teachers; however, researchers agree that there is a knowledge base necessary for teaching (Collinson, 1996; Desforges, 2001; Shulman, 1987).

Several researchers have indicated that content knowledge is integral to the teaching and learning process (Collinson, 1996; Desforges, 2001; Shulman, 1987). According to Ehri (1998), teachers are responsible for teaching and assessing phonemic awareness and phonics knowledge, which presumes that they should possess this knowledge themselves. Additionally, Moats (1994) stated that teachers need language knowledge to teach reading effectively (Section 2 will address the specific cognitive-linguistic knowledge recommended for teachers of beginning reading.).

Although the evidence is clear that content knowledge is crucial to teaching reading, many teachers lack requisite knowledge to efficiently instruct their students in beginning reading (Moats; Adams & Bruck, 1995). This discrepancy is at least partially due to the constant flux in reading instruction, which has lead to different content knowledge required to teach beginning reading throughout the decades.

Historical Trends in Beginning Reading Instruction

In the United States, teacher knowledge about beginning reading has been influenced by the perpetually changing trends in teaching and learning. Reading instruction has oscillated from one emphasis to another, often due to strong opinions about a particular method or adaptation of an old method following the publication of a new finding. During the twentieth century, word recognition instruction, alone, shifted from emphasis on identifying words by using letter-sound associations to emphasis on identifying whole words through varying strategies including sight and context. These swings affected the knowledge teachers needed to implement prescribed methods.

Until the late 1920s, teachers used letter-sound knowledge to teach students to decode words using phonics (Flesch, 1955). Because this type of instruction was typically taught through skill-and-drill exercises and focused less on reading for
meaning, it was considered by many educators to be drudgery. As a backlash, teachers were taught to teach reading using the look-say method, the identification of whole words by sight, rather than letter-sound knowledge. The look-say method persisted in the schools from the 1930s to the 1950s (Beck & Hamilton, 2000).

During the look-say period, the theory of reading readiness emerged (Flesch, 1981). This theory, which hypothesized that children were not ready to read until the mental age six and a half (Morphett & Washburne, 1931), persisted in schools until the 1980s (Flesch, 1981). Followers of the reading readiness theory withheld formal reading instruction until the children had mastered basic developmental skills such as knowing their colors and recognizing the letters of the alphabet. Some of these skills, like alphabet recognition, were beneficial for learning to read (Adams, 1990), but others were not. Unfortunately, reading was not taught until all of the skills were mastered.

In 1955, Flesch published the best selling book *Why Johnny Can’t Read*, which opposed whole word methods and called for a return to phonics instruction. This book was initially rejected by the educational establishment, but eventually contributed to the resurgence of some phonics instruction by the mid 1960s (Beck & Hamilton, 2000). In order to implement this instruction, teachers needed to know, once again, about the alphabetic principle.

In the following decade, Chall wrote *Learning to Read* (1967), which validated a phonics approach and established credibility in code-emphasis instruction. The emphasis was on identifying words by using letter-sound associations rather than whole word recognition or other meaning-based cues (Beck & Hamilton, 2000). Almost 20 years later, Anderson, Hiebert, Scott, and Wilkinson (1985) published *Becoming a Nation of Readers*, which reported that phonics instruction was most effective for teaching children to read words. Phonics instruction, although not necessarily systematic, continued to have a prominent presence in reading programs until the mid 1980s (Beck & Hamilton).

Two cooperative theories became prominent in the schools in the 1980s: emergent literacy and whole language. The emergent literacy theory replaced the reading readiness theory, and held that children’s knowledge and literacy experiences were acquired before conventional reading and writing. The emphasis was on
developmentally appropriate instruction and the use of the child’s interest and experiences to encourage reading (Slegers, 1996).

In the beginning, the emergent literacy and whole language theories supported each other. The widespread dissemination of the whole language movement, which held that reading and writing were naturally learned through authentic experiences and that reading instruction should progress from whole to part, was marked by the publication of California’s English/Language Arts Framework in 1986 (Beck & Hamilton, 2000). The primary strategy for teaching word recognition was using the context of the sentence to figure out the unknown word, which was a type of whole word strategy. The whole language movement continued to proliferate in classrooms throughout the 1990s.

For the next few decades, teachers were trained in the whole language method, and returned to teaching students to read words through whole word exposure in the context of a meaningful sentence. Through preservice and inservice training, teachers were presented with the views of the whole language movement, which affected teacher knowledge. According to Weaver (1998), whole language advocates approach education with the philosophy “…that children will learn to read and write by being supported in actually reading and writing whole texts-not by being required to do limited activities with bits and pieces of language” (p. 7).

Goodman and Goodman (1979) had similar views, about learning to read, that were widely distributed. Accordingly, “Children learn to read and write in the same way and for the same reason that they learn to speak and listen” (p. 138). Likewise, Holdaway (1979) reported “…there is a wealth of evidence...indicating that literacy skills develop in the same ‘natural’ way as spoken language when the conditions for learning are comparable” (p. 20). Clay (1991) also reported that learning to read is a holistic process, and pondered “…how little real guidance children got when teachers were led to believe that learning to read and write depended upon learning the letters, and learning the sounds that letters make” (p. 175). These philosophies did not emphasize extensive teacher knowledge of the alphabetic principle, and in fact seemed to discourage it.
There is evidence that reading achievement began to decrease as teachers were expected to implement whole language. According to the Nation’s Report Card (2001), which began a longitudinal study of reading achievement in 1971, although reading scores in nine-year-old students have improved since the beginning of the assessment, there have been no improvements in reading since 1980. Ironically, Chall’s 1967 code-based findings were reconfirmed in 1990 when Adams published *Beginning to Read*, advocating systematic phonemic awareness and phonics instruction along with emphasis on gaining meaning from text. Recent research has investigated the various whole word and letter-sound claims with some distinct findings.

**Current Knowledge of Reading Instruction**

There have been a significant number of research studies devoted to analyzing whether letter-sound or whole word strategies are best for teaching beginning reading, thus affecting content knowledge about beginning reading. The three reading approaches that have been investigated are direct instruction of whole words or the look-say method, identifying words through context or the preferred whole language method for identifying words, and using the alphabetic principle to identify words or phonics.

Contrary to past beliefs about the look-say method, research has indicated that direct instruction in the pronunciation and meaning of each word is unlikely to account for the extensive word recognition needed for adequate reading comprehension of the English language (Share & Stanovich, 1995). English has about 88,500 word families (Nagy & Anderson, 1984) and fifth graders encounter about 10,000 new words during that year alone (Nagy & Herman’s, 1987). Furthermore, students using logographic systems, where each word is represented by a different symbol, learn to read only a few hundred word representations per year (Mason, Anderson, Omura, Uchida, & Imai, 1989). Therefore, this strategy does not explain the extensive word acquisition required for proficient word recognition in the alphabetic system of the English language (Share & Stanovich, 1995).

When attempting to identify an unknown word from context, children accurately identify 10% to 20% of unknown content words and 40% of unknown function words (Gough, 1983). Thus, the successful use of context for recognizing the pronunciation of
unknown words that encapsulate the meaning of the sentence occurs between 1 in 5 and 1 in 10 attempts. Although context clues do help in figuring out the meaning of words, the strategy of using context to figure out the pronunciation of unknown words has proven to be inefficient (Share & Stanovich, 1995). Furthermore, contrary to the theory that good readers sample the text for meaning, studies of eye movement during reading show that proficient readers look at almost every word when they are reading (Just & Carpenter, 1980).

The only word recognition theory that has been substantiated is that students learn to read words through mastery of the alphabetic principle (Share & Stanovich, 1995). In fact, the instructional strategies of using context clues or letter-sound correspondences to identify words have been contrasted. In a study of 80 first graders (Foorman, Francis, Novy, & Liberman, 1991), half of whom were taught letter-sound correspondence while the other half were taught identification of words in meaningful contexts, the letter-sound group had more success in segmenting words. This led to word recognition and, in turn, to accelerated growth in reading. At the end of the year, the letter-sound group had developed orthographic representation strategies, but the context group was still developing alphabetic strategies.

Furthermore, Share and Stanovich (1995) consolidated the empirical reading research and found that, although the ultimate goal of reading is to gain meaning from print, learning to read is not natural and children need to be taught how to apply the alphabetic principle to read words. In the late 1990s and early 2000s, additional studies supported these findings (Lyon, 1998; Snow et al., 1998; Moats, 1999; NRP, 2000).

Most recently, the No Child Left Behind Act of 2001 was passed to improve the achievement of all children in the country, and Reading First was developed to implement the reading aspect of this law (Introduction: No Child Left Behind, 2002). The goals of Reading First are to ensure that all students in kindergarten through third grade receive the instruction necessary for successful early reading, and that all students read on or above level by the end of third grade. Reading programs are supposed to incorporate the Reading Framework detailed in Put Reading First: The Research Building Blocks for Teaching Children to Read (Armbruster et al., 2001), which advocates systematic phonemic awareness and phonics instruction, as well as
explicit instruction in fluency, vocabulary, and comprehension. The Reading First recommendations should lead to an increase in teacher knowledge about the alphabetic principle, since teachers must have explicit knowledge of phonemic awareness and phonics to implement this instruction.

Reading instruction has a continuously evolving history, which has significantly affected teacher knowledge about beginning reading and the alphabetic principle. Consequently, a significant portion of the student population have been affected by this continuous polarization of reading instruction and the enthusiastic adherence to methods that have conflicting findings in the empirical research. In order to ensure that all students learn to read, rigorous research must be continually conducted and the most accurate knowledge must be delivered to and implemented by teachers.

Present Status of Teacher Knowledge

Since explicit instruction in the alphabetic principle maximizes the chance for reading success (NRP, 2000), the content knowledge base for beginning reading should include thorough knowledge of the alphabetic principle and, potentially, that of comprehensive knowledge of language (Bos et al., 2001; Mather et al., 2001; McCutchen et al., 2000; McCutchen et al., 2002).

Although knowledge about beginning reading should begin with preservice training, evidence indicates that too few future teachers are being taught the basics of the English language, reading development, and the specifics of teaching children with reading difficulties (Lyon, 1998). Many future teachers are not receiving adequate training, and many inservice teachers, taught to use whole language, are not well versed in phonics instruction (Rayner et al., 2001). Additionally, many teachers are not informed about current research (Moats, 1994; Torgesen, 2001a), and, therefore, have not had opportunities to expand their knowledge.

Since instruction for children at risk for reading difficulty should be more intense, explicit, and supportive (Torgesen, 2002b), it is important that teachers possess language knowledge to successfully teach students to read words. This specific content knowledge is detailed in the following section.
The Cognitive-Linguistic Base of Beginning Reading

This section will focus on the cognitive-linguistic base of reading, with discussions including theoretical foundations of reading, knowledge of language, word recognition, the alphabetic principle, the alphabet, phonemic awareness, phonics, phonological recoding, the four stages of reading, fluency, and comprehension.

Theoretical Foundations of Reading

For this study, the simple view of reading, as outlined by Gough and Tunmer (1986), is considered, whereby reading is the product of word recognition and comprehension. According to Gough and Tunmer, word recognition is learned through mastery of phonemic awareness and phonics. Since it is unlikely that children will decipher the code from exposure to whole words alone, it is necessarily for students to be taught the code explicitly. In contrast, comprehension is the ability to understand language and is developed in a similar manner as learning to comprehend oral language. For successful reading to occur, students must be proficient in decoding and comprehension (Gough & Tunmer).

Adams (1994) has developed a similar theoretical reading framework based on cognitive processing. She believes that reading and writing involve an interaction between orthographic, phonological, meaning, and context processing in the brain. The orthographic processor receives information from written text, and attempts to translate the print into speech. As one becomes a more developed reader, the orthographic processor adds visual representations of words and parts of words to the long-term memory based on the correspondence of the spelling to phonology. The phonological processor assists this process, and also helps the reader translate speech into print. The meaning processor helps the reader determine the meaning of the orthographic units and text in general, and the context processor interprets the text, using the context to construct meaning. All four parts must work together for reading to occur.

If the simple view (Gough & Tunmer, 1986) is applied to Adam’s model, the orthographic and phonological processor correspond to word recognition, and the meaning and context processor correspond to comprehension. Figure 1 illustrates the interaction of these models. This dissertation will focus on the word recognition aspect of the process.
Adapted from Adams, 1994.

Figure 1
Theoretical Foundations of Reading
Knowledge of Language

According to Parker and Riley (2000), specialists in reading are “…in need of a solid grounding in the core areas of pragmatics, semantics, syntax, morphology, and phonology” (p. 3). Understanding the core areas of linguistics leads to the ability to apply the necessary areas to their own specialty.

Moats (2000) divided the understanding of linguistics into lower level and upper level language knowledge. Lower level language knowledge, required to construct words, involves phonology and morphology, and includes phonemes, letters, syllables, and morphemes. Upper level language knowledge, required to decipher units bigger than words, involves syntax, semantics, and pragmatics, and includes phrases, sentences, and paragraphs. Although not the major focus of this study, consideration will be given to lower level language knowledge as it relates to the alphabetic principle and student reading outcomes.

Moats (2000) theorized that teachers of beginning reading need a broad knowledge of lower level language, or comprehensive language knowledge, including knowledge of phonology (speech sounds), orthography (spelling systems), and morphology (units of meaning such as affixes). There research evidence to support teachers’ thorough mastery of comprehensive language knowledge is lacking; however, this knowledge might be beneficial for instructing more advanced readers. There is more evidence to support teacher knowledge of phonology because teachers need this knowledge to directly teacher the alphabetic principle.

According to Moats (2001), “Knowledge of phonology is very important for teachers of reading, spelling, or writing” (p. 42) since problems in these domains indicate potential reading difficulty. Teachers with limited knowledge of phonology and its relationship to print are less able to teach letter-sound knowledge explicitly and accurately, which may inhibit their ability to teach reading and spelling.

Word Recognition

Teachers who understand phonology are better able to explicitly identify its relationship to print, which helps them assess and instruct their students as they learn to
read. The skills that learners use to translate print into speech and thus become proficient readers inform what teachers need to know to teach reading.

As previously presented, proficient word reading is essential for reading success (Rayner et al., 2001) and students develop word recognition through mastery of the alphabetic principle (Share & Stanovich, 1995). These fundamental skills are examined beginning with alphabet recognition, phonemic awareness, and expanding knowledge of the alphabetic principle, and concluding with an overview of fluency and comprehension as related to word recognition. This progression will give an indication of the content knowledge teachers need to develop word-reading skills with their students.

**The Alphabetic Principle**

According to the IRA literacy dictionary, the alphabetic principle is “the assumption underlying the alphabetic writing system that each speech sound or phoneme of a language should have its own distinctive graphic representation” (Harris & Hodges, 1995, p. 7). Research has consistently indicated that successful readers master the alphabetic principle (Rayner et al., 2001), and use this knowledge to develop an orthographic, or sight word, representation of each word (Share & Stanovich, 1995). The alphabetic principle is taught through phonics instruction, which “emphasizes the relationship between graphemes (printed letters) and phonemes (their associated sounds)” (Rayner et al., 2001, p. 32). There are several steps necessary to master the alphabetic principle.

**The alphabet.**

Students need knowledge of letters and sounds to master the alphabetic principle. The first step is learning to identify the letters of the alphabet. In an extensive review, Chall (1983) found that early knowledge of the alphabet promotes reading achievement. Similarly, Adams (1990) found that reading achievement was best predicted by students’ early ability to recognize and identify uppercase and lowercase letters.

There are several theories that explain this phenomenon. Letter recognition might predict reading success because it requires memorization of seemingly meaningless information, which is similar to memory of phonological information. Additionally, blending, which is needed for initial word identification, similarly taxes the
short-term memory (Share & Stanovich, 1995). Students who learn letter names effortlessly often learn future skills with similar ease; therefore, students who can automatically produce these names may rapidly recall orthographic representations later. Another theory is that the letter names are closely related to letter sounds, so students who have learned the alphabet master letter sounds quickly and also use cues from their letter name knowledge (Adams, 1990).

*Phonemic awareness.*

In addition to learning the letters of the alphabet, students need to develop phonemic awareness or knowledge of phonemes, which “…involves teaching students to focus on and manipulate phonemes in spoken syllables” (NRP, 2000, p. 7). Phonemic awareness does not involve analysis of print; however, it is the precursor to developing an understanding of the alphabetic principle and a subsequent sight word vocabulary that leads to reading comprehension. Studies of elementary students have identified the importance of phonemic awareness (Torgesen & Mathes, 2000) in predicting future reading achievement.

According to a meta-analysis of 52 studies (NRP, 2000), students who received instruction in phonemic awareness had better phonemic awareness and lasting effects in reading and spelling skills. More specifically, explicit and systematic teaching of phoneme manipulation, using only one or two strategies in small groups, yielded the greatest gains in phonemic awareness (NRP).

Foorman, Jenkins, and Francis (1993) found that first and second graders were more likely to read and spell words that had been correctly segmented. There was a causal link between phonological awareness and reading and spelling. Additionally, the researchers determined that phonological awareness of beginning and ending sounds is a prerequisite for reading and spelling, and awareness of middle sounds and consonant blends is a consequence of reading and spelling.

In a longitudinal study conducted in a low- socioeconomic elementary school with a large minority population, Juel (1988) followed 54 students from first to fourth grade. The poor readers identified in the study entered first grade with little phonemic awareness. At the end of first grade, the poor readers could not read any pseudowords, which Juel suggested was an indication of lack of mastery of the alphabetic principle.
The poor readers did improve their phonemic awareness, but were still lower in phonemic awareness at the end of first grade than were their better reading peers at the beginning of first grade. Furthermore, in an in-depth study of retention in first grade, Juel and Leavell (1988) found that students weak in word recognition, and retained in first grade, benefited from retention if they received additional training in phonemic awareness.

Students who have mastered the alphabet and phonemic awareness can begin to translate print into speech. To increase the likelihood that teachers will explicitly instruct their students during this process and maximize reading success, they need to know how letters represent the sounds.

*Phonics.*

Phonemic awareness gives meaning to letter-sound correspondences by helping the learner understand the alphabetic principle. The National Reading Panel (2000) conducted a meta-analysis of 38 phonics studies and found that students in kindergarten through sixth grade benefited from systematic phonics instruction and this led to fluent reading and writing. First graders who were taught phonics systematically had better decoding skills and improved comprehension. Additionally, systematic synthetic phonics instruction was more effective in improving alphabetic and word recognition skills with students from low socioeconomic status than were other approaches. Snow et al. (1998) reported similar findings in their large-scale study of reading research.

Opponents of phonics instruction allege that it will produce *word callers* who are able to pronounce the words that they encounter, but are not able to understand what they are reading (Juel, 1988). By definition, a *word caller* would be able to comprehend a passage that was transmitted orally, but not a passage of equal difficulty that they read independently. Juel did not find any *word callers* with good word recognition and listening comprehension, and poor reading comprehension.

*Phonological recoding.*

Students apply their knowledge of the alphabetic principle to develop a repertoire of words recognizable by sight. Share (1995) developed the self-teaching model to explain the learner's development of orthographic representations. In this model,
students use phonological recoding, where they translate the grapheme representation of the word into speech by deciphering the sounds from the letters and then blend the sounds together to make a word. For successful phonological recoding, the student should use the alphabetic principle to identify the word correctly. Students need varying amounts of experience with a word to develop a permanent orthographic representation using phonological recoding. Once the orthographic representation is established, the student has automatic lexical (word) access. This, in turn, improves reading fluency and spelling abilities. Skilled readers recognize words with such automaticity that the translation of print to speech is not evident during reading.

The four stages of word recognition.

Ehri (1998, 2002) has identified the stages that explain how students gain word recognition skills. Ehri’s theory expands the phonological recoding theory, and together they explain word recognition acquisition. Words become useful sight words when the reader recognizes their pronunciation and meaning automatically. Ehri calls the process of learning to read new sight words a connection-forming process. The reader forms connections among grapheme representations, pronunciations, and meanings of words.

According to Ehri (1998, 2002), students go through four stages in sight word reading. First, students use visual cues to recognize words. This is termed the pre-alphabetic stage. An example would be “reading” the McDonald’s sign. During this stage, students are not able to read a known word if the presentation of the word changes, such as removal of the golden arches from the McDonald’s sign. Next, in the partial alphabetic stage, students use developing knowledge of grapheme-phoneme representations to decode words using a combination of other strategies. They might know some of the letters in the word, and combine this knowledge with a picture or other cue to correctly identify the word. For example, a child might combine the letter “k” and a picture to identify the word kitten. In the full alphabetic stage, students decode words using grapheme-phoneme representations. They do not need any other support to read the word. Finally, in the consolidated alphabetic phase, readers develop orthographic representations of words and parts of words by remembering portions of grapheme-phoneme representations. In this final stage, students can recognize whole
words, and apply their knowledge of existing orthographic representations to identify new words (Ehri, 1998, 2002).

Fluency

Although the focus of this study is teacher knowledge of the alphabetic principle and comprehensive language knowledge, teachers should know how mastery of these contribute to fluent reading for meaning. In order to become fluent readers, students must be able to apply the alphabetic principle to decode words and subsequently gain automaticity in word recognition. Students struggling to identify every word are unlikely to extract meaning from the entire text because all of their energies are being devoted to word recognition. Competent readers recognize words with such ease that they can focus on comprehension (Ehri, 1998,2002). This is developed through increased knowledge of words and experiences with text (Rayner et al., 2001). According to Adams (1990), “Proficient reading comprehension depends not just on the ability to recognize words, but the ability to recognize them relatively quickly and effortlessly” (p. 27). Therefore, to read successfully, the student must be able to fluidly translate print into speech.

The National Reading Panel (2000) conducted an analysis of 16 fluency studies, and found that guided repeated oral reading improved word recognition, fluency, and comprehension. Hiebert and Fisher (2002) examined a variety of studies and concluded that texts with controlled vocabulary are more beneficial for developing fluency than literature-based series that have fewer word repetitions. In a review of intervention studies, Torgesen, Rashotte, and Alexander (2001) found that it is more difficult to improve fluency in older struggling readers than it is to improve word recognition and reading comprehension. These findings on fluency are supported by the self-teaching theory (Share, 1995) because more experiences with text give multiple opportunities to develop an orthographic representation of each word.

Reading Comprehension

Teachers should keep the goal of reading comprehension in mind while building word recognition with their students. Students need to be fluent in the alphabetic principle, but “…at the same time, both the use and acquisition of such knowledge depend on the child’s fuller understanding of and interest in the reading process”
According to Snow (2002), “Children who can read words accurately and rapidly have a good foundation for progressing well in comprehension” (p. 8). When students learn the code early, they can then expand their knowledge of vocabulary, concepts, and texts through a variety of reading experiences (Beck & Juel, 1995).

Effective Instruction for Students At Risk for Reading Difficulties

This section will focus on instruction specific to the population of this study: students who are at risk for reading difficulties. The findings related to emergent literacy and preventing reading difficulties in at-risk learners will be explored. It will also consider characteristics of effective instruction that build on the teachers’ language knowledge.

The population for this study is at-risk readers with specific instructional needs for learning to read. These readers often fail to fully develop emergent literacy concepts without explicit instruction from a knowledgeable teacher. Likewise, they need instruction focused on prevention of reading difficulties including explicit instruction in the alphabetic principle.

**Emergent Literacy**

Researchers are beginning to reexamine emergent literacy, especially as it relates to children from low-income backgrounds. In particular, concern has been voiced about developmentally appropriate instruction. Hirsch (1996) stated:

…when an elementary school declines to teach demanding knowledge and skills at an early age, the school is unwittingly withholding education differentially from different social classes. As a result, the doctrine of developmental appropriateness, which holds back all students, has had especially deleterious effects on disadvantaged children and on social justice (p. 249).

This view is supported by the finding that children from low-income homes are less likely to encounter a plethora of home literacy experiences (Peterson, 1997; Whitehurst & Lonigan, 1998), and, therefore, are less likely to have a broad understanding of literacy. Whitehurst and Lonigan have developed a new model of emergent literacy supporting the development of literacy skills both outside-in, such as
language and conceptual knowledge which progresses from whole to part, and inside-out, such as phonological awareness and letter knowledge, which progresses from part to whole. This model requires teachers to know the alphabetic principle, and can lead to more direct instruction focused on preventing reading difficulties.

Furthermore, based on a review of literature, Chall (1983) found that in early reading development, code-oriented programs produced better word recognition and reading comprehension outcomes than programs that emphasized identification of whole words by sight, especially for children from lower socioeconomic status. Additionally, direct phonics instruction, where students are explicitly taught phonics concepts, was more effective than indirect phonics instruction, where students are expected to extrapolate phonics concepts from experiences with words. She hypothesized that students, not surrounded by literacy experiences at home or by adults who encourage reading, have fewer opportunities to discover letter-to-sound relationships on their own, and need explicit instruction. Students who receive direct instruction in the alphabetic principle as they are learning to read are less likely to have long-term reading difficulties.

_Preventing Reading Difficulties_

Evidence leads to the conclusion that teacher knowledge of language, and more specifically knowledge of the alphabetic principle, could help prevent reading disabilities. The most prevalent reading disability occurs at the level of word recognition, either with phonological awareness and/or fluent recognition of words (Torgesen, 1998), which can be affected by many causes, including instruction (Torgesen, 1999b) and genetics (Torgesen, 1999a).

According to Torgesen (2001a), “Current research suggests that appropriate attention to building early literacy can actually prevent the occurrence of reading difficulties in a significant proportion of children who would otherwise be at risk for special education referral” (p. 1) and, similarly, “Intensive preventive instruction can bring the average word reading skills of children at risk for reading disabilities solidly into the average range” (Torgesen, 2002a, p. 5). An analysis of empirical studies found that children receiving phonemically explicit training showed the best growth in word reading (Torgesen, 2000).
Similarly, Foorman, Francis, Shaywitz, and Fletcher (1997) found that children who struggle with literacy skills typically have a deficit in word recognition as opposed to a developmental lag. Intervention should occur as early as possible when problems with word recognition are indicated, instead of waiting for struggling readers to catch up developmentally (Foorman et al.). The goal of prevention should be maintaining word recognition skills at normal levels, because if the at-risk students’ skills are on level, they will be able to read independently and accurately (Torgesen, 2001b).

Foorman, Frances, Fletcher, Schatschneider, and Mehta (1998) studied 285 first and second-grade children who were at risk for reading failure. During the 90-minute language arts block, children received one of three types of instruction: direct code, which utilized explicit instruction in the alphabetic principle combined with reading of decodable text; embedded code, which used less direct instruction in the alphabetic principle through identification of onsets and rimes while reading connected text; and implicit code, which included incidental phonics instruction embedded in connected text.

While the *embedded code* and *implicit code* groups had a higher percentage (38% and 46%) of students with little or no growth in word reading, only 16% of the *direct code* group had small or no growth in word reading. On a standardized test, the *direct code* group averaged 43rd percentile in decoding and 45th percentile in reading comprehension, whereas the other groups had lower average scores in both decoding (embedded-27th percentile and implicit-29th percentile) and reading comprehension (embedded-33rd percentile and implicit-35th percentile). This study showed that direct instruction in the alphabetic principle is most effective for teaching reading to first and second grade students who are at risk for reading failure (Foorman et al., 1998).

In a study of first graders at risk for reading difficulty, Gaskins, Ehri, Cress, O’Hara, & Donnelly (1996) also found that students were not able to identify words until they were explicitly taught individual letter-sound correspondences. The class had previously been taught to read words by onset-rime analogy (such as using the word *cat* to read the word *fat*), but the weaker readers did not make discoveries about word reading on their own. These students needed explicit instruction in how to decode new words, and once instructed, went through stages of word learning to improve their reading abilities.
The amount of time taken to fully develop phonics knowledge varies from child to child. In a study of 30 children from low socioeconomic status, Chall, Jacob, and Baldwin (1990) found that above-average readers obtained perfect scores on phonics assessments by fourth grade; however, below-average readers did not make this achievement until seventh grade.

Students who are at risk for reading difficulty compose the population having the greatest need for effective instruction because they are least likely to receive academic support at home; however, all students benefit from excellent instruction. Some students do gain knowledge of the code implicitly, but based on the high rate of reading failure, it is evident that many children do not. According to Moats (1999), “…research indicates that although some children will learn to read in spite of incidental teaching, others never learn unless they are taught in an organized, systematic, efficient way by a knowledgeable teacher using a well-designed instructional approach” (p. 7). The research on preventing reading difficulties leads to the conclusion that teachers need explicit knowledge of the alphabetic principle to be effective with their students.

### Characteristics of Effective Teachers

Teachers must possess knowledge of reading content to implement instruction effectively. If nearly all children are to learn to read, teachers must deliver instruction that facilitates student learning. Several qualitative studies have assessed the characteristics of effective teachers.

Wharton-McDonald, Pressley, and Hampston (1998) studied suburban teachers and they found that the more effective teachers combined systematic, explicit instruction in the alphabetic principle with other strategies including instructional balance, a literature-rich environment with extra support for struggling readers, and integration of reading and writing activities. In a qualitative study of teacher effectiveness, Pressley et al. (2001) also found that more effective teachers provided a balanced literacy environment and a scaffolded curriculum.

Pressley, Rankin, and Yokoi (1995) conducted a survey of 83 kindergarten, first, and second-grade teachers nominated by their supervisors as effective literacy instructors. The teachers taught in schools with an average of 38% of students qualifying for free lunch. According to the survey, the teachers conveyed that they
provided similar instruction to all of their students; however, students with lower skills received more intense instruction. Pressley et al. concluded that the effective teachers needed language knowledge in order to provide more intense instruction.

Researchers have also examined effective teachers teaching children whose families live in poverty. While attempting to understand how to maximize effectiveness with students from high-poverty environments, Taylor, Pressley, and Pearson (2000) reviewed the literature and found that research converges on several traits of effective teachers. There is an association between excellent teaching and a balanced approach to literacy that is scaffolded with skill-based instruction. Additionally, excellent teachers use small group instruction to improve skills. These traits are indicative of the explicit, intense, and supportive instruction necessary to prevent reading difficulties in students (Torgesen, 2002b).

Based on a review of qualitative studies of reading instruction, Pressley (1994) suggested that students who are at risk for reading difficulties, such as those coming from lower socioeconomic homes, need reading instruction that is more explicit than whole language. Once students have learned to read, explicit instruction allows children to apply their skills to authentic literacy experiences. Furthermore, Pressley found a relationship between explicit phonemic awareness instruction and improvement in children’s reading skills, which led to subsequent reading achievement.

Since studies of characteristics of effective teachers have predominately been qualitative and have not been associated with class-wide outcomes, the next step in investigating effective teaching is to associate quantitative measures of student achievement with teachers’ knowledge about beginning reading.

Summary

Evidence exists that almost all children can be taught to read through explicit instruction in the alphabetic principle. Teachers, especially those who teach at-risk students, must have enough language knowledge to deliver this content; however, many practicing teachers are not prepared to deliver the instruction effectively.

Therefore, this study will examine teacher knowledge of the alphabetic principle and the reading outcomes of students at risk for reading difficulties. Additionally, since the breadth of language knowledge has not been established, teachers’ comprehensive
language knowledge, vocabulary knowledge, and student reading outcomes will be explored.
CHAPTER 3
METHODOLOGY

Introduction

This chapter details the methodology used to conduct this study. It includes the school setting, population, development of the teacher instrumentation, student assessments, teacher and student assessment procedures, and analysis.

The goal of this study was to examine the relationship between explicit teacher knowledge of the alphabetic principle, comprehensive language knowledge, and vocabulary knowledge, and student outcomes in reading in first-grade students attending low-income schools. In addition, teacher demographics were examined in relation to teacher knowledge and reading outcomes. Using teacher and student assessments, this study sought to answer the following questions:

What is the relationship between teachers’ explicit knowledge of the alphabetic principle and reading outcomes in first-grade students attending low-income schools?
What is the relationship between teachers’ comprehensive knowledge of language and reading outcomes in first-grade students attending low-income schools?
What is the relationship between teachers’ vocabulary knowledge and reading outcomes in first-grade students attending low-income schools?
What is the relationship between teacher demographics (number of years teaching, highest degree earned, decade last degree earned, and number of reading courses taken) and explicit knowledge of the alphabetic principle?
What is the relationship between teacher demographics (number of years teaching, highest degree earned, decade last degree earned, and number of reading courses taken) and comprehensive language knowledge?
What is the relationship between teacher demographics (number of years teaching, highest degree earned, decade last degree earned, and number of reading courses taken) and vocabulary knowledge?

What is the relationship between teacher demographics (number of years teaching, highest degree earned, decade last degree earned, and number of reading courses taken) and student outcomes in reading?

Setting

This study was conducted in 15 Reading First schools from seven districts in Florida. To qualify for Reading First, schools must show that the percentage of fourth-grade students reading below level is greater than the state average, and at least 15% of the population is eligible for free or reduced lunch (Reading First in Florida, 2002).

As shown in Table 1, participating schools in this study not only met the minimum requirement of 15% of students receiving free or reduced lunch, but also had much higher rates of poverty. In fact, the average free and reduced lunch percentage for the schools participating in this study was 74%.

Population

The population included 69 first-grade teachers and 1146 first-grade students enrolled in Florida’s Reading First schools. As indicated in Table 1, the majority of the students received free and reduced lunch.

Instruments

A variety of instruments were used to assess the teachers and students. One test was designed to measure teacher knowledge of the alphabetic principle and two other tests were adapted to assess comprehensive knowledge of language and vocabulary knowledge. The tests were developed and/or selected to be correlated with student reading measures, which included the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) and the SAT/10. These tests assessed students’ phonemic awareness, phonics, and fluency skills (DIBELS) and reading comprehension (SAT/10).
Table 1  
School Demographics

<table>
<thead>
<tr>
<th>School</th>
<th>No. of Students</th>
<th>Racial Percentages</th>
<th>Free/ Reduced Lunch</th>
<th>Stability</th>
<th>FCAT Reading Achievement</th>
<th>FCAT Total Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
<td>White</td>
<td>Hispanic</td>
<td></td>
<td>High Standards</td>
<td>Learning Gains</td>
<td>Lowest 25%</td>
</tr>
<tr>
<td>1</td>
<td>541</td>
<td>15%</td>
<td>84%</td>
<td>1%</td>
<td>69%</td>
<td>94%</td>
<td>64%</td>
</tr>
<tr>
<td>2</td>
<td>531</td>
<td>67%</td>
<td>25%</td>
<td>3%</td>
<td>65%</td>
<td>93%</td>
<td>69%</td>
</tr>
<tr>
<td>3</td>
<td>730</td>
<td>13%</td>
<td>72%</td>
<td>10%</td>
<td>64%</td>
<td>94%</td>
<td>73%</td>
</tr>
<tr>
<td>4</td>
<td>696</td>
<td>19%</td>
<td>74%</td>
<td>3%</td>
<td>56%</td>
<td>95%</td>
<td>74%</td>
</tr>
<tr>
<td>5</td>
<td>703</td>
<td>44%</td>
<td>48%</td>
<td>4%</td>
<td>76%</td>
<td>91%</td>
<td>57%</td>
</tr>
<tr>
<td>6</td>
<td>787</td>
<td>20%</td>
<td>69%</td>
<td>7%</td>
<td>67%</td>
<td>91%</td>
<td>70%</td>
</tr>
<tr>
<td>7</td>
<td>869</td>
<td>2%</td>
<td>84%</td>
<td>12%</td>
<td>74%</td>
<td>94%</td>
<td>79%</td>
</tr>
<tr>
<td>8</td>
<td>855</td>
<td>74%</td>
<td>6%</td>
<td>18%</td>
<td>77%</td>
<td>90%</td>
<td>50%</td>
</tr>
<tr>
<td>9</td>
<td>480</td>
<td>77%</td>
<td>9%</td>
<td>7%</td>
<td>77%</td>
<td>89%</td>
<td>69%</td>
</tr>
<tr>
<td>10</td>
<td>692</td>
<td>63%</td>
<td>33%</td>
<td>1%</td>
<td>82%</td>
<td>92%</td>
<td>54%</td>
</tr>
<tr>
<td>11</td>
<td>594</td>
<td>10%</td>
<td>79%</td>
<td>8%</td>
<td>79%</td>
<td>92%</td>
<td>65%</td>
</tr>
<tr>
<td>12</td>
<td>590</td>
<td>93%</td>
<td>5%</td>
<td>0%</td>
<td>74%</td>
<td>94%</td>
<td>47%</td>
</tr>
<tr>
<td>13</td>
<td>333</td>
<td>89%</td>
<td>2%</td>
<td>10%</td>
<td>85%</td>
<td>93%</td>
<td>46%</td>
</tr>
<tr>
<td>14</td>
<td>390</td>
<td>95%</td>
<td>3%</td>
<td>0%</td>
<td>96%</td>
<td>85%</td>
<td>47%</td>
</tr>
<tr>
<td>15</td>
<td>587</td>
<td>64%</td>
<td>32%</td>
<td>0%</td>
<td>65%</td>
<td>92%</td>
<td>72%</td>
</tr>
<tr>
<td>Average</td>
<td>625</td>
<td>50%</td>
<td>42%</td>
<td>6%</td>
<td>74%</td>
<td>92%</td>
<td>62%</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Number of students, racial percentages, free and reduced lunch percentages, and stability rates were retrieved from Florida School Indicators Report (2003).  FCAT data and school grades were retrieved from Florida School Grades (2004).

Teacher Instruments

Selecting the teacher instruments began with a comprehensive review of the literature to establish a rationale for a test of explicit knowledge of the alphabetic principle and a test of comprehensive language knowledge. Then, previously published assessments that measured teachers’ beginning reading knowledge and language knowledge were identified and reviewed.

Following examination of these measures, instrument development was undertaken to adapt and construct each test: first a test of knowledge of phonemic awareness and phonics, then a test of comprehensive language knowledge, and finally a test of vocabulary knowledge. This included the tests’ adaptation and construction, initial field tests, and assessments of validity and reliability. Then, the overall format for the tests was completed. Each of these steps is discussed, in turn, in the remaining sections.
Test Rationale

The selection of a test to adapt to assess phonemic awareness and phonics knowledge was based on an aspect of the consensus documents that address empirically based reading acquisition theory (Snow et al., 1998; NRP, 2000). In particular, at-risk students need explicit instruction in phonemic awareness and phonics in order to become proficient in word recognition (Armbruster et al., 2001). Phonemic awareness, phonics, and fluency development are necessary for accurate and automatic word recognition, and vocabulary and comprehension are necessary to gain understanding of text. Although the ultimate goal of reading is to understand what one reads, word recognition must be present for comprehension to be possible (Gough & Tunmer, 1986).

The consensus documents focus primarily on instruction; however, a prerequisite for delivery of explicit instruction in the alphabetic principle is explicit knowledge of the principle. Therefore, the desired focus of this test was explicit knowledge of phonemic awareness and phonics.a

Previous Measures of Teacher Knowledge About Beginning Reading

Before designing a test, several existing tests were reviewed based on the goals of this study. First to be examined was Rude’s (1981) Knowledge Test of Reading for Elementary School Teachers, which explored minimum competencies for teaching reading. The development of this test was aided by 36 professors and 455 teachers, and reliability and validity measures were provided. The content, however, reflected the research base established before 1981, which has dramatically changed since then. As presented in Chapter 2, recent research suggests that teaching the alphabetic principle is more effective for developing word recognition than direct instruction of whole words and use of context (Share & Stanovich, 1995).

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According to the author, the test assesses knowledge of the alphabetic principle. stands for the following:

a As discussed in the first chapter, since the test is a written assessment and phonemic awareness is an oral language activity, the test assesses knowledge of the alphabetic principle.
Next, Troyer and Yopp’s (1990) survey was reviewed. This self-reporting questionnaire focused on kindergarten teachers’ perceived level of phonemic awareness knowledge and the importance of segmentation. The responses were presented on a Likert-type scale. The strengths of the questionnaire were its large number of respondents (n=165) with a range of experience levels and a focus on phonemic awareness. However, it lacked validity and reliability measures, and relied on self-reports. The questionnaires’ sole focus on phonemic awareness, in light of the designated purpose for this study, as measuring both phonemic awareness and phonics, was also a limitation.

Moats’ (1994) Informal Survey of Linguistic Knowledge was also examined. This survey was designed to assess teachers’ knowledge of phonemes, phoneme grapheme correspondence, morphemes, and concepts of language. The items included multiple-choice, fill in the blank, and short-answer items, rather than self-reported knowledge. The test was administered to 89 inservice teachers with a range of experience levels, and was used in two studies (McCutchen et al., 2000; McCutchen et al., 2002). The results were positively correlated with some measures of reading achievement, but the test was not without limitations. In addition to the lack of validity and reliability measures, the test had a broad coverage of language knowledge rather than the intended focus for the first test of phonemic awareness and phonics.

Another examined test was Foorman and Moats’ (in press) Teacher Knowledge Survey. This 19 question multiple-choice test measured teachers’ knowledge of the orthographic, phonological, and morphological structure of words; reading instruction; and spelling, reading, and writing errors in student work. It was administered to 80 inservice teachers. The multiple-choice format correlated positively with reading outcomes. However, the test lacked validity and reliability measures and the broad coverage of topics was beyond the desired scope of this study.

Finally, Mather et al.’s (2001) Teacher Knowledge About the Structure of Language Assessment (TKA: SL) was evaluated. The test contained 22 multiple-choice items that primarily assessed teachers’ explicit knowledge of the alphabetic principle. The TKA: SL was piloted with 55 teachers, and found to have a reliability of .83 (Cronbach’s coefficient alpha) and item-test correlations ranging from .21 to .63.
Bos et al. (2001) also used the TKA: SL in a study of teacher knowledge. This test established validity and reliability measures, used a multiple-choice format, and had a primary focus on phonemic awareness and phonics. Although this assessment was not designed for associations with student reading outcomes, it provided a starting point for creating a test of explicit teacher knowledge of the alphabetic principle.

**Test of Explicit Knowledge of the Alphabetic Principle (TEKAP)**

*Test adaptation and construction.*

Based on the validity and reliability measures, the specific focus on knowledge of phonemic awareness and phonics, and the multiple-choice format, the TKA: SL was chosen for adaptation for a test of phonemic awareness and phonics knowledge. This test was adapted into the Test of Explicit Knowledge of the Alphabetic Principle (TEKAP) with a few changes. First, questions were substituted to take regional dialect into account. Additionally, the number of choices for each item was considered and it was determined that five choices instead of four would decrease the probability of guessing the right answer and increase the reliability of the test. The questions from the TKA: SL (Mather et al.) measured different types of knowledge, including phonemic awareness and phonics terminology and the ability to apply knowledge of phonemic awareness and phonics. To increase the reliability, questions were added so that each content item was sampled at least twice.

The specifications in Table 2 identify the types of items on the test. Using the types of questions identified on the TKA: SL, the test was broken into objectives and content. The objectives, derived from the TKA: SL, for the TEKAP were as follows: demonstrates knowledge of terminology and applies knowledge. Under each objective, there was phonemic awareness and phonics content. There were similar numbers of content items, with one exception. There were additional items that test the teachers’ ability to segment phonemes into words in order to assess a range of ability for that task: from segmenting words with one-to-one letter-sound correspondence to segmenting words with multiple letter or sound correspondences.

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a The TKA: SL had 15 items with four choices and seven items with five choices (Mather et al., 2001).
### Table 2
Table of Specifications for the TEKAP Pilot Test

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Phonemic Awareness</th>
<th>Phonics</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrates knowledge of terminology.</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Applies knowledge of the alphabetic principle.</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
</tbody>
</table>

In order to maintain consistency, all items were phrased in the form of a question with five possible answers that were similar in content and form. For example, a question on the TEKAP appeared as follows:

What do you call a letter of group of letters that represent one sound?

a. a phoneme
b. a diphthong
c. a **grapheme**
d. a digraph
e. a cluster

The distracters included words with similar sounds and spellings or similar terms, except for the phoneme segmentation items, where the distracters were numbers adjacent to the correct answer.

*Initial field test.*

The initial field test had 47 respondents who had a range of experience levels. Twenty-one respondents, referred to as MORE trainers, were teachers and former teachers who were trained to deliver Reading First professional development.
workshops to classroom teachers. Twenty-six respondents were preservice teachers who had completed their second semester of the elementary education curriculum, which had already included a beginning reading, language arts, linguistics, and children’s literature course. Demographic information was obtained for both groups. As shown in Table 3, the respondents represented a desirable range of experience levels.

Validity and reliability.

With the theoretical conceptualization that construct validity functions as an overarching measure of validity (Messick, 1995), several measures were taken to ensure validity and reliability of the TEKAP. The content evidence of validity for the TEKAP, derived from the major consensus documents (Snow et al., 1998; NRP, 2000), has shown that explicit word recognition instruction is necessary for beginning readers from less advantaged environments. In order for teachers to explicitly teach their students the alphabetic principle, they should have explicit knowledge of phonemic awareness and phonics (Moats, 1999).

In order to further investigate construct validity, a 7-item questionnaire was attached to the pilot test and administered to the MORE trainers to assess whether the purpose of the test was apparent and the items were clear. Because the MORE trainers were experienced reading educators, their evaluation of the test would assist the researcher in determining if there was face evidence of validity. All the respondents indicated that the directions and questions were clear. Several respondents replied that they understood phonics concepts, but did not remember certain terminology such as digraph. One respondent was concerned that there were too many questions with option “d” as the correct answer. As indicated later in this document, the unevenness of answers was identified and corrected as part of the pilot test analysis. Several respondents correctly identified the purpose of the test as assessing phonemic awareness and phonics. The letter explaining the test and the questionnaire are included in Appendix A.
<table>
<thead>
<tr>
<th>Demographic</th>
<th>MORE Trainers</th>
<th>Preservice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>Males</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Caucasian</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Latino</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Years Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>6-10</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>11-15</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>16-20</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>&gt;20</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Highest Degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Master’s</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Specialist</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Doctorate</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Year of Last Degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1970</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1970-1979</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>1980-1989</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>1990-1999</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>2000-present</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Reading Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2-3</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>4-5</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>6-7</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>&gt;7</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

\(^a^\)Two MORE trainers and four preservice teachers chose not to provide demographic information.  \(^b^n = 21. \(^c^n = 26. .5\)
A test analysis was conducted using the results of a 22-item pilot test. As shown in Table 4, the mean and standard deviation were calculated for both groups individually and combined. The mean number of correct responses was 54.0% for the preservice teachers (n=26) and 82.5% for the MORE trainers (n=21). The difference between the two groups indicates that there is construct evidence of validity because the experienced teachers had more knowledge on this instrument.

Table 4
TEKAP Pilot Test Results

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORE Trainers</td>
<td>82.5</td>
<td>19.5</td>
</tr>
<tr>
<td>Preservice Teachers</td>
<td>54.0</td>
<td>19.3</td>
</tr>
<tr>
<td>Total</td>
<td>66.8</td>
<td>23.9</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Percentage of correct responses out of 20 items.</td>
</tr>
<tr>
<td>b</td>
<td>n = 21.</td>
</tr>
<tr>
<td>c</td>
<td>n = 26.</td>
</tr>
</tbody>
</table>

The mean percentage of correct responses for the total respondents was 67. The scores ranged from 100% to 14% correct, which further indicates a range of ability levels. Using Cronbach’s coefficient alpha, the reliability of the test was determined to be .88a, which is considered to be acceptable.

Appendix B presents each item, grouped by the objectives previously identified in Table 2, with the percent of preservice and MORE trainers answering each item correctly. As indicated by the table, the two groups had a similar percent correct on some items, and a different percent correct on other items. For example, 96% of the preservice teachers and 95% of the MORE trainers answered question 1 correctly.

\[ a \text{ The TKA: SL (Mather et al., 2001) had a reliability of .83. } \]
Conversely 23% of the preservice teachers and 62% of the MORE trainers answered question 2 correctly.

Table 5 shows the test statistics for all of the respondents (n=47). The item difficulty ranged from 34% to 96% of respondents answering correctly, which indicates that there is a large range of difficulty. A range of difficulty is desirable to distinguish between respondents. Additionally, the different types of objectives were represented at varying levels of difficulty. As indicated in the questionnaire used to assess face evidence of validity, the most difficult item was question 3, which tested knowledge of digraphs. The easiest item was question 1, which tested knowledge of segmentation.

Contrary to expectations, the preservice teachers had more knowledge of the word *grapheme* than MORE trainers. Fifty-four percent of preservice teachers and only 33% of MORE trainers answered this question correctly. This might have occurred because the students had more recent exposure to this term.

Comparing the average correct response of the upper and lower half of respondents was used to discriminate each item and offer more evidence of construct validity. This analysis distinguishes the average difference in response for each item between the top and bottom scoring half of the respondents, also considered to be the more and less knowledgeable respondents. An item has a fairly high discrimination when there is a 20% to 35% difference between the upper and lower half and high discrimination when the difference is 40% to 75% (Frost, n.d.). For example, 59% more respondents from the upper half of the group responded correctly to question 3 when compared to the lower half. Therefore, this question is considered to have high discrimination power. Conversely, 9% of respondents from the upper half of the group responded correctly to question 1 when compared to the lower half and 14% of respondents from the lower half of the group responded correctly to question 4 respectively when compared to the upper half. Therefore, question 1 does not have as much discrimination power as many of the other items, and question 4 does not have discrimination power. Thirteen items had high discrimination power and 5 items had fairly high discrimination power. Four items had less discrimination power even though the items addressed similar content as high discrimination power items.
As an additional analysis, an item-total correlation was conducted. In an item-total correlation, the correlation between each item and the total score is assessed. According to this analysis, questions 1 and 4 were not positively correlated with the total (-.014 and -.022 respectively). Based on the discrimination power and the item-total correlations, these items were removed. Upon removal of these two items, the item-total correlations ranged from .41 to .79\(^a\). Removal of these items increased the reliability to .90 (Cronbach’s coefficient alpha). Table 6 details the revised specifications for each objective.

Table 5

TEKAP Pilot Test Statistics

<table>
<thead>
<tr>
<th>Item #</th>
<th>3</th>
<th>2</th>
<th>4</th>
<th>18</th>
<th>19</th>
<th>22</th>
<th>15</th>
<th>10</th>
<th>11</th>
<th>21</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective(^a)</td>
<td>b</td>
<td>c</td>
<td>b</td>
<td>e</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>a</td>
<td>e</td>
<td>c</td>
</tr>
<tr>
<td>Difficulty Index (%)(^b)</td>
<td>34</td>
<td>40</td>
<td>45</td>
<td>45</td>
<td>49</td>
<td>53</td>
<td>55</td>
<td>60</td>
<td>60</td>
<td>66</td>
<td>68</td>
</tr>
<tr>
<td>U-L (%)(^c)</td>
<td>59</td>
<td>54</td>
<td>-14</td>
<td>62</td>
<td>70</td>
<td>71</td>
<td>66</td>
<td>74</td>
<td>40</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Item-Total Correlation</td>
<td>.56</td>
<td>.62</td>
<td>-.22</td>
<td>.62</td>
<td>.79</td>
<td>.58</td>
<td>.55</td>
<td>.62</td>
<td>.50</td>
<td>.56</td>
<td>.57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item #</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>17</th>
<th>14</th>
<th>6</th>
<th>12</th>
<th>13</th>
<th>16</th>
<th>20</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>d</td>
<td>f</td>
<td>c</td>
<td>d</td>
<td>c</td>
<td>e</td>
<td>e</td>
<td>a</td>
<td>c</td>
<td>d</td>
<td>a</td>
</tr>
<tr>
<td>Difficulty Index (%)</td>
<td>68</td>
<td>68</td>
<td>68</td>
<td>77</td>
<td>83</td>
<td>85</td>
<td>85</td>
<td>87</td>
<td>87</td>
<td>92</td>
<td>96</td>
</tr>
<tr>
<td>U-L (%)</td>
<td>40</td>
<td>57</td>
<td>57</td>
<td>13</td>
<td>35</td>
<td>22</td>
<td>14</td>
<td>26</td>
<td>26</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Item-Total Correlation</td>
<td>.68</td>
<td>.72</td>
<td>.56</td>
<td>.45</td>
<td>.51</td>
<td>.44</td>
<td>.41</td>
<td>.64</td>
<td>.65</td>
<td>.49</td>
<td>-.14</td>
</tr>
</tbody>
</table>

\(^a\)The objective categories are as follows: “a” corresponds to phonemic awareness terminology, “b” corresponds to phonics terminology, “c” corresponds to phonemic awareness segmentation, “d” corresponds to phonemic awareness manipulation, “e” corresponds to phonics vowel knowledge, and “f” corresponds to phonics consonant knowledge. \(^b\)Indicates percentage of respondents who answered the question correctly. \(^c\)Percent difference in item answered correctly between upper and lower half of respondents. Item has high discrimination power if the difference between upper and lower half of respondents is 40% to 75%, and fairly high discrimination power if the difference is 20% to 35% (Frost, n.d.).

\(^a\)The TKA: SL (Mather et al, 2001) had item-total correlations ranging from .21 to .63.
As part of the item analysis, the distribution of correct responses was assessed and found to be uneven. Interestingly, one respondent said that there were too many questions in which the option “d” was the correct choice; however, “c” was actually the most frequently occurring answer. The distribution of correct choices was as follows: 2 a's, 4 b's, 8 c's, 6 d's, and 2 e's. The responses were randomly redistributed to create an even distribution. The revised test in Appendix C reflects the elimination of questions 1 and 4 and the redistribution of correct responses. Based on the evidence from the reliability and validity measures, the Test of Explicit Knowledge of the Alphabetic Principle was found to be both valid and reliable.

Table 6
Table of Specifications for the TEKAP

<table>
<thead>
<tr>
<th>Objective</th>
<th>Phonemic Awareness</th>
<th>Phonics</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrates knowledge of terminology.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Applies knowledge of the alphabetic principle.</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

*Test of Comprehensive Language Knowledge (TCLK)*

*Test rationale.*

According to Moats (1994), “...lower language mastery is as essential for the literacy teacher as anatomy is for the physician” (1994, p. 99). Although there is
evidence that teachers need explicit knowledge of the alphabetic principle to teach word recognition skills explicitly (NRP, 2000), the necessary breadth of teacher knowledge about language has not yet been established. While the TEKAP focuses on the skills needed specifically to decode words: phonemic awareness and phonics; there are other aspects of language that might be useful for teacher knowledge.

Due to the existing ambiguity concerning how much language knowledge is needed, teachers will also be tested using an adaptation of the Comprehensive Survey of Language Knowledge (Moats, 2000), which was derived from Moats’ (1994) Informal Survey of Linguistic Knowledge. Moats’ 1994 test has been used in several studies to compare teachers’ comprehensive knowledge of language to student growth in reading (McCutchen et al., 2000; McCutchen et al., 2002). Since the content is theoretically broader than word recognition, the test results will help determine whether explicit knowledge of the alphabetic principle alone or comprehensive language knowledge is necessary to teach beginning reading. To make this determination, the correlation between the TEKAP and student outcomes will be compared to the correlation between comprehensive language knowledge and student outcomes to determine which type of knowledge is more strongly correlated.

Test adaptation and construction.

The original test was revised for several reasons. As shown in Appendix D, the original Comprehensive Survey of Language Knowledge (Moats, 2000) consisted of 14 short-answer and essay questions. However, nine questions had multiple items, and invited 59 possible answers, making the test considerably long. For example, a test item on the original test was:

From the list below, find an example of each of the following (answer will be a word or part of a word):
Inflected verb ______________
Compound noun ______________
Bound root ________________
Derivational suffix ______________
Greek combining form ______________
peaches incredible slowed although shameful doughnut bicycle neuropsychology sandpaper vanish (Moats, 2000)
Validity and reliability measures had not been determined for the original test, and the variety of item formats made reliability more difficult to establish. Therefore, the test was converted into a shortened multiple-choice format. To convert the test, all items were phrased in the form of a question, but the content was not changed. The adapted test had the following item that addresses a similar subject matter as the previous question:

Which word is an example of a compound noun?
- a. television
- b. children
- c. alligator
- d. sandpaper
- e. carnivorous

Additionally, like the TEKAP, the test was limited to 20 questions, due to the time constraints of the participants. In order to shorten the test, several steps were taken. First, the test was analyzed to determine which language concepts were addressed. The language concepts addressed on the original test included the lower levels of language: phonology, including phoneme knowledge and syllabication; orthography; and morphology. In order to evenly distribute content for the shorter test, the questions were limited to five items per content area. To increase the reliability and decrease the probability of guessing the correct answer, each question had five possible answers that were evenly distributed among the choices: 4 a’s, 4 b’s, 4 c’s, 4 d’s, and 4 e’s. Table 7 details the specifications for the adapted test labeled as the Test of Comprehensive Language Knowledge (TCLK).

Initial field test.

The TCLK was piloted with 27 special education majors. Fifteen of the students were junior and senior level undergraduates and 12 of the students were graduate students. This population of test takers offered a range of experiences in education and reading content. As shown in Table 8, of the undergraduate students, 12 had taken no reading courses, 2 had taken 1 reading course, and 1 had taken 2 reading courses. Among the graduate students, 7 had taken one reading course, 4 had taken 2 reading courses, and 1 had taken 3 reading courses. Through their educational program, the graduate students also had extensive experience observing in classrooms and tutoring individual students in beginning reading.
Table 7
Table of Specifications for the TCLK Pilot Test

<table>
<thead>
<tr>
<th>Objective</th>
<th>Phonemes</th>
<th>Orthography</th>
<th>Syllabication</th>
<th>Morphology</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrates and applies knowledge of lower level language.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 8
TCLK Pilot Test Demographics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Undergraduates&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Graduates&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Males</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Caucasian</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Latino</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Reading Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>&gt;3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<sup>a</sup>n = 15.  <sup>b</sup>n = 12.
Validity and reliability.

The validity and reliability of the TCLK were assessed using a variety of methods. The content evidence of validity for the TCLK is based on several studies that have found an association between comprehensive language knowledge and student outcomes in beginning reading (McCutchen et al., 2000; McCutchen et al., 2002).

A test analysis was conducted using the results of a 20-item pilot test to provide additional construct evidence of validity and establish reliability. As shown in Table 9, the mean and standard deviation were calculated for both groups individually and combined. The mean number of correct responses was 43.7% for the undergraduate students (n=15) and 50.0% for the graduate students (n=12). The difference between the two groups, while not statistically significant, indicates that there is some construct evidence of validity because the more experienced students had more knowledge on this instrument.

<table>
<thead>
<tr>
<th>Table 9</th>
<th>TCLK Pilot Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Undergraduates&lt;sup&gt;b&lt;/sup&gt;</td>
<td>43.7</td>
</tr>
<tr>
<td>Graduates&lt;sup&gt;c&lt;/sup&gt;</td>
<td>50.0</td>
</tr>
<tr>
<td>Total</td>
<td>46.5</td>
</tr>
</tbody>
</table>

<sup>a</sup>Percentage of correct responses out of 20 items.  <sup>b</sup>n = 15.  <sup>c</sup>n = 12.

The mean percent of correct responses for the total respondents was 46.5%. The scores ranged from 15% to 80% correct, which is an indication that the respondents represented a range of ability levels, thus providing construct evidence of validity. Using Cronbach’s coefficient alpha, the reliability of the test was determined to be .56, which is lower than the TEKAP; however, this test measured a wider range of
language knowledge so the reliability was expected to be lower. Appendix F presents each item, grouped by the objectives previously identified in Table 7, with the percent of students answering each item correctly.

Table 10 shows test statistics for all of the respondents (n=27). The item difficulty ranged from 12% to 100% of respondents answering correctly, which indicates additional construct evidence of validity because there is a large range of difficulty and therefore, the test is able to distinguish between respondents. Furthermore, the different types of objectives were represented at varying levels of difficulty. The easiest item was question 2, which tested the ability to identify the number of syllables in a word. The most difficult item was question 17, which tested knowledge of phonemes.

Table 10
TCLK Pilot Test Statistics

<table>
<thead>
<tr>
<th>Item #</th>
<th>17</th>
<th>3</th>
<th>6</th>
<th>18</th>
<th>9</th>
<th>20</th>
<th>12</th>
<th>4</th>
<th>13</th>
<th>19</th>
<th>5</th>
<th>11</th>
<th>10</th>
<th>14</th>
<th>7</th>
<th>15</th>
<th>8</th>
<th>2°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>a</td>
<td>d</td>
<td>b</td>
<td>a</td>
<td>d</td>
<td>c</td>
<td>d</td>
<td>b</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>a</td>
<td>b</td>
<td>d</td>
<td>b</td>
<td>d</td>
<td>c</td>
</tr>
<tr>
<td>Difficulty Index (%)</td>
<td>11</td>
<td>19</td>
<td>19</td>
<td>26</td>
<td>26</td>
<td>33</td>
<td>33</td>
<td>37</td>
<td>41</td>
<td>41</td>
<td>44</td>
<td>44</td>
<td>48</td>
<td>52</td>
<td>56</td>
<td>56</td>
<td>74</td>
<td>82</td>
</tr>
<tr>
<td>U-L (%)</td>
<td>-12</td>
<td>16</td>
<td>16</td>
<td>29</td>
<td>13</td>
<td>-5</td>
<td>41</td>
<td>47</td>
<td>23</td>
<td>28</td>
<td>38</td>
<td>29</td>
<td>51</td>
<td>11</td>
<td>18</td>
<td>48</td>
<td>49</td>
<td>15</td>
</tr>
<tr>
<td>Item-Total Correlation</td>
<td>0</td>
<td>.21</td>
<td>.48</td>
<td>.43</td>
<td>.23</td>
<td>.07</td>
<td>.44</td>
<td>.47</td>
<td>.30</td>
<td>.13</td>
<td>.43</td>
<td>.42</td>
<td>.53</td>
<td>.34</td>
<td>.23</td>
<td>.47</td>
<td>.57</td>
<td>.32</td>
</tr>
</tbody>
</table>

°All respondents answered item 2 correctly. °°The objective categories are as follows: “a” corresponds to phoneme identification, “b” corresponds to orthography, “c” corresponds to syllabication, and “d” corresponds to morphology. °Indicates percentage of respondents who answered the question correctly. °°Percent difference in item answered correctly between upper and lower half of respondents. Item has high discrimination power if the difference between upper and lower half of respondents is 40% to 75%, and fairly high discrimination power if the difference is 20% to 35% (Frost, n.d.).

As previously discussed in the development of the TEKAP, comparing the average correct response of the upper and lower half of respondents assessed the discrimination of each item. Five items had high discrimination power and 5 items had fairly high discrimination power. Seven questions had some discrimination power, that is, the discrimination power was greater than zero. Questions 2, 9, and 17 did not have discrimination power.
The content of the items without discrimination power was assessed and compared to other questions. Question 2 tested the ability to identify the number of syllables in *elephant*. Every respondent answered this question correctly, so the discrimination power was 0. Similarly, item 15 tested the ability to syllabicate *bookworm*, but only 81% of respondents answered correctly, and this question had a discrimination power of 15. Question 9 tested the ability to define an open syllable, and it was found to have a discrimination power of −5, meaning that 5% more of the lower half of respondents answered this question correctly than the upper half of respondents. Question 5 tested the ability to define a closed syllable, and this item had a discrimination power of 29. Question 17 tested the ability to identify a consonant digraph and had a discrimination power of −12. Question 13 also tested the ability to identify a consonant digraph and had a discrimination power of 28. Therefore, all of these items without discrimination power had questions of similar content with discrimination power, so it was necessary to further assess each item.

As an additional analysis, an item-total correlation was conducted. According to this analysis, once again questions 2, 9, and 17 were not significantly and positively correlated with the total (0, .07, and 0 respectively). Therefore, since the discrimination power and item-total correlations for these items were both unacceptable, these items were removed. Upon removal of these three items, the item-total correlations ranged from .13 to .57. Removal of these items increased the reliability to .61 (Cronbach’s coefficient alpha), which is lower than the TEKAP, but reflected the test’s coverage of four distinct aspects of language as opposed to the one aspect represented by the TEKAP.

*Further adaptation.*

Several additional measures taken to increase reliability of the TCLK since the reliability from the first pilot test was only .61. To decrease the number of domains assessed and since phonology was addressed on the TEKAP; the subject matter was limited to orthography, syllabication, and morphology. Additionally, questions where less than 40% of the respondents answered correctly were eliminated and ten questions similar to the content of the original items were included for each topic. The revised test
had 30 items with answers that were evenly distributed among the choices: 6 a’s, 6 b’s, 6 c’s, 6 d’s, and 6 e’s. Table 13 details the specifications for the revised TCLK.

Secondary field test.

The revised TCLK was piloted with 28 elementary education majors. The students were junior-level undergraduates who had completed all of their beginning reading curriculum, which included 3 reading courses. Through their educational program, the students also had extensive experience observing in classrooms and tutoring individual students.

Table 11
Table of Specifications for the Revised TCLK

<table>
<thead>
<tr>
<th>Content</th>
<th>Orthography</th>
<th>Syllabication</th>
<th>Morphology</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrates and applies lower-level language knowledge.</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
</tr>
</tbody>
</table>

Final validity and reliability.

The validity and reliability of the revised TCLK were further assessed using a variety of methods. A test analysis was conducted using the results of a 30-item pilot test to provide additional construct evidence of validity and establish reliability. As shown in Table 12, the mean number of correct responses was 51.1%. The scores ranged from 10% to 77% correct, which is an indication that the respondents represented a range of ability levels, thus providing construct evidence of validity. Using Cronbach’s coefficient alpha, the reliability of the test was determined to be .82, which was substantially higher than the original pilot test.
Table 12
Revised TCLK Pilot Test Results

<table>
<thead>
<tr>
<th></th>
<th>M&lt;sup&gt;a&lt;/sup&gt;</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students&lt;sup&gt;b&lt;/sup&gt;</td>
<td>51.1</td>
<td>18.1</td>
<td>10-77</td>
</tr>
</tbody>
</table>

<sup>a</sup>Percentage of correct responses out of 20 items.  <sup>b</sup>n = 28.

Appendix F presents each item, grouped by the objectives previously identified in Table 11, with the percent of students answering each item correctly.

Table 13 shows test statistics for all of the respondents (n=28). The item difficulty ranged from 7% to 96% of respondents answering correctly, which indicates additional construct evidence of validity because there is a large range of difficulty and therefore, the test is able to distinguish between respondents. Furthermore, the different types of objectives were represented at varying levels of difficulty. The easiest item was question 16, which tested the ability to identify a compound noun. The most difficult item was question 7, which tested the ability to identify an open syllable.

As previously discussed in the development of the TEKAP and TCLK, comparing the average correct response of the upper and lower half of respondents assessed the discrimination power of each item. Thirteen items had high discrimination power and 7 items had fairly high discrimination power. Ten questions had some discrimination power, that is, the discrimination power was greater than zero. There were no items without discrimination power, so no further assessment of discrimination power was necessary.
### Table 13
Revised TCLK Pilot Test Statistics

<table>
<thead>
<tr>
<th>Item #</th>
<th>Objective&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Difficulty Index&lt;sup&gt;b&lt;/sup&gt; (%)</th>
<th>U-L&lt;sup&gt;c&lt;/sup&gt; (%)</th>
<th>Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>b</td>
<td>7</td>
<td>1</td>
<td>-.07</td>
</tr>
<tr>
<td>2</td>
<td>a</td>
<td>21</td>
<td>18</td>
<td>.23</td>
</tr>
<tr>
<td>5</td>
<td>a</td>
<td>21</td>
<td>3</td>
<td>-.05</td>
</tr>
<tr>
<td>24</td>
<td>b</td>
<td>21</td>
<td>18</td>
<td>.13</td>
</tr>
<tr>
<td>8</td>
<td>a</td>
<td>25</td>
<td>11</td>
<td>.21</td>
</tr>
<tr>
<td>1</td>
<td>a</td>
<td>29</td>
<td>18</td>
<td>.27</td>
</tr>
<tr>
<td>14</td>
<td>c</td>
<td>32</td>
<td>41</td>
<td>.56</td>
</tr>
<tr>
<td>26</td>
<td>b</td>
<td>36</td>
<td>19</td>
<td>.22</td>
</tr>
<tr>
<td>30</td>
<td>b</td>
<td>36</td>
<td>5</td>
<td>.11</td>
</tr>
<tr>
<td>3</td>
<td>a</td>
<td>39</td>
<td>27</td>
<td>.21</td>
</tr>
<tr>
<td>4</td>
<td>a</td>
<td>39</td>
<td>42</td>
<td>.29</td>
</tr>
<tr>
<td>10</td>
<td>a</td>
<td>39</td>
<td>42</td>
<td>.38</td>
</tr>
<tr>
<td>6</td>
<td>a</td>
<td>43</td>
<td>21</td>
<td>.44</td>
</tr>
<tr>
<td>7</td>
<td>a</td>
<td>43</td>
<td>49</td>
<td>.39</td>
</tr>
<tr>
<td>9</td>
<td>a</td>
<td>43</td>
<td>64</td>
<td>.69</td>
</tr>
<tr>
<td>18</td>
<td>c</td>
<td>46</td>
<td>42</td>
<td>.55</td>
</tr>
<tr>
<td>21</td>
<td>b</td>
<td>50</td>
<td>50</td>
<td>.45</td>
</tr>
<tr>
<td>12</td>
<td>c</td>
<td>61</td>
<td>45</td>
<td>.73</td>
</tr>
<tr>
<td>17</td>
<td>c</td>
<td>61</td>
<td>2</td>
<td>.17</td>
</tr>
</tbody>
</table>
As an additional analysis, an item-total correlation was conducted. According to this analysis, questions 5 and 23 were not positively correlated with the total (-.05 and -.07 respectively). Since some discrimination power was present in each item, these items were not removed. The test in Appendix G reflects the final format of the TCLK. Based on the evidence from the reliability and validity measures, the Test of Comprehensive Language Knowledge was found to be both valid and reliable.

**Test of Vocabulary Knowledge (TVK)**

*Test rationale and adaptation.*
Since the research literature has found that teacher verbal ability is most strongly associated with student achievement (Whitehurst 2002), a measure of vocabulary knowledge was included to control for teachers’ vocabulary ability. The vocabulary knowledge test was adapted from a vocabulary analogies subtest of the Stanford Achievement Test, Ninth Edition (SAT/9) TASK 3 multiple-choice reading measure (1996). The test, which included several measures of vocabulary and reading comprehension, was the highest-level SAT/9 test and was created as a junior/senior-level high school test. The SAT/9 TASK 3 reading measure had a reliability of .93 and evidence of content, criterion-related, and construct validity.

Each item on the original test had the following format:

**Something that is** [devious]
- a. flexible
- b. desirable
- c. extraneous
- d. sneaky

In order for the format of all three tests to remain consistent and to decrease the chance of correctly guessing an answer, an additional answer choice was added to each question, bringing the total number of possible answers from 4 to 5. Additionally, to improve reliability by increasing the number of test items, five questions with the same format were added using twelfth grade vocabulary words from the EDL Core Vocabularies in Reading (Taylor, Frackenpohl, & White, 1989). This supplement brought the total number of questions from 15 to 20. The adapted test was named the Test of Vocabulary Knowledge (TVK) and is presented in Appendix H.

*Initial field test.*

The TVK was piloted with the 28 elementary education majors who also participated in the second TCLK field test.

*Validity and reliability.*

Although the validity and reliability of the SAT/9 TASK 3 reading test (1996) had already been established, a pilot test was conducted to assess the reliability of the adapted vocabulary subtest. The adapted test had a reliability of .85 (Cronbach’s coefficient alpha).
As shown in Table 14, the mean and standard deviation were calculated. The mean percent of correct responses was 60.4. The scores ranged from 10% to 85% correct, which is an indication that the respondents represented a range of ability levels, thus providing additional construct evidence of validity.

Table 14
TVK Pilot Test Results

<table>
<thead>
<tr>
<th></th>
<th>M&lt;sup&gt;a&lt;/sup&gt;</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students&lt;sup&gt;b&lt;/sup&gt;</td>
<td>60.4</td>
<td>23.5</td>
<td>10-85</td>
</tr>
</tbody>
</table>

<sup>a</sup>Percentage of correct responses out of 20 items.  <sup>b</sup>n = 28.

Appendix I presents each item from the TVK with the percent of students answering each item correctly. Based on the preexisting evidence and the further evidence from the reliability and validity measures, the Test of Vocabulary Knowledge was found to be both valid and reliable.

Final Test Format for Teachers

As shown in Appendix J, the tests were presented to the teachers as one test divided into four parts: the TEKAP was presented in part 1; the TCLK was presented in part 2; the TVK was presented in part 3; and the questions that elicit teacher demographics constituted part 4. Although presented as one test for efficiency, the four parts were analyzed separately.

Student Instruments

*Dynamic Indicators of Basic Early Literacy Skills (DIBELS)*

The first-grade students participating in this study were assessed using the DIBELS (Good & Kaminski, 2001a). Reading First (Florida Reading First, 2002) requires an assessment of each child four times per year using grade-appropriate reading measures that are intended to predict future reading success. DIBELS satisfies this requirement.
The DIBELS measures used to assess students’ outcomes in reading include Phoneme Segmentation Fluency, which measures phonemic awareness skills by assessing how many words a student can segment in a minute, Nonsense Word Fluency, which measures the student’s application of the alphabetic principle by measuring how many fake words a student can read in a minute, and Oral Reading Fluency, which measures the amount of words a child can read in a passage in a minute (Good & Kaminski, 2001a). The reliability and validity for these tests have been found to be acceptable (Good & Kaminski, 2001b; Good & Kaminski, 2001c; Good & Kaminski, 2001d), and are listed in Table 15.

*Stanford Achievement Test, Tenth Edition (SAT/10)*

The SAT/10 (2003) was administered at the end of the school year to all first-grade students in the district. The SAT/10 is a norm-referenced test with multiple-choice and open-ended questions, which measure students’ comprehensive content mastery. A subtest of the SAT/10, the primary 1 multiple-choice reading comprehension measure, was used. This assessment includes twenty-two items that require the student to match the picture with the correct sentence or sentences, and eighteen items where the student reads selected passages and answers the comprehension questions. The reliability coefficient for the SAT/10 was .88 and there was evidence of content, criterion-related, and construct validity (2003). The results of this assessment gave a measure of the students’ reading comprehension, which is not tested by the DIBELS.

**Procedure**

Consent was acquired from the appropriate authorities including Florida State University, the County School Board when applicable, and the school principals.

*Teacher Assessment*

Before conducting the research, the consent of each first-grade teacher was obtained (see the letter included in Appendix K). The consenting first-grade teachers at Reading First schools were assessed using the TEKAP, TCLK, and TVK. The test was administered to the teachers in the presence of a test administrator to insure uniform procedures and data collection. The test administrator was instructed to make sure that
the teachers completed the tests individually without help from any resources. The test takers read the directions silently and questions were not answered during the test.

Table 15
Reliability and Validity of DIBELS assessments

<table>
<thead>
<tr>
<th>Test</th>
<th>Reliability</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>test-retest</td>
<td>alternate form</td>
</tr>
<tr>
<td>Nonsense Word Fluency(^a)</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>Oral Reading Fluency(^b)</td>
<td>.92-.97</td>
<td>.89-.94</td>
</tr>
<tr>
<td>Phoneme Segmentation Fluency(^c)</td>
<td>.79-.88</td>
<td></td>
</tr>
</tbody>
</table>


Student Assessment

The students were assessed with the DIBELS in September and April. The DIBELS was administered to each child individually by a team of trained testers who read standardized directions. For this study, the initial assessment of Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency were used to control for initial classroom differences and the final assessments from the same tests were used to determine student outcomes.

The classroom teacher administered the SAT/10 to the entire class using standardized directions in April.

Analysis of Results

The analysis of results began with a preliminary analysis for each comparison (Tate, 1998). First, a missing subjects and missing data analysis was conducted.
Then, the data were checked for any influential observations (delta betas or other outliers that had excessive influence on the data). Finally, an assessment for violations of assumptions was conducted. This included an examination of the distributional assumptions for the observed versus expected values, which included correct fit, constant variance, and normality. For the exact independent variable assumption, the reliability was greater than .8 in the pilot studies, which was required for this assumption. The relationships were examined once the preliminary analysis was completed for each comparison.

*Teacher Knowledge and Student Outcomes*

Using multiple regression, student outcomes in reading were compared to teacher knowledge of the alphabetic principle, comprehensive language knowledge, and vocabulary knowledge. Student outcomes in reading were estimated using three DIBELS assessments (Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency) and the SAT/10 and were predicted from teacher knowledge as assessed by the TEKAP, TCLK, and TVK. In this model, the independent variable was teacher knowledge using the results of the three tests individually, and the dependent variable was student outcomes in reading as assessed by the three DIBELS assessments and the SAT/10.

After completing a preliminary analysis for each comparison, the following equation was used to compare the DIBELS assessments and teacher knowledge variables:  

\[ Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + E. \]

Separate analyses were conducted to examine the relationship between each teacher knowledge assessment and each DIBELS assessment. The first analysis examined the relationship between Phoneme Segmentation Fluency and the TEKAP. The predicted score for Phoneme Segmentation Fluency was represented by \( Y \) and the dependent variables were represented as follows: \( X_1 \) was the beginning of the year Phoneme Segmentation Fluency score to control for initial classroom differences and \( X_2 \) was the TEKAP score. The analysis was the same for the other comparisons.

Since the SAT/10 only had an outcome score, the three initial DIBELS scores were used to control for initial classroom differences. The following equation was used to compare the SAT/10 and teacher knowledge assessments:  

\[ Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \]
\[ \beta_3X_3 + \beta_4X_4 + E. \] The predicted SAT/10 score was represented by Y and the dependent variables were represented as follows: \( X_1, X_2, \) and \( X_3 \) were the beginning of the year Phoneme Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency scores respectively, and \( X_4 \) was the TEKAP score. The analysis was the same for the other comparisons.

From these analyses, it was determined whether or not there was a significant correlation between teacher knowledge of the alphabetic principle and student outcomes in beginning reading, comprehensive knowledge of language and student outcomes in beginning reading, and vocabulary knowledge and student outcomes in beginning reading. Then, these correlations were compared to determine which type of teacher knowledge was more strongly correlated with student outcomes.

**Teacher Demographics and Student Outcomes**

One-way analysis of covariance was used to answer the secondary questions concerning the relationship of teacher demographics and student outcomes. The independent variable was teacher demographics, which included number of years teaching, highest degree earned, decade last degree earned, and number of reading courses taken. The dependent variable was student outcomes, which included Phoneme Segmentation Fluency, Nonsense Word Fluency, Oral Reading Fluency, and the SAT/10. Each teacher demographic was compared to each student outcome variable separately.

For the DIBELS analyses, the equation \( Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + E \) was used. In these equations, \( Y \) represented the predicted outcome for each DIBELS assessment and \( X_1 \) represented the initial student levels as discussed in the teacher knowledge and student outcomes comparison. Since the teacher demographic variables were all categorical, \( X_2, X_3, X_4, \) and \( X_5 \) were used to mechanically represent each variable. The exception was in the case of highest degree earned where only \( X_2, X_3, \) and \( X_4 \) were used because there were only four possible choices.

The following equation was used to compare the SAT/10 and teacher demographics: \( Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + E. \) The predicted score on the SAT/10 was represented by \( Y \) and the dependent variables were represented as follows: \( X_1, X_2, \) and \( X_3 \) were the beginning of the year Phoneme
Segmentation Fluency, Nonsense Word Fluency, and Oral Reading Fluency scores respectively; and \(X_4, X_5, X_6,\) and \(X_7\) were used to mechanically represent each teacher demographic variable, except the highest degree earned only had three mechanical variables as previously discussed.

From these analyses, it was determined whether or not there was a significant correlation between the teacher demographic and student outcome variables.

*Teacher Demographics and Teacher Knowledge*

Teacher demographics and teacher knowledge were compared using one-way analysis of variance. The dependent variable was teacher knowledge as represented by the TEKAP, TCLK, and TVK assessments and the independent variable was teacher demographics as represented by the number of years teaching, highest degree earned, decade last degree earned, and number of reading courses. Each dependent variable was compared to each independent variable in a separate analysis. After completing the preliminary analyses, the following equation was used: 

\[
Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + E.
\]

To compare the TEKAP results to the number of years teaching, \(Y\) represented the predicted TEKAP result and \(X_1, X_2, X_3,\) and \(X_4\) mechanically represented the categories for number of years teaching. This analysis was repeated for each teacher demographic and then the entire analysis was completed for each teacher test.

From these analyses, it was determined whether or not there was a significant correlation between the teacher demographic and teacher knowledge variables.

*Summary*

This chapter presented the methodology for the study. The goal of this study was to examine the relationship between explicit teacher knowledge of the alphabetic principle, comprehensive language knowledge, and vocabulary knowledge, and student reading outcomes in low-income first-grade students. A description of the setting and population, instrument development for teachers, instruments for students, assessment procedures for teachers and students, and the analysis of results were included. In the following chapter, the results of the study will be discussed.
CHAPTER 4
FINDINGS

Introduction

This chapter will focus on the data findings for this study. It will begin with a description of the sample, which will be followed by the results of the teacher knowledge and student assessments. The chapter will conclude with a presentation of the findings for the relationships between teacher knowledge and student outcomes, and the relationships between teacher demographics, teacher knowledge, and student outcomes.

Description of the Sample

There were 15 participating schools from 7 participating districts. The population included 69 first-grade teachers and 1146 first-grade students enrolled in Florida’s Reading First schools. As shown in Table 16, 9 of the schools used a detailed lesson dialogue for their reading program reading program and 6 schools used a less detailed lesson dialogue for their reading program.

Table 16
Type of Reading Program by School

<table>
<thead>
<tr>
<th>School</th>
<th>Reading Program</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>2</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>3</td>
<td>Scott Foresman</td>
<td>Less Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>4</td>
<td>Scott Foresman</td>
<td>Less Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>5</td>
<td>Scott Foresman</td>
<td>Less Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>6</td>
<td>Harcourt Trophies</td>
<td>Less Detailed Lesson Dialogue</td>
</tr>
</tbody>
</table>
Table 16-continued

<table>
<thead>
<tr>
<th>School</th>
<th>Reading Program</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Harcourt Trophies</td>
<td>Less Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>8</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>9</td>
<td>Reading Mastery Plus</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>10</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>11</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>12</td>
<td>Scott Foresman</td>
<td>Less Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>13</td>
<td>Reading Mastery Plus</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>14</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
<tr>
<td>15</td>
<td>Open Court</td>
<td>Detailed Lesson Dialogue</td>
</tr>
</tbody>
</table>

Table 17 presents a summary of the demographic information for the teachers participating in this study. Caucasian women between the ages of 21 and 30 who had been teaching for 1 to 5 years were most represented. Most of the participants had a bachelor’s degree and none had a specialist or doctorate degree. The majority received their last degree after 1990 and had taken 2 to 3 reading courses.

According to the Florida School Indicators Report (2003), in 2003-2004, 35.1% of elementary school teachers in the state of Florida had advanced degrees and teachers had an average of 12.8 years of experience. Since 79% of teachers in this study had a bachelor’s degree and the majority of teachers had been teaching for 0 to 5 years, fewer teachers in this study had advanced degrees and the teachers were less experienced than the average teacher in the state of Florida. There was no additional external information available to assess whether the sample was representative of the population. In addition, seventy-eight percent of participants chose to respond to the survey of demographic information. There were two instances of missing data that did not have an effect on the results.
Table 17
Teacher Demographics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Teachers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n^a</td>
<td>%^b</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>51</td>
<td>94</td>
</tr>
<tr>
<td>Males</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>No response</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-30</td>
<td>20</td>
<td>37</td>
</tr>
<tr>
<td>31-40</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td>41-50</td>
<td>13</td>
<td>24</td>
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<tr>
<td>51-60</td>
<td>8</td>
<td>15</td>
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<tr>
<td>&gt;60</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No response</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>18</td>
<td>33</td>
</tr>
<tr>
<td>Caucasian</td>
<td>33</td>
<td>61</td>
</tr>
<tr>
<td>Latino</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Years Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td>6-10</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>11-15</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>&gt;20</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>No response</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Highest Degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>42</td>
<td>79</td>
</tr>
<tr>
<td>Master’s</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Specialist</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Doctorate</td>
<td>0</td>
<td>0</td>
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<tr>
<td>No response</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Year of Last Degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1970</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>1970-1979</td>
<td>6</td>
<td>1</td>
</tr>
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<td>1980-1989</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>1990-1999</td>
<td>20</td>
<td>37</td>
</tr>
<tr>
<td>2000-present</td>
<td>20</td>
<td>37</td>
</tr>
<tr>
<td>No response</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Reading Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2-3</td>
<td>33</td>
<td>62</td>
</tr>
</tbody>
</table>
Table 17-continued

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n a</td>
</tr>
<tr>
<td>4-5</td>
<td>12</td>
</tr>
<tr>
<td>6-7</td>
<td>2</td>
</tr>
<tr>
<td>&gt;7</td>
<td>4</td>
</tr>
<tr>
<td>No response</td>
<td>16</td>
</tr>
</tbody>
</table>

a n=69. b Percentage of respondents with valid scores.

Assessment Results

This section will include the results of the teacher knowledge tests including the Test of Explicit Knowledge of the Alphabetic Principle (TEKAP), Test of Comprehensive Language Knowledge (TCLK), and Test of Vocabulary Knowledge (TVK). Additionally, the results of the student assessments will be presented including the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), and Oral Reading Fluency (ORF), and the Stanford Achievement Test, Tenth Edition (SAT/10).

Teacher Knowledge

Table 18 presents the results of the three teacher knowledge assessments, which were administered to 69 teachers. The means for the TEKAP, TCLK, and TVK tests were 70.4, 65.8, and 80.8%, and the ranges of scores for the tests were 80, 64, and 60 points.

The percentage of respondents who answered each item correctly on the TEKAP, TCLK, and TVK is shown in Appendix L. For the TEKAP and TCLK, the items are grouped by objective. The range of correct responses on each item for the three tests was 17 to 94, 32 to 94, and 33 to 99% respectively. The tests had a reliability of .82, .75, and .81 respectively (Cronbach’s coefficient alpha).
Table 18
Teacher Knowledge Test Results$^a$

<table>
<thead>
<tr>
<th></th>
<th>M$^b$</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEKAP</td>
<td>70.4</td>
<td>20.1</td>
<td>20-100</td>
</tr>
<tr>
<td>TCLK</td>
<td>65.8</td>
<td>15.3</td>
<td>33-97</td>
</tr>
<tr>
<td>TVK</td>
<td>80.8</td>
<td>16.9</td>
<td>40-100</td>
</tr>
</tbody>
</table>

$^a$n=69. $^b$Percentage correct out of 20 items on the TEKAP and TVK and 30 items on TCLK.

Student Outcomes

As shown in Table 19, the classes of students in this study scored an average of 35.2 on the initial PSF assessment and 48.8 on the final assessment$^a$, 33.4 on the initial NWF assessment and 66.9 on the final assessment$^b$, and 14.9 on the initial ORF assessment and 51.7 on the final assessment$^c$. According to the DIBELS Risk Levels Chart, the average class was on grade level for both PSF assessments, above average for both NWF assessments, and on grade level for both ORF assessments (2004). Furthermore, the classes' average scaled score on the SAT/10 was 556.7, which was slightly higher than the average scaled score for this assessment$^d$ (Stanford Achievement Test, Tenth Edition: Technical Data Report, 2003).

$^a$On the PSF, the score represents the number of phonemes correctly identified from spoken words in one minute.

$^b$On the NWF, the score represents the number of phonemes correctly identified from written words in one minute.

$^c$On the ORF, the score represents the number of correctly identified words in a passage in one minute.

$^d$The average scaled score was 551.4 with a standard deviation of 51.
Table 19
Student Test Results\textsuperscript{a}

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>DIBELS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSF</td>
<td>35.2</td>
<td>48.8</td>
</tr>
<tr>
<td>NWF</td>
<td>33.4</td>
<td>66.9</td>
</tr>
<tr>
<td>ORF</td>
<td>14.9</td>
<td>51.7</td>
</tr>
<tr>
<td>SAT/10</td>
<td>-</td>
<td>556.7\textsuperscript{b}</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Based on the average for each teacher. \textsuperscript{b}Scaled Score.

Data Findings

This section will discuss the data findings for the relationships of the variables in this study including teacher knowledge about the alphabetic principle, comprehensive language knowledge, and vocabulary knowledge and student outcomes, and teacher demographics, teacher knowledge, and student outcomes.

Teacher Knowledge and Student Outcomes

The relationships between three types of teacher knowledge (alphabetic principle, language, and vocabulary, as assessed by the TEKAP, TCLK, and TVK) and student outcomes in beginning reading (phonemic awareness, phonics, fluency, and comprehension as assessed by three DIBELS measures, PSF, NWF, and ORF, and the SAT/10) were determined by comparing each teacher knowledge variable to each student outcome variable using multiple regression. Relevant initial DIBELS assessments were used to control for initial differences. Each analysis began with a preliminary analysis.
**Preliminary Analysis**

A preliminary analysis was conducted before determining the relationship between the teacher tests and student outcomes. For all three tests, since the teachers were only tested once and the student outcomes were averaged by class, there were no missing subjects or data.

A case analysis was conducted for each relationship. Inspection of the scatterplots and examination of the residuals revealed the following: the TEKAP comparisons had no outliers and the TCLK and TVK comparisons had an outlier on the NWF assessment. The delta betas were also examined with the following results: there were influential observations between the TCLK and NWF, TCLK and ORF, and TVK AND NWF. These delta beta indicated the possibility of excessive influence on the regression coefficient; however, a sensitivity study was conducted for each observation and none of the observations had excessive influence on the results because all three relationships remained non significant with and without the influential observation.

The assumptions for multiple regression were also examined. The distributional assumptions were met for all analyses. In addition, for all tests, each participant was tested independently, so the independence assumption was fulfilled.

**The Relationships of Teacher Knowledge and Student Outcomes**

Table 20 shows the relationships between the teacher knowledge and the class average on the student assessments (bivariate correlations are presented in Appendix M). When controlled for initial differences, there were statistically significant relationships between the alphabetic principle knowledge (TEKAP) and comprehension (SAT/10), vocabulary knowledge (TVK) and phonemic awareness (PSF), and vocabulary knowledge (TVK) and fluency (ORF). The findings will be discussed in more detail in the sections to follow.
Table 20

The Relationships Between Teacher Knowledge and Student Outcomes

<table>
<thead>
<tr>
<th>Test</th>
<th>Teacher</th>
<th>Student</th>
<th>$\Delta R^2$</th>
<th>Effect Estimate$^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEKAP</td>
<td>PSF</td>
<td>.001</td>
<td>.028</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NWF</td>
<td>.003</td>
<td>.056</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORF</td>
<td>.003</td>
<td>.055</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAT/10</td>
<td>.042*</td>
<td>.209*</td>
<td></td>
</tr>
<tr>
<td>TCLK</td>
<td>PSF</td>
<td>.023</td>
<td>.152</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NWF</td>
<td>.000</td>
<td>-.015</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORF</td>
<td>.001</td>
<td>.023</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAT/10</td>
<td>.038</td>
<td>.200</td>
<td></td>
</tr>
<tr>
<td>TVK</td>
<td>PSF</td>
<td>.070*</td>
<td>-.268*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NWF</td>
<td>.000</td>
<td>-.013</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORF</td>
<td>.042*</td>
<td>.205*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAT/10</td>
<td>.012</td>
<td>.116</td>
<td></td>
</tr>
</tbody>
</table>

$^a$Controlled for initial student differences. $^b$The $\Delta R^2$ is the change in $R^2$ when controlled for initial student differences. $^c$Standardized regression coefficient. *Significant at the 0.05 level.

Alphabetic principle knowledge and student outcomes.

Teacher alphabetic principle knowledge was compared to the class average of student outcomes in phonemic awareness, phonics, fluency, and comprehension. Table 20 shows the percent of variance accounted for by the teacher knowledge tests and the effect estimates for the TEKAP and student outcomes when controlled for initial student differences. The relationship between the TEKAP and PSF was non significant,
as was the relationship between the TEKAP and NWF and TEKAP and ORF when controlled for the initial NWF and ORF scores respectively.

There was a statistically significant positive relationship between the TEKAP and the SAT/10, with a $\Delta R^2$ of .375 and a standardized regression coefficient of .209. Since the confidence interval for the raw score regression coefficient was between .007 and .383 and the threshold of practical importance for the raw score was .0935, the practical importance of this finding was inconclusive because some points were greater than and some points were less than the threshold.

**Comprehensive language knowledge and student outcomes.**

Teacher comprehensive language knowledge was compared to the class average of student outcomes in phonemic awareness, phonics, fluency, and comprehension. Table 20 shows the percent of variance accounted for by the teacher knowledge tests and the effect estimates for the TCLK and student outcomes when controlled for initial student differences. The relationship between the TCLK and PSF was non significant, as were the relationships between the TCLK and NWF when controlled for the initial NWF score, and the TCLK and ORF and TCLK and SAT/10 when controlled for the initial ORF score.

**Vocabulary knowledge and student outcomes.**

Teacher vocabulary knowledge was compared to the class average of student outcomes in phonemic awareness, phonics, fluency, and comprehension. Table 20 shows the percent of variance accounted for by the teacher knowledge tests and the effect estimates for the TVK and student outcomes when controlled for initial student differences. The relationships between the TVK and NWF when controlled for the initial NWF score and TVK and SAT/10 when controlled for the initial ORF score were non significant.

When controlled for initial student differences, there was a statistically significant negative relationship between the TVK and PSF with a $\Delta R^2$ of .070 and a standardized regression coefficient of -.268. In addition, when controlled for initial student differences, there was a statistically significant positive relationship between the TVK and ORF with a $\Delta R^2$ of .042 and a standardized regression coefficient of .205.
For the TVK and PSF comparison, since the confidence interval for the raw score regression coefficient was between -.186 and -.010 and the threshold of practical importance for the raw score was .0365, the practical importance of this finding was inconclusive because some points were greater than and some points were less than the threshold.

For the TVK and ORF comparison, since the confidence interval for the raw score regression coefficient was between .040 and .275 and the threshold of practical importance for the raw score was .0767, the practical importance of this finding was inconclusive because some points were greater than and some points were less than the threshold.

**Teacher Demographics and Student Outcomes**

Teacher demographics including number of years teaching, highest degree earned, year of last degree, and number of reading courses were compared to student outcomes in beginning reading including phonemic awareness, phonics, fluency, and comprehension using an ANCOVA design. Each dependent variable was individually compared to each independent variable. The means and standard deviations for each variable are listed in Appendix N.

As shown in Table 21, when controlled for initial differences, there was one statistically significant relationship: highest degree earned and ORF, which exhibited a statistically significant negative relationship. The $\Delta R^2$ was .044 and the regression coefficient was -7.378, indicating that teachers with master’s degrees had greater gains in student fluency than teachers with bachelor’s degrees. Since the confidence interval for the raw score regression coefficient was between -13.874 and -.882 and the threshold of practical importance for the raw score was 3.500, the practical importance of this finding was inconclusive because some points were greater than and some points were less than the threshold.
Table 21
The Relationships Between Student Outcomes and Teacher Demographics\(^a\)

<table>
<thead>
<tr>
<th>Test</th>
<th>Demographic</th>
<th>(\Delta R^2)</th>
<th>(F^c)</th>
<th>df</th>
<th>p</th>
</tr>
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<tbody>
<tr>
<td>PSF</td>
<td>Years Teaching</td>
<td>.041</td>
<td>.579</td>
<td>4, 46</td>
<td>.679</td>
</tr>
<tr>
<td></td>
<td>Highest Degree</td>
<td>.027</td>
<td>1.378</td>
<td>1, 48</td>
<td>.246</td>
</tr>
<tr>
<td></td>
<td>Year of Last Degree</td>
<td>.095</td>
<td>1.239</td>
<td>4, 46</td>
<td>.307</td>
</tr>
<tr>
<td></td>
<td>Reading Courses</td>
<td>.078</td>
<td>.992</td>
<td>4, 45</td>
<td>.422</td>
</tr>
<tr>
<td>NWF</td>
<td>Years Teaching</td>
<td>.072</td>
<td>1.671</td>
<td>4, 46</td>
<td>.173</td>
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<tr>
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<td>Highest Degree</td>
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<td>.656</td>
<td>1, 48</td>
<td>.422</td>
</tr>
<tr>
<td></td>
<td>Year of Last Degree</td>
<td>.051</td>
<td>1.134</td>
<td>4, 46</td>
<td>.352</td>
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<tr>
<td></td>
<td>Reading Courses</td>
<td>.014</td>
<td>.287</td>
<td>4, 45</td>
<td>.885</td>
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<tr>
<td>ORF</td>
<td>Years Teaching</td>
<td>.011</td>
<td>.276</td>
<td>4, 46</td>
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<td>Highest Degree</td>
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<td>Year of Last Degree</td>
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<td>4, 46</td>
<td>.931</td>
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<td>Reading Courses</td>
<td>.002</td>
<td>.054</td>
<td>4, 45</td>
<td>.994</td>
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<td>SAT/10</td>
<td>Years Teaching</td>
<td>.016</td>
<td>.264</td>
<td>4, 43</td>
<td>.900</td>
</tr>
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<td></td>
<td>Highest Degree</td>
<td>.001</td>
<td>.041</td>
<td>1, 45</td>
<td>.841</td>
</tr>
<tr>
<td></td>
<td>Year of Last Degree</td>
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<td>4, 43</td>
<td>.942</td>
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<td></td>
<td>Reading Courses</td>
<td>.021</td>
<td>.343</td>
<td>4, 42</td>
<td>.840</td>
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</tbody>
</table>

\(^a\)Controlled for initial student differences. \(^b\)The \(\Delta R^2\) is the change in \(R^2\) as a result of controlling for initial student differences. \(^c\)Controlled for initial student differences. *Significant at the 0.05 level.
Teacher Demographics and Teacher Knowledge

Teacher demographics including number of years teaching, highest degree earned, year of last degree, and number of reading courses were compared to teacher knowledge, as measured by three tests, which assessed alphabetic principle, language, and vocabulary knowledge using an ANOVA design. Each dependent variable was individually compared to each independent variable.

As shown in Table 22, the only statistically significant comparison was teacher vocabulary knowledge and highest degree earned, with an $R^2$ of .09 and a regression coefficient of -12.976, indicating that teachers with bachelor's degrees had less vocabulary knowledge than teachers with master's degrees. Since the confidence interval for the raw score regression coefficient was between -2.561 and -1.392 and the threshold of practical importance for the raw score was 4.32, the practical importance of this finding was inconclusive since some points were greater than and some points were less than the threshold.

Table 22
The Relationships Between Teacher Knowledge and Teacher Demographics

<table>
<thead>
<tr>
<th>Test</th>
<th>Demographic</th>
<th>$R^2$</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEKAP</td>
<td>Years Teaching</td>
<td>.020</td>
<td>.250</td>
<td>4</td>
<td>.908</td>
</tr>
<tr>
<td></td>
<td>Highest Degree</td>
<td>.027</td>
<td>1.404</td>
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<td>.242</td>
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<tr>
<td></td>
<td>Year of Last Degree</td>
<td>.096</td>
<td>1.301</td>
<td>4</td>
<td>.283</td>
</tr>
<tr>
<td></td>
<td>Reading Courses</td>
<td>.050</td>
<td>.627</td>
<td>4</td>
<td>.646</td>
</tr>
<tr>
<td>TCLK</td>
<td>Years Teaching</td>
<td>.089</td>
<td>1.200</td>
<td>4</td>
<td>.323</td>
</tr>
<tr>
<td></td>
<td>Highest Degree</td>
<td>.000</td>
<td>.006</td>
<td>1</td>
<td>.937</td>
</tr>
<tr>
<td></td>
<td>Year of Last Degree</td>
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<td>.697</td>
<td>4</td>
<td>.598</td>
</tr>
<tr>
<td></td>
<td>Reading Courses</td>
<td>.157</td>
<td>2.239</td>
<td>4</td>
<td>.079</td>
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</table>
Table 22-continued

<table>
<thead>
<tr>
<th>Test</th>
<th>Demographic</th>
<th>$R^2a$</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVK</td>
<td>Years Teaching</td>
<td>.130</td>
<td>1.836</td>
<td>4, 49</td>
<td>.137</td>
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<tr>
<td></td>
<td>Highest Degree</td>
<td>.090*</td>
<td>5.057</td>
<td>1, 51</td>
<td>.029</td>
</tr>
<tr>
<td></td>
<td>Year of Last Degree</td>
<td>.060</td>
<td>.788</td>
<td>4, 49</td>
<td>.539</td>
</tr>
<tr>
<td></td>
<td>Reading Courses</td>
<td>.075</td>
<td>.968</td>
<td>4, 48</td>
<td>.433</td>
</tr>
</tbody>
</table>

*a Global effect for each categorical variable. *Significant at the 0.05 level.

Summary

This chapter presented the data findings for this study including the results of the teacher knowledge and student outcomes assessments, and the findings for the relationships between teacher knowledge and student outcomes, and the relationships between teacher demographics, teacher knowledge, and student outcomes.

For the primary questions of this study, when controlled for initial student differences, there were statistically significant positive relationships between teacher alphabetic principle knowledge and student comprehension and teacher vocabulary knowledge and student fluency and significant negative relationships between vocabulary knowledge and student phonemic awareness. In addition, there were statistically significant negative relationships between highest degree earned and student fluency when controlled for initial student differences and between teacher vocabulary knowledge and highest degree earned.

The final chapter will discuss the results of the teacher knowledge and student outcomes assessments, the relationships between teacher knowledge and student outcomes, and the relationships between teacher demographics, teacher knowledge, and student outcomes. Then, the implications of the study will be presented, which will be followed by generalizations, assumptions, limitations of the study, and conclusions and recommendations for further research.
CHAPTER 5
DISCUSSION AND RECOMMENDATIONS

Introduction

The goal of this study was to examine the relationship between teacher knowledge and student outcomes in beginning reading. Three different measures were adapted and used to assess the 69 participating teachers including the Test of Explicit Knowledge of the Alphabetic Principle (TEKAP), the Test of Comprehensive Language Knowledge (TCLK), and the Test of Vocabulary Knowledge (TVK). The 1146 participating students were assessed with the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), and Oral Reading Fluency (ORF) at the beginning and end of the school year and the Stanford Achievement Test, Tenth Edition (SAT/10) at the end of the school year.

This final chapter will discuss the findings of this study beginning with the summary of results for teacher knowledge and student outcomes, the relationships between teacher knowledge and student outcomes, and the relationships between teacher demographics, teacher knowledge, and student outcomes. This discussion will be followed by a presentation of the implications of the study, generalizations, assumptions, limitations of the study, threats to external validity, and measurement and statistical issues. This dissertation will close with recommendations for further research and conclusions.

Summary of Results

This section will summarize the results for each teacher knowledge and student outcome measure and then discuss the status of the relationships between those measures. In addition, the relationships between teacher demographics, teacher knowledge, and student outcomes will be presented.
**Teacher Knowledge**

The means for the final TEKAP, TCLK, and TVK pilot tests were 67.5, 51.1, and 60.4% compared to the study means of 70.4, 65.8, and 80.8%, which indicates that the teachers in this study had more knowledge on these measures than the pilot study participants with one exception. The MORE trainers scored 82.5% on the TEKAP pilot test, which is reasonable since they were selected to train teachers in how to teach reading. The preservice teachers who participated in the TEKAP pilot study scored 54.0%. Therefore, the teachers in this study scored in between these two groups on the TEKAP.

The TEKAP tests results were similar to previous studies. On the Teacher Knowledge About the Structure of Language Assessment (TKA: SL) from which the TEKAP was adapted, Mather et al. (2001) found that inservice teachers answered 68% of the questions correctly and Bos et al. (2001) found that inservice teachers answered 60% of the questions correctly.

For the TCLK and TVK, the pilot study participants were preservice teachers. Presumably, the teachers in this study had higher means because they had gained knowledge since becoming teachers through delivery of curriculum and professional development. In addition, the No Child Left Behind Act of 2001 has promoted professional development for teachers (Introduction: No Child Left Behind, 2002), and the increase in scores could be the result.

The teachers in this study scored higher on the TCLK than participants tested with the Informal Survey of Linguistic Knowledge (Moats, 1994) from which the TCLK was adapted. McCutchen et al. (2000) found an average score of 45% when this test was administered to inservice teachers. Since the TCLK was multiple choice and the Informal Survey of Linguistic Knowledge had open-ended questions, it was reasonable for the average score to be higher because teachers had a much better chance of guessing and getting correct answers and/or using partial knowledge and elimination to identify the correct answer.

Although the means for the tests were higher than the pilot test, the range of scores was still large with the scores ranging from 20 to 100% on the TEKAP, 33 to 97% on the TCLK, and 40 to 100% on the TVK. This range suggests a wide range of
knowledge among teachers and indicates that there is a strong need for at least some
teachers to gain more knowledge. Lyon (1998), Rayner et al. (2001), and Moats (1994)
have come to similar conclusions.

There was also a range of correct responses for the three tests (20 to 80, 40 to
97, and 45 to 100% respectively), which indicates that there were varying levels of
knowledge on individual items.

On the TEKAP, the item with the lowest percent of correct responses was from
the phonemic awareness application (segmentation) category (objective C):

How many phonemes are in the word box?
(a) one
(b) two
(c) three
(d) four
(e) five

Although the majority of the participants answered the other phoneme
segmentation items correctly, this item indicates that the teachers were not completely
able to distinguish the difference between the number of sounds and the number of
letters in a word.

The items with the highest percent of correct responses was from the phonics
application category (vowels) (objective E):

If tife were a word, which word would probably have a similar “i” sound?
(a) if
(b) beautiful
(c) find
(d) ceiling
(e) sing

This item indicates that most teachers were able to isolate an individual sound
and compare that sound to the sounds in other words; however, in phonemic
awareness application (manipulation, objective D), approximately 3 out of 10 teachers
were not able to reverse the sounds in a word. Therefore, some teachers needed more
practice with phonemic awareness application. In addition, in the phonics application
(consonants, objective F), the majority of teachers did answer the questions accurately;
however, between 2 and 4 out of 10 teachers were not able to apply basic phonics terms, so more knowledge was needed in this area as well.

For the phonemic awareness definitions (objective A), about 9 out of 10 teachers were able to correctly define a phoneme; however, only about 4 in 10 were able to correctly define phonemic awareness. Only about half of the participants answered the phonics definitions (objective B) items correctly.

On the TCLK, the item with the lowest percent of correct responses was a morphology (objective C) item:

Which word has one morpheme?
(a) amorous
(b) jumped
(c) woman
(d) defected
(e) incredible

The items in this section had varying levels of correct responses based on the teachers’ familiarity with the concepts. The majority of the teachers were familiar with compound nouns, prefixes, and the definition of morphology; however, most were not able to identify morphemes in words and were not familiar with the type of English words derived from Greek.

On the TCLK, the item with the highest percent of correct responses was from syllabication (objective B):

How many syllables does cabinet have?
(a) 7
(b) 5
(c) 3
(d) 6
(e) 4

Most, but not all, teachers were able to identify the number of syllables in a word. The majority of teachers answered each syllabication item correctly, except for one item that concerned identifying an open syllable where 45% of teachers answered the item correctly. For the orthography items (objective A), the knowledge was varied based on the detail of spelling knowledge solicited by the question.
On the TVK, the items with the lowest and highest percent of correct responses were the following:

Something that is salient is
(a) noticeable
(b) overt
(c) opaque
(d) salty
(e) interesting

A roster is
(a) a list
(b) an answer
(c) a plan
(d) a pledge
(e) an oath

All items on the TVK concerned vocabulary knowledge; and therefore, the variance in correct responses was due to varying levels of knowledge about individual words.

Student Outcomes

The classes of students in this study performed average or above average on the reading assessments. These results could be a result of the implementation of Reading First in Florida (Reading First in Florida, 2002). In addition, the students in this study were in first grade; and therefore, it is yet undetermined whether or not they will experience the fourth grade slump identified by Chall, Jacob, and Baldwin (1990).

Teacher Knowledge and Student Outcomes

The results of this study validate some of the original hypotheses in that there were several significant relationships identified between some of the teacher knowledge and student outcomes measures. This section will present each hypothesis and discuss the results.

TEKAP

There is a positive relationship between teachers’ explicit knowledge of the alphabetic principle and their students’ outcomes in beginning reading.

The results for the comparisons between teacher alphabetic principle knowledge and student outcomes in beginning reading were mixed. The relationship between teacher alphabetic principle knowledge and student phonemic awareness was not
significant. When controlled for initial differences, there was not a significant relationship between teacher alphabetic principle knowledge and student phonics and fluency knowledge. The only significant positive relationship was between teacher alphabetic principle knowledge and student reading comprehension.

**TCLK**

*There is a positive correlation between teachers’ comprehensive language knowledge and their students’ outcomes in beginning reading.*

When controlled for initial differences, the relationships between teacher comprehensive language knowledge and student outcomes were not significant. There was no relationship between teacher language knowledge and student phonemic awareness. With student phonics and fluency knowledge, initial differences accounted for the significant relationships and with student reading comprehension, initial differences in fluency accounted for the significant relationship.

**TVK**

*There is a positive correlation between teachers’ vocabulary knowledge and their students’ outcomes in beginning reading.*

The results for the comparisons between teacher vocabulary knowledge and student outcomes in beginning reading were mixed. The relationship between teacher vocabulary knowledge and student phonics knowledge was explained by initial differences. Similarly, the relationship between teacher vocabulary knowledge and student reading comprehension was explained by initial differences in student fluency. There was a significant negative relationship between teacher vocabulary knowledge and student phonemic awareness and a significant positive relationship between teacher vocabulary knowledge and student fluency.

**Teacher Demographics, Teacher Knowledge, and Student Outcomes**

*There is a positive relationship between the following teacher demographics: more experienced teachers, teachers with advanced degrees, teachers receiving their degrees before 1980 and after 1999, and teachers with more reading courses; and student outcomes, knowledge of the alphabetic principle, and comprehensive language knowledge. There is a positive relationship between teachers with advanced degrees and vocabulary knowledge.*
The results indicate that there were two significant relationship between teacher demographics and student outcomes: a significant negative relationship between highest degree earned and student fluency.

In addition, there was a significant negative relationship between teacher demographics and teacher knowledge: teacher vocabulary knowledge was negatively related to highest degree earned, with teachers with master’s degrees having more vocabulary knowledge than teachers with bachelor’s degrees.

Implications of the Study

The implications of the data findings will be discussed in this section and will be divided into two parts: relationships involving teacher knowledge and student outcomes and relationships involving teacher demographics, teacher knowledge, and student outcomes.

*Teacher Knowledge and Student Outcomes*

There were four types of relationships identified between teacher knowledge and student outcomes: relationships based on initial differences, significant positive relationships, significant negative relationships, and non significant relationships. Those relationships will be discussed below.

*Significant Relationships Due to Initial Student Differences*

The results of this study indicate that it was difficult for teacher knowledge to have a significant influence on student outcomes when the relationships are controlled for initial differences. For all three teacher knowledge assessments, phonics outcomes were explained by initial student differences. In addition, fluency outcomes for the teacher alphabetic principle and comprehensive language knowledge were accounted for by initial differences and reading comprehension outcomes were also accounted for by initial differences on the three DIBELS measures for teacher comprehensive language and vocabulary knowledge.

There are relevant findings in the literature. In a 1-year longitudinal study of 115 preschool children, Burgess (1999) found that initial phonological sensitivity was most influential on final phonological sensitivity. Allor (2002) found that phonemic awareness, an aspect of phonological sensitivity, does contribute to the variance in reading
development, so possibly, the initial differences in phonics and fluency knowledge could continue to have a strong influence on outcomes.

In addition, Byrne, Freebody, and Gates (1992) conducted a longitudinal study of 76 second and 83 third grade students, and found that low readers remained below average and high readers remained above average on phonemic awareness, word reading including nonwords, reading time (fluency), and comprehension tasks. Juel’s (1988) finding that students who leave first grade reading below level have a one in eight chance of reading on level for the duration of elementary school is similar because the below average readers tended to remain below average. The findings in the study for phonics, fluency, and comprehension are consistent with these results.

**Significant Positive Relationships Controlled for Initial Student Differences**

Although several relationships were defined by initial differences, there were significant positive relationships between teacher alphabetic principle knowledge and student reading comprehension and teacher vocabulary knowledge and student fluency.

Previous studies of teacher knowledge of the alphabetic principle have hypothesized on the importance of this knowledge, but have not compared teacher knowledge of the alphabetic principle to student outcomes (Bos et al., 2001; Mather et al., 2001), so these findings represent an initial exploration of the topic. Since researchers have determined that reading success necessitates proficient word reading (Rayner et al., 2001) and word recognition is developed through mastery of the alphabetic principle (Share & Stanovich, 1995), it is reasonable that teachers with more alphabetic principle knowledge would have students with improved reading comprehension.

The significant positive relationship between teacher vocabulary knowledge and fluency could be related to Whitehurst’s (2002) finding that teachers’ verbal abilities are the biggest teacher predictor of student outcomes and fluency is the culmination of several reading skills such as phonemic awareness and phonics proficiency. This study was an initial exploration of the relationships between the variables, and the discovery of both of these positive relationships suggests the need for further research in these areas.
Significant Negative Relationships Controlled for Initial Student Differences

In addition, there was a significant negative relationship between teacher vocabulary knowledge and student phonemic awareness. This finding was unexpected and has not been discovered in previous studies. Although the researcher was unaware of any previous research directly related to this finding, there is a possible explanation. In a study of 108 first-grade students, Connor, Morrison, and Katch (2004) found that children with low decoding scores at the beginning of the year benefited from more explicit decoding training. Teachers with higher vocabulary ability might have more difficulty teaching students how to break language down into the individual sounds because their reading ability seems automatic. These factors might be applicable because the majority of students in this study were from environments that lead them to be at-risk for reading difficulty.

Non Significant Relationships

Non significant relationships were also of interest, especially the lack of relationships between teacher language knowledge and student outcomes. While previous studies have found significant positive relationships between teacher comprehensive language knowledge and student outcomes in reading (McCutchen et al., 2000; McCutchen et al., 2002), this study did not find any significant relationships between comprehensive language knowledge and student outcomes. The comprehensive language knowledge test was adapted from the language test used in the other studies; however, for this study, alphabetic principle knowledge was tested separately. The significance from the other studies could be attributed to phonological awareness and alphabetic principle knowledge portions of the test. Further studies would be necessary to explore these discrepancies.

Although teacher alphabetic principle knowledge was positively related to student outcomes in reading comprehension, this knowledge was not significantly related to student phonemic awareness. This finding was unexpected because teacher phonemic awareness knowledge was necessary to succeed on this assessment and it would be reasonable for teachers with increased knowledge in this subject to have students with increased phonemic awareness knowledge. One potential explanation is that the reading programs with detailed lesson dialogue implemented in many Reading First
schools may have resulted in fewer differences in the implementation of phonemic awareness instruction, which would have decreased the influence of individual teacher knowledge. Since this finding contradicts Bos et al. (2001) and Mather et al. (2001) yet to be tested hypothesis that teachers with increased knowledge of the alphabetic principle with cause students to have increased outcomes in phonemic awareness and phonics, more research is need.

Demographics

There was one significant relationship between teacher demographics and student outcomes and one significant relationship between teacher demographics and teacher knowledge. The rest of the relationships were non significant. The significant and non significant relationships will be discussed below.

Significant Relationships

There was a significant negative relationship between highest degree earned and student fluency. In addition, teacher vocabulary knowledge was negatively related to highest degree earned, meaning that teachers with master’s degrees had more vocabulary knowledge than teachers with bachelor’s degrees. This finding is reasonable because teachers with more vocabulary knowledge should be more likely to engage in graduate studies, and further education should expose teachers to a larger vocabulary.

Whitehurst (2002) found that teacher verbal ability was the strongest teacher predictor of increased student outcomes, but he also found that teachers with master’s degrees do not show significant classroom gains when compared to teachers with bachelor’s degrees. Since the teachers with master’s degrees in this study had significantly higher vocabulary knowledge, perhaps these relationships need to be explored in more depth.

Non Significant Relationships

Also of interest with the teacher demographics comparisons is the lack of significant relationships. Since the demographic questions were broken down into four or five choices, each group had a smaller number of participants. A larger sample might have yielded different results. In addition, Reading First has included the adoption of scientifically-based reading programs and professional development (Reading First in
Florida, 2002). Therefore, the participants were more likely to be exposed to a similar knowledge base, regardless of the demographic groups to which they belong. Finally, the detailed lesson dialogue programs that are currently being implemented in many Reading First schools would be more likely to encourage teachers to deliver a more standard curriculum to the students, so the student outcomes would be more likely to be similar, regardless of teacher demographics.

Generalizations

Due to the high percentage of teachers from participating schools choosing to participate, the sample should reflect the intended population: first-grade teachers and students attending low-income schools. The results are only generalizable to this population. Further studies from a cross section of socioeconomic groups would be necessary to determine whether or not the results are generalizable to the entire population of first-grade teachers. More studies would also be necessary to investigate whether the results are similar with teachers and students in other grade levels.

Assumptions

The following assumptions were made when conducting this study.

- The participating schools were representative of low-income schools and the Florida schools are representative of nationwide schools.
- Knowledgeable teachers are able to use their knowledge when working with students.
- Based on the pilot study findings and previous studies, the teacher knowledge assessments used in this study accurately reflected knowledge of various aspects of language.
- Student outcomes in reading can be measured using the DIBELS and SAT/10 and that reading consists of five components including phonemic awareness, phonics, fluency, vocabulary, and comprehension (Armbruster, Lehr, & Osborn, 2001).
- The three DIBELS measures administered at the beginning of the year control for initial differences in reading that would affect the results of the SAT/10.
Limitations of the Study

In analyzing the conditions for this study, the researcher found the following possible limitations:

Threats to External Validity

- Since the implementation of Reading First in these schools, teachers have been required to use reading programs that contain curriculum with scientifically based reading research (Reading First in Florida, 2002). The majority of schools in this study used programs with detailed lesson dialogue. These programs may limit the necessity of teacher knowledge, improve the knowledge of all teachers, or limit teachers with an abundance of knowledge. In addition, teachers at Reading First schools have participated in beginning reading professional development. This professional development is designed to improve the knowledge of all teachers, and subsequently may have limited the variance of teacher knowledge.

- Due to the challenge of recruiting participants, participants were not selected randomly. Instead, requests for participation were made to districts or schools (depending on protocol) in many of the Reading First schools in Florida. All volunteers for participation were selected.

- Although participants were compensated with $20 for participating in this study, not all districts, schools, and teachers chose to participate. Non-participating districts and schools reported that they had been inundated with requests for research and did not feel comfortable asking teachers to participate in any more research studies. The reason for declining does not seem to relate to varying amounts of teacher knowledge. Non-participating teachers did not share their reasons for not participating, but they possibly could have felt insecure in their knowledge about the various aspect of language; however, the participation rate at participating schools was high. Based on the school and district’s reasons for declining to participate and the high percentage of participating teachers at participating schools, these threats to external validity were not deemed substantial.

- The population of interest was students attending low-income schools. Within this population, not all students were from low-income families. On average,
74% of the students attending these schools received free or reduced lunch (the measure used to determine whether or not a student is from a low-income family). Furthermore, not all students whose families qualify for free or reduced lunch have other characteristics that make them part of the at-risk population. This study was only intended to compare teacher knowledge and student outcomes in general, and therefore, this study explored group characteristics, not individual characteristics.

- This study did not examine how teachers translate knowledge into classroom practices. An observational study might have yielded different results since there is often a difference between theory and practice. In addition, this was not an experimental study; and therefore, the effect of teacher knowledge on student outcomes was not determined.

Measurement Issues

- Tests had to be adapted because, to the best of the researcher’s knowledge, there were no tests with the specifications needed for this study that tested the various aspects of language knowledge in teachers. The reliability of the tests was assessed several times in pilot testing; however, the tests had not been used in previous studies. The pilot testing was intended to assess and confirm the reliability and validity of each measure.

- When examining the validity of student outcomes, it is important to consider that reading is a complex task that is difficult to measure. Although this study contained four reliable assessments that measured different aspects of reading, the measures were only intended to measure phonemic awareness, phonics, fluency, and reading comprehension. There are other aspects of reading that this study did not directly measure such as vocabulary knowledge in students.

- Even though there was an initial assessment for each DIBELS measure, there was not a pretest for the SAT/10, so initial differences in reading comprehension were not measured. The DIBELS measures were used to control for initial differences in reading skills that relate to reading comprehension.
Statistical Issues

- Due to the difficulty of recruiting participants and the expense of compensating them, the number of participants was 69. A larger group of participants might have influenced the significance of the results.

Conclusions and Recommendations

This study made several contributions to the field of teacher knowledge about beginning reading. The study’s primary purpose was to explore the relationships between teacher knowledge of the alphabetic principle, comprehensive language knowledge, and vocabulary knowledge and student outcomes in beginning reading for teachers and students attending low-income schools.

Since there were no appropriate preexisting teacher knowledge tests available to investigate these relationships, three teacher knowledge tests were adapted and piloted before examining the potential associations. Each test assessed specific domains of language knowledge and, as a group, these tests were selected and designed to give a comprehensive assessment of the language knowledge that teachers possess including phonemic awareness, phonics, syllabic, orthographic, morphological, and vocabulary knowledge.

In particular, a test of alphabetic principle knowledge was adapted to comprehensively assess aspects of phonemic awareness and phonics knowledge. Although the test was designed to test both phonemic awareness and phonics knowledge, it was designated as an alphabetic principle knowledge assessment because phonemic awareness only involves oral language and the test was a pencil paper assessment that required written language. The Test of Explicit Knowledge of the Alphabetic Principle (TEKAP) had a final reliability .82 (Cronbach’s coefficient alpha) and was positively correlated with student outcomes in reading comprehension.

Additionally, a test of comprehensive language knowledge was adapted to assess other aspects of language knowledge. The original test included open ended answers and had not been assessed for reliability (Moats, 2000). The adapted test, the Test of Comprehensive Language Knowledge (TCLK), was multiple choice, had a final reliability of .75 (Cronbach’s coefficient alpha), and was limited to syllabication, orthography, and morphology since the TEKAP already assessed alphabetic principle
knowledge. The correlations between teacher comprehensive language knowledge and student outcomes in beginning reading were non significant when controlled for initial differences.

Finally, the Test of Vocabulary Knowledge (TVK) was adapted from the vocabulary analogies subtest of the highest level of the SAT/9 reading measure (1996). The TVK was adapted to include five possible answer instead of four to decrease the chance of guessing the correct answer and had a final reliability of .81 (Cronbach’s coefficient alpha). This test was used to assess teacher vocabulary knowledge and was positively correlated with student outcomes in fluency and negatively correlated with student outcomes in phonemic awareness.

The results of these teacher knowledge tests indicate that teacher knowledge of language could be improved. The means for the final TEKAP, TCLK, and TVK tests were 70.4, 65.8, and 80.8%, but the range of scores was from 20 to 100% on the TEKAP, 33 to 97% on the TCLK, and 40 to 100% on the TVK, which indicates that at least some of the teachers had extremely limited language knowledge.

Once the tests were adapted, teacher knowledge was compared to student outcomes and the significance of these relationships was varied. For all three types of teacher knowledge, student outcomes in phonics were only significantly related to initial differences. Student outcomes in fluency were only significantly related to initial differences for teacher knowledge about the alphabetic principle and comprehensive language knowledge. In addition, student outcomes in reading comprehension were significantly related to initial differences for teacher comprehensive language and vocabulary knowledge when controlled for initial student differences. There were significant positive relationships between teacher alphabetic principle knowledge and student comprehension and teacher vocabulary knowledge and student fluency when controlled for initial student differences when controlled for initial student differences. There was a significant negative relationship between teacher vocabulary knowledge and student phonemic awareness when controlled for initial student differences. The relationships between teacher alphabetic principle and comprehensive language knowledge and student phonemic awareness were non significant.
The relationships between teacher demographics, teacher knowledge, and student outcomes were also examined. Although most of these relationships were non-significant, there were two significant negative relationships when controlled for initial student differences: one between highest degree earned and student fluency and one between teacher vocabulary knowledge and highest degree earned, with teachers with master’s degrees having more student fluency gains and vocabulary knowledge than teachers with bachelor’s degrees.

These results provide preliminary insight into the link between teacher knowledge and student outcomes and provide reliable assessments to further investigate these associations. The results also indicate a potential need to improve teacher knowledge and a definitely need to conduct more research in this field.

There are several recommendations for further research based on the results of this study. Since the investigations about teacher knowledge of beginning reading are preliminary, replications are needed to further examine the relationship between teacher knowledge and student outcomes. These studies would ideally contain a larger number of participant teachers. Furthermore, these studies would examine the importance of the different domains addressed on each test, and explore which specific domains of teacher knowledge contribute more substantially to student outcomes in beginning reading.

In addition, studies should compare teachers who use detailed lesson dialogue with teachers who use lesson detailed lesson dialogue and/or teachers who teach in Reading First and non Reading First schools to determine whether or not detail lesson dialogue programs and unified professional development affect the relationships between teacher knowledge and student outcomes.

To determine the potential generalizability of these findings, this study should be replicated with schools from different socioeconomic levels and regions. Furthermore, this study should be replicated in different grade levels to determine the relative importance of teacher knowledge about reading in different grade levels.

Since this study only explored teacher knowledge about the alphabetic principle, language, and vocabulary, an additional assessment should be created and used to assess teacher knowledge about the actual teaching of aspects of word recognition and
reading comprehension. This assessment would be designed to measure knowledge about classroom practices. Additionally, continued research should be conducted to create and validate student assessments in order to make sure that student outcomes in reading are being comprehensively measured.

In addition, further research should be conducted into characteristics of effective teachers based on those teachers who produce the largest gains in student reading achievement. These studies would examine the influence of teacher knowledge and identify other teacher characteristics that produce great gains in student reading achievement.

When more is known about the relationship between teacher knowledge about beginning reading and student outcomes, observations should be conducted to determine how teacher knowledge translates into classroom practice and what types of knowledge are associated with classroom practices that result in higher student outcomes.

After the preliminary correlational investigations of teacher knowledge about beginning reading are conducted, experimental studies should be conducted that involve improving teacher knowledge and teaching teachers how to use this knowledge with their students. These studies will determine the effect of teacher knowledge on student outcomes.

The importance of teacher knowledge on student outcomes is a topic that has yet to be fully explored. Further research will continue to give valuable insight into how teacher knowledge and student outcomes in beginning reading can be improved.
Dear Florida Educator,

My name is Staci Walton-Duggar. I am a doctoral candidate in reading and language arts education and I work at the Florida Center for Reading Research. I am a former first-grade teacher, and I'm very interested in the knowledge teachers have about early reading skills. I am piloting the enclosed test to use in my dissertation, in which I will study the relationship between teacher knowledge and student outcomes in reading.

I appreciate your willingness to help me obtain information about the test in its present form. Your responses will be completely anonymous, and you will be helping me develop a good test to obtain information in this important area.

Please use the accompanying bubble sheet to answer the test questions (pp. 1-4) and demographic information (p. 5). On the last page of this packet (p. 6) are additional questions about the construction of the test. Please answer these questions by writing directly on the last page. I encourage you to provide additional feedback in the comments section since your feedback will help me to finalize this assessment.

I really appreciate your help.

Thank you,

Staci Walton-Duggar
Doctoral Candidate
Directions: Please bubble the correct answer on the bubble sheet.

1. What type of task would this be? “I am going to say the word dog and then I want you to break the word apart and tell me each of the sounds.”
   a. blending  
   b. alliteration  
   c. rhyming  
   d. segmentation  
   e. manipulation  

2. How many phonemes are in the word box?
   a. one  
   b. two  
   c. three  
   d. four  
   e. five  

3. What do you call two adjacent consonants that represent one speech sound?
   a. schwa  
   b. consonant blend  
   c. phoneme  
   d. digraph  
   e. consonant diphthong  

4. What do you call a letter or group of letters that represent one sound?
   a. a phoneme  
   b. a diphthong  
   c. a grapheme  
   d. a digraph  
   e. a cluster  

5. How many phonemes are in the word eight?
   a. one  
   b. two  
   c. three  
   d. four  
   e. five  

6. Which word contains a long vowel sound?
   a. met  
   b. give  
   c. cough  
   d. me  
   e. cow
7. If you say the word *ice*, and then reverse the order of the sounds, what word would *ice* be?
   a. easy
   b. sea
   c. size
   d. sigh
   e. keys

8. Which word contains a consonant digraph?
   a. play
   b. chick
   c. flip
   d. desk
   e. flower

9. How many phonemes are in the word *slip*?
   a. two
   b. three
   c. four
   d. five
   e. six

10. Which word contains a consonant blend?
    a. this
    b. dish
    c. desk
    d. whale
    e. which

11. Which statement is true?
    a. Phonological awareness is a precursor to phonics.
    b. Phonological awareness is an oral language activity.
    c. Phonological awareness is a method of reading instruction that begins with individual letters and sounds.
    d. Both a and b.
    e. Both b and c.

12. If *tife* were a word, which word would probably have a similar “i” sound?
    a. if
    b. beautiful
    c. find
    d. ceiling
    e. sing
13. What is a phoneme?
   a. a single letter
   b. a group of letters
   c. a single speech sound
   d. a single unit of meaning
   e. a grapheme

14. How many phonemes are in the word fan?
   a. one
   b. two
   c. three
   d. four
   e. five

15. What do you call a combination of two or three consonants in which each letter keeps its own sound?
   a. consonant phoneme
   b. silent consonant
   c. consonant digraph
   d. consonant diphthong
   e. consonant blend

16. How many phonemes are in the word chip?
   a. one
   b. two
   c. three
   d. four
   e. five

17. If you say the word enough, and then reverse the order of the sounds, what word would enough be?
   a. fun
   b. phone
   c. funny
   d. one
   e. often

18. Which word contains a diphthong?
   a. coat
   b. boy
   c. battle
   d. sing
   e. been
19. Which word contains a consonant digraph?
   a. slip
   b. ship
   c. desk
   d. frame
   e. street

20. If you say the word peace, and then reverse the order of the sounds, what word would peace be?
   a. sigh
   b. seize
   c. keep
   d. see
   e. seep

21. Which word contains a diphthong?
   a. ointment
   b. locomotion
   c. receive
   d. transportation
   e. helicopter

22. Which word contains a consonant blend?
   a. baseball
   b. cheeseburger
   c. flower
   d. literal
   e. rather

Note. Adapted from Mather, Bos, and Babur (2001).
Directions: Bubble the answer that represents you the best.

22. What is your gender?
   a. female
   b. male

23. What is your age?
   a. 21-30
   b. 31-40
   c. 41-50
   d. 51-60
   e. >60

24. What is your race?
   a. African American
   b. Caucasian
   c. Latino
   d. Native American
   e. Other

25. How many years have you taught?
   a. 0-5
   b. 6-10
   c. 11-15
   d. 16-20
   e. >20

26. What is your highest earned degree?
   a. Bachelor’s
   b. Master’s
   c. Specialist
   d. Doctorate

27. When did you receive your last degree?
   a. before 1970
   b. 1970-1979
   c. 1980-1989
   d. 1990-1999
   e. 2000-present

28. How many reading courses have you taken?
   a. 0-1
   b. 2-3
   c. 4-5
   d. 6-7
   e. >7
29. Which grades have you taught? (mark all that apply)
   a. K
   b. 1
   c. 2
   d. 3
   e. other
Questions About the Test
Please write on this sheet.

Were the test directions clear? If not, what should be changed?

Which questions were the easiest for you to answer? Why? Please indicate question number(s) and provide explanation(s).

Which questions were most difficult for you to answer? Why? Please indicate question number(s) and provide explanation(s).

Which questions were confusing? Why? Please indicate question number(s) and provide explanation(s).

Are there any questions that you would delete? Why? Please indicate question number(s) and provide explanation(s).

Are there any questions that you would add? Please specify an area to test or provide a question.

What is this test assessing?

Additional Comments:
APPENDIX B. PERCENTAGE CORRECT BY OBJECTIVE AND ITEM FOR THE TEKAP PILOT TEST
Percentage Correct by Objective and Item for the TEKAP Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Preservice</th>
<th>MORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
</tbody>
</table>

Objective A: Phonemic Awareness Terminology

1. What type of task would this be? “I am going to say the word *dog* and then I want you to break the word apart and tell me each of the sounds.”
   (a) blending (b) alliteration (c) rhyming
   (d) *segmentation* (e) manipulation

11. Which statement is true?
   (a) Phonological awareness is a precursor to phonics.
   (b) Phonological awareness is an oral language activity.
   (c) Phonological awareness is a method of reading instruction that begins with individual letters and sounds.
   (d) **Both a and b.** (e) Both b and c.

13. What is a phoneme?
   (a) a single letter (b) a group of letters
   (c) **a single speech sound**
   (d) a single unit of meaning (e) a grapheme

Objective B: Phonics Terminology

3. What do you call two adjacent consonants that represent one speech sound?
   (a) schwa (b) consonant blend (c) phoneme
   (d) **digraph** (e) consonant diphthong

4. What do you call a letter or group of letters that represent one sound?
   (a) a phoneme (b) a diphthong (c) **a grapheme**
   (d) a digraph (e) a cluster

---

a Answers are indicated in boldface.
b n = 26.
c n = 21.
Percentage Correct by Objective and Item for the TEKAP Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Preservice</th>
<th>MORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>15. What do you call a combination of two or three consonants in which each letter keeps its own sound? (a) consonant phoneme (b) silent consonant (c) consonant digraph (d) consonant diphthong (e) <strong>consonant blend</strong>*</td>
<td>35</td>
<td>81</td>
</tr>
</tbody>
</table>

**Objective C: Phonemic Awareness Application (Segmentation)**

14. How many phonemes are in the word *fan*? (a) one (b) two (c) **three** (d) four (e) five | 73 | 95 |

9. How many phonemes are in the word *slip*? (a) two (b) three (c) **four** (d) five (e) six | 50 | 91 |

16. How many phonemes are in the word *chip*? (a) one (b) two (c) **three** (d) four (e) five | 81 | 95 |

5. How many phonemes are in the word *eight*? (a) one (b) **two** (c) three (d) four (e) five | 58 | 81 |

2. How many phonemes are in the word *box*? (a) one (b) two (c) **three** (d) four (e) five | 23 | 62 |

**Objective D: Phonemic Awareness Application (Manipulation)**

7. If you say the word *ice*, and then reverse the order of the sounds, what word would *ice* be? (a) easy (b) sea (c) size (d) **sigh** (e) keys | 54 | 86 |

20. If you say the word *peace*, and then reverse the order of the sounds, what word would *peace* be? (a) sigh (b) seize (c) keep (d) see (e) **seep** | 89 | 95 |

17. If you say the word *enough*, and then reverse the order of the sounds, what word would *enough* be? (a) fun (b) phone (c) **funny** (d) one (e) often | 73 | 81 |

**Objective E: Phonics Application (Vowels)**

6. Which word contains a long vowel sound? (a) met (b) give (c) cough (d) **me** (e) cow | 81 | 91 |
### Percentage Correct by Objective and Item for the TEKAP Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Preservice</th>
<th>MORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. If <em>tife</em> were a word, which word would probably have a similar “i” sound?</td>
<td>85</td>
<td>86</td>
</tr>
<tr>
<td>(a) if (b) beautiful (c) <strong>find</strong> (d) ceiling (e) sing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Which word contains a diphthong?</td>
<td>27</td>
<td>67</td>
</tr>
<tr>
<td>(a) coat (b) <strong>boy</strong> (c) battle (d) sing (e) been</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Which word contains a diphthong?</td>
<td>54</td>
<td>76</td>
</tr>
<tr>
<td>(a) <strong>ointment</strong> (b) locomotion (c) receive (d) transportation (e) helicopter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Objective F: Phonics Application (Consonants)**

| 8. Which word contains a consonant digraph? | 46 | 95 |
| (a) play (b) **chick** (c) flip (d) desk (e) flower | |
| 19. Which word contains a consonant digraph? | 15 | 91 |
| (a) slip (b) **ship** (c) desk (d) frame (e) street | |
| 10. Which word contains a consonant blend? | 35 | 91 |
| (a) this (b) dish (c) **desk** (d) whale (e) which | |
| 22. Which word contains a consonant blend? | 31 | 81 |
| (a) baseball (b) cheeseburger (c) **flower** (d) literal (e) rather | |

**Note.** Adapted from Mather et al., 2001.
APPENDIX C. TEST OF EXPLICIT KNOWLEDGE OF THE ALPHABETIC PRINCIPLE
(TEKAP)
Directions: Please bubble the correct answer on the bubble sheet.

1. How many phonemes are in the word box?
   a. one
   b. two
   c. three
   d. four
   e. five

2. What do you call two adjacent consonants that represent one speech sound?
   a. schwa
   b. consonant blend
   c. phoneme
   d. consonant diphthong
   e. digraph

3. How many phonemes are in the word eight?
   a. one
   b. two
   c. three
   d. four
   e. five

4. Which word contains a long vowel sound?
   a. met
   b. give
   c. cough
   d. me
   e. cow

5. If you say the word ice, and then reverse the order of the sounds, what word would ice be?
   a. easy
   b. sea
   c. size
   d. sigh
   e. keys

6. Which word contains a consonant digraph?
   a. play
   b. chick
   c. flip
   d. desk
   e. flower
7. How many phonemes are in the word slip?
   a. two
   b. three
   c. four
   d. five
   e. six

8. Which word contains a consonant blend?
   a. desk
   b. this
   c. dish
   d. whale
   e. which

9. Which statement is true?
   a. Phonological awareness is a precursor to phonics.
   b. Phonological awareness is an oral language activity.
   c. Phonological awareness is a method of reading instruction that begins with individual letters and sounds.
   d. Both a and b.
   e. Both b and c.

10. If tife were a word, which word would probably have a similar “i” sound?
    a. find
    b. if
    c. beautiful
    d. ceiling
    e. sing

11. What is a phoneme?
    a. a single letter
    b. a group of letters
    c. a single speech sound
    d. a single unit of meaning
    e. a grapheme

12. How many phonemes are in the word fan?
    a. one
    b. two
    c. three
    d. four
    e. five
13. What do you call a combination of two or three consonants in which each letter keeps its own sound?
   a. consonant phoneme
   b. silent consonant
   c. consonant digraph
   d. consonant diphthong
   e. consonant blend

14. How many phonemes are in the word chip?
   a. one
   b. two
   c. three
   d. four
   e. five

15. If you say the word enough, and then reverse the order of the sounds, what word would enough be?
   a. fun
   b. phone
   c. one
   d. often
   e. funny

16. Which word contains a diphthong?
   a. coat
   b. boy
   c. battle
   d. sing
   e. been

17. Which word contains a consonant digraph?
   a. slip
   b. ship
   c. desk
   d. frame
   e. street

18. If you say the word peace, and then reverse the order of the sounds, what word would peace be?
   a. sigh
   b. seize
   c. keep
   d. see
   e. seep
19. Which word contains a diphthong?
   a. ointment
   b. locomotion
   c. receive
   d. transportation
   e. helicopter

20. Which word contains a consonant blend?
   a. flower
   b. baseball
   c. cheeseburger
   d. literal
   e. rather

Note. Adapted from Mather, Bos, and Babur (2001).
Directions: Bubble the answer that represents you the best.

21. What is your gender?
   a. female
   b. male

22. What is your age?
   a. 21-30
   b. 31-40
   c. 41-50
   d. 51-60
   e. >60

23. What is your race?
   a. African American
   b. Caucasian
   c. Latino
   d. Native American
   e. Other

24. How many years have you taught?
   a. 0-5
   b. 6-10
   c. 11-15
   d. 16-20
   e. >20

25. What is your highest earned degree?
   a. Bachelor’s
   b. Master’s
   c. Specialist
   d. Doctorate

26. When did you receive your last degree?
   a. before 1970
   b. 1970-1979
   c. 1980-1989
   d. 1990-1999
   e. 2000-present

27. How many reading courses have you taken?
   a. 0-1
   b. 2-3
   c. 4-5
   d. 6-7
   e. >7
Key

Answers are indicated in boldface.

Directions: Please bubble the correct answer on the bubble sheet.

1. How many phonemes are in the word **box**?
   a. one
   b. two
   c. three
   d. **four**
   e. five

2. What do you call two adjacent consonants that represent one speech sound?
   a. schwa
   b. consonant blend
   c. phoneme
   d. consonant diphthong
   e. **digraph**

3. How many phonemes are in the word **eight**?
   a. one
   b. **two**
   c. three
   d. four
   e. five

4. Which word contains a long vowel sound?
   a. met
   b. give
   c. cough
   d. **me**
   e. cow

5. If you say the word **ice**, and then reverse the order of the sounds, what word would **ice** be?
   a. easy
   b. sea
   c. size
   d. **sigh**
   e. keys
6. Which word contains a consonant digraph?
   a. play
   b. chick
   c. flip
   d. desk
   e. flower

7. How many phonemes are in the word slip?
   a. two
   b. three
   c. four
   d. five
   e. six

8. Which word contains a consonant blend?
   a. desk
   b. this
   c. dish
   d. whale
   e. which

9. Which statement is true?
   a. Phonological awareness is a precursor to phonics.
   b. Phonological awareness is an oral language activity.
   c. Phonological awareness is a method of reading instruction that begins with individual letters and sounds.
   d. Both a and b.
   e. Both b and c.

10. If tife were a word, which word would probably have a similar “i” sound?
    a. find
    b. if
    c. beautiful
    d. ceiling
    e. sing

11. What is a phoneme?
    a. a single letter
    b. a group of letters
    c. a single speech sound
    d. a single unit of meaning
    e. a grapheme
12. How many phonemes are in the word **fan**?
   a. one
   b. two
   c. three
   d. four
   e. five

13. What do you call a combination of two or three consonants in which each letter keeps its own sound?
   a. consonant phoneme
   b. silent consonant
   c. consonant digraph
   d. consonant diphthong
   e. consonant blend

14. How many phonemes are in the word **chip**?
   a. one
   b. two
   c. three
   d. four
   e. five

15. If you say the word **enough**, and then reverse the order of the sounds, what word would **enough** be?
   a. fun
   b. phone
   c. one
   d. often
   e. funny

16. Which word contains a diphthong?
   a. coat
   b. boy
   c. battle
   d. sing
   e. been

17. Which word contains a consonant digraph?
   a. slip
   b. ship
   c. desk
   d. frame
   e. street
18. If you say the word peace, and then reverse the order of the sounds, what word would peace be?
   a. sigh
   b. seize
   c. keep
   d. see
   e. seep

19. Which word contains a diphthong?
   a. ointment
   b. locomotion
   c. receive
   d. transportation
   e. helicopter

20. Which word contains a consonant blend?
   a. flower
   b. baseball
   c. cheeseburger
   d. literal
   e. rather

Note. Adapted from Mather, Bos, and Babur, (2001).
APPENDIX D. COMPREHENSIVE SURVEY OF LANGUAGE KNOWLEDGE
1. From the list below, find an example of each of the following (answer will be a word or part of a word):
   Inflected verb ______________
   Compound noun ______________
   Bound root ______________
   Derivational suffix ______________
   Greek combining form ______________

   peaches incredible slowed although shameful doughnut bicycle neuropsychology sandpaper vanish

2. For each word on the left, determine the number of syllables and the number of morphemes:

<table>
<thead>
<tr>
<th>Word</th>
<th>Syllables</th>
<th>Morphemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bookworm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unicorn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>elephant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>believed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>incredible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>finger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hogs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>telegram</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. A closed syllable is one that ________________________
   An open syllable is one that ________________________

4. How many speech sounds are in the following words?
<table>
<thead>
<tr>
<th>Word</th>
<th>Speech Sounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>sigh</td>
<td>4</td>
</tr>
<tr>
<td>throw</td>
<td>6</td>
</tr>
<tr>
<td>scratch</td>
<td>7</td>
</tr>
<tr>
<td>ice</td>
<td>5</td>
</tr>
<tr>
<td>sung</td>
<td>6</td>
</tr>
<tr>
<td>poison</td>
<td>8</td>
</tr>
<tr>
<td>mix</td>
<td>4</td>
</tr>
<tr>
<td>shrink</td>
<td>5</td>
</tr>
<tr>
<td>know</td>
<td>5</td>
</tr>
</tbody>
</table>

5. What is the third speech sound in each of the following words?
<table>
<thead>
<tr>
<th>Word</th>
<th>Third Speech Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>joyful</td>
<td></td>
</tr>
<tr>
<td>should</td>
<td></td>
</tr>
<tr>
<td>talk</td>
<td></td>
</tr>
<tr>
<td>tinker</td>
<td></td>
</tr>
<tr>
<td>rouge</td>
<td></td>
</tr>
<tr>
<td>shower</td>
<td></td>
</tr>
<tr>
<td>square</td>
<td></td>
</tr>
<tr>
<td>start</td>
<td></td>
</tr>
<tr>
<td>protect</td>
<td></td>
</tr>
<tr>
<td>patchwork</td>
<td></td>
</tr>
</tbody>
</table>

6. Underline the schwa vowels:
   telephone addenda along precious imposition unless
7. Underline the consonant blends:  
   knight  climb  wreck  napkin  squished  springy  first  

8. Underline the consonant digraphs:  
   spherical  church  numb  shrink  thought  whether  

9. When is ck used in spelling?  

10. What letters signal that a c is pronounced /s/?  

11. List all of the ways you know to spell “long o”:  

12. List all of the ways you know to spell the consonant sound /f/:  

13. When adding a suffix to a word ending with silent e, what is the spelling rule?  

14. How can you recognize an English word that came from Greek?
Key<br>

Answers are indicated in boldface.


1. From the list below, find an example of each of the following (answer will be a word or part of a word):<br>Inflected verb _**slowed**_<br>Compound noun _**sandpaper**_<br>Bound root _**cred, cyc, psych**_<br>Derivational suffix _**ful, ible**_<br>Greek combining form _**neuro + psych + ology**_<br>peaches incredible slowed although shameful doughnut bicycle neuropsychology sandpaper vanish

2. For each word on the left, determine the number of syllables and the number of morphemes:

<table>
<thead>
<tr>
<th></th>
<th>Syllables</th>
<th>Morphemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bookworm</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>unicorn</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>elephant</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>believed</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>incredible</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>finger</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>hogs</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>telegram</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

3. A closed syllable is one that **contains a short vowel and ends in a consonant.** An open syllable is one that **contains a long vowel sound spelled with one vowel letter that ends the syllable.**

4. How many speech sounds are in the following words?

- sigh _**2**_<br>- thrown _**4**_<br>- scratch _**5**_<br>- ice _**2**_<br>- sung _**3**_<br>- poison _**5**_<br>- mix _**4**_<br>- shrink _**5**_<br>- know _**2**_<br>

5. What is the third speech sound in each of the following words?

- joyful _**/lɪf/**_<br>- should _**/loʊ/**_<br>- talk _**/lɔw/**_<br>- tinker _**/tnik/**_<br>- rouge _**/rʊzh/**_<br>- shower _**/ʃɔrw/**_<br>- square _**/kwɛr/**_<br>- start _**/stɑrt/**_<br>- protect _**/prəktɪʃ/**_<br>- patchwork _**/pætʃwɜrk/**_<br>

---

*a Answers are as reported by Moats (2003).*
6. Underline the schwa vowels:
   telephone  addenda  along  precious  imposition  unless

7. Underline the consonant blends:
   knight  climb  wreck  napkin  squished  springy  first

8. Underline the consonant digraphs:
   spherical  church  numb  shrink  thought  whether

9. When is ck used in spelling?
   The spelling ck is used when a /k/ sound follows a stressed, short vowel.

10. What letters signal that a c is pronounced /s/?
    e, i, or y

11. List all of the ways you know to spell "long o":
    o, oa, ow, oe, o-consonant-e, ough

12. List all of the ways you know to spell the consonant sound /f/:
    f, ff, gh, ph

13. When adding a suffix to a word ending with silent e, what is the spelling rule?
    Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.

14. How can you recognize an English word that came from Greek?
    An English word that came from Greek might have ph for /f/, ch for /k/, or y for /i/ or /i/ spelling; it is likely to be constructed from two or more combining forms; and it is likely to be a mythological, scientific, or a mathematical term.
Initial Pilot Test

1. When adding a suffix to a word ending with silent e, what is the spelling rule?
   a. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.
   b. Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.
   c. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.
   d. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.
   e. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a blend.

2. How many syllables does elephant have?
   a. 1    b. 2    c. 3    d. 4    e. 5

3. Which word contains an example of a bound root?
   a. bicycle   b. division   c. country   d. possess   e. abnormal

4. How many speech sounds are in thrown?
   a. 2    b. 3    c. 4    d. 5    e. 6

5. What is a closed syllable?
   a. A syllable that contains a long vowel and ends in a digraph.
   b. A syllable that contains a short vowel and ends in a consonant.
   c. A syllable that contains a long vowel and ends in a consonant.
   d. A syllable that contains a short vowel and ends in a vowel.
   e. A syllable that contains a long vowel and ends in a vowel.
6. Which word has a schwa vowel underlined?
   a. snowman
   b. telephone
   c. fragrant
   d. hopping
   e. There is no schwa vowel underlined.

7. Which word is an example of a compound noun?
   a. television
   b. children
   c. alligator
   d. sandpaper
   e. carnivorous

8. How many syllables does unicorn have?
   a. 3
   b. 1
   c. 2
   d. 6
   e. 7

9. What is an open syllable?
   a. A syllable that contains a long vowel sound spelled with two vowel letters that end the syllable.
   b. A syllable that contains a short vowel sound spelled with two vowel letters that end the syllable.
   c. A syllable that contains a long vowel sound spelled with one vowel letter that ends the syllable.
   d. A syllable that contains a short vowel sound spelled with one vowel letter that ends the syllable.
   e. A syllable that contains a diphthong spelled with at least two vowels that end the syllable.

10. How can you recognize an English word that came from Greek?
    a. It is likely to be a historical, scientific, or a mathematical term.
    b. It is likely to be a mythological, scientific, or a geographical term.
    c. It is likely to be a mythological, linguistic, or a mathematical term.
    d. It is likely to be a scientific, educational, or historical term.
    e. It is likely to be a mythological, scientific, or a mathematical term.

11. What is the third speech sound in protect?
    a. /ë/
    b. /t/
    c. /c/
    d. /ö/
    e. /r/
12. When is ck used in spelling?
   a. The spelling ck is used when a /k/ sound follows a stressed, long vowel.
   b. The spelling ck is used when a /k/ sound follows an unstressed, short vowel.
   c. The spelling ck is used when a /k/ sound follows an unstressed, short vowel.
   d. The spelling ck is used when a /k/ sound follows a stressed diphthong.
   e. The spelling ck is used when a /k/ sound follows a stressed, short vowel.

13. Which word has a consonant digraph underlined?
   a. **clap**
   b. **shrink**
   c. **frog**
   d. **wrought**
   e. There is no consonant digraph underlined.

14. What letters signal that c is pronounced /s/?
   a. e, i, or y
   b. a, i, or o
   c. i, o, or y
   d. e, i, or o
   e. e, i, or u

15. How many syllables does bookworm have?
   a. 2
   b. 1
   c. 4
   d. 3
   e. 6

16. Which letters or groups of letters spell “long o”?
   a. o, oa, ow, oe, o-consonant-e, oi
   b. o, oa, ow, oe, o-consonant-a, ough
   c. o, oa, oe, ou, o-consonant-e, ough
   d. o, oa, ow, oe, o-consonant-e, ough
   e. o, oe, ou, o-consonant-e, ow

17. Which word has a consonant digraph underlined?
   a. **numb**
   b. **napkin**
   c. **knife**
   d. **stress**
   e. There is no consonant digraph underlined.
18. How many morphemes does elephant have?
   a. 2
   b. 3
   c. 4
   d. 1
   e. 5

19. Which letters or groups of letters spell the consonant sound /f/?
   a. f, ff, ph, ough
   b. f, ff, gh, pf
   c. f, ff, gh, ph
   d. f, gh, ph
   e. f, gh, ph, ough

20. How many morphemes does unicorn have?
   b. a. 3
   c. b. 1
   d. c. 6
   d. 7
   e. 2

Note. Adapted from Moats (2000).
Second Pilot Test

1. When adding a suffix to a word ending with silent e, what is the spelling rule?
   a. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.
   b. Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.
   c. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.
   d. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.
   e. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a blend.

2. When is ck used in spelling?
   a. The spelling ck is used when a /k/ sound follows a stressed, long vowel.
   b. The spelling ck is used when a /k/ sound follows an unstressed, short vowel.
   c. The spelling ck is used when a /k/ sound follows an unstressed, long vowel.
   d. The spelling ck is used when a /k/ sound follows a stressed diphthong.
   e. The spelling ck is used when a /k/ sound follows a stressed, short vowel.

3. Which letters signal that c is pronounced with an /s/ sound?
   a. e, i, or y
   b. a, i, or o
   c. i, o, or y
   d. e, i, or o
   e. e, i, or u

4. When spelling a two-syllable word, what is the rule for the vowel in the first syllable?
   a. A diphthong is followed by one consonant and a long vowel is followed by two consonants.
   b. A short vowel is followed by two consonants and a long vowel is followed by one consonant.
   c. A short vowel is followed by two consonants and a long vowel is followed by two consonants.
   d. A short vowel is followed by one consonant and a long vowel is followed by two consonants.
   e. A diphthong is followed by one consonant and a short vowel is followed by one consonant.
5. Which letters or groups of letters spell the consonant sound /f/?
   a. f, ff, gh, pf
   b. f, gh, pf, ph
   c. f, ff, ph, ough
   d. f, gh, ph, ough
   e. f, ff, gh, ph

6. Which spelling pattern typically indicates a short vowel?
   a. consonant-vowel-consonant-e
   b. consonant-vowel
   c. consonant-vowel-consonant-vowel
   d. consonant-vowel-consonant
   e. consonant-vowel-vowel-consonant

7. In English spelling, which type of letter or letters does each syllable typically have?
   a. blend
   b. diphthong
   c. vowel
   d. digraph
   e. consonant

8. Which letters or groups of letters spell “long o”?
   a. o, oa, oe, oi
   b. o, oa, oe, o-consonant-a
   c. o, oa, oi, ough
   d. o, oa, o-consonant-e, ough
   e. o, oe, o-consonant-ea, ow

9. Which spelling patterns typically indicate a long vowel?
   a. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   b. consonant-vowel-consonant, consonant-vowel, consonant-vowel-vowel-consonant
   d. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   e. consonant-vowel-consonant-e, consonant-vowel-consonant, consonant-vowel-vowel-consonant
10. When is the /k/ sound spelled with a k?
   a. When the word begins with a /k/ sound, the letter k is used before a, o, and u.
   b. When the word ends with a /k/ sound, the letter k is used.
   c. When a word begins with a /k/ sound, the letter k is used before the vowels i and e.
   d. When the word ends with a /k/ sound, the letter k is used if it is proceeded by a, o, and u.
   e. The /k/ sound is always spelled with a k.

11. Which word has a suffix?
   a. philosophy
   b. predictable
   c. insufficient
   d. consonant
   e. snowman

12. How many morphemes does unicorn have?
   a. 3
   b. 1
   c. 6
   d. 7
   e. 2

13. Which word is an example of a compound noun?
   a. television
   b. children
   c. alligator
   d. sandpaper
   e. carnivorous

14. How can you recognize an English word that came from Greek?
   a. It is likely to be a historical, scientific, or a mathematical term.
   b. It is likely to be a mythological, scientific, or a geographical term.
   c. It is likely to be a mythological, linguistic, or a mathematical term.
   d. It is likely to be a scientific, educational, or historical term.
   e. It is likely to be a mythological, scientific, or a mathematical term.

15. What is a morpheme?
   a. A predictable phonetic variant of a phoneme.
   b. The smallest meaningful unit of language.
   c. The unit of pronunciation that is arranged around a vowel.
   d. A speech sound that combines with others in a language system to make words.
   e. A writing system.
16. Which word is an example of a compound noun?
   a. ladybug
   b. family
   c. mechanic
   d. computer
   e. limousine

17. Which word has one morpheme?
   a. amorous
   b. jumped
   c. woman
   d. defected
   e. incredible

18. How many morphemes does elephant have?
   a. 2
   b. 3
   c. 4
   d. 1
   e. 5

19. What is a prefix?
   a. A morpheme that precedes a root word that contributes to or modifies the meaning of a word.
   b. A phoneme that precedes a root word that contributes to or modifies the meaning of a word.
   c. A syllable that precedes a root word that contributes to or modifies the meaning of a word.
   d. An orthography that precedes a root word that contributes to or modifies the meaning of a word.
   e. A morpheme that follows a root word that contributes to or modifies the meaning of a word.

20. How many morphemes does bookworm have?
   a. 6
   b. 4
   c. 2
   d. 3
   e. 1

21. What is a closed syllable?
   a. A syllable that contains a short vowel and ends in a consonant.
   b. A syllable that contains a long vowel and ends in a digraph.
   c. A syllable that contains a long vowel and ends in a consonant.
   d. A syllable that contains a short vowel and ends in a consonant.
   e. A syllable that contains a long vowel and ends in a vowel.
22. How many syllables does literacy have?
   a. 3
   b. 2
   c. 6
   d. 4
   e. 8

23. Which word has an open syllable?
   a. mention
   b. spurious
   c. attention
   d. trainer
   e. program

24. Which word has a vowel-consonant-e syllable?
   a. teachers
   b. adapted
   c. syllable
   d. conflate
   e. literacy

25. How many syllables does backpack have?
   a. 2
   b. 1
   c. 4
   d. 3
   e. 6

26. What is an open syllable?
   a. A syllable that contains a long vowel sound spelled with two vowels that end the syllable.
   b. A syllable that contains a short vowel sound spelled with two vowels that end the syllable.
   c. A syllable that contains a long vowel sound spelled with one vowel that ends the syllable.
   d. A syllable that contains a diphthong spelled with two vowels that end the syllable.
   e. A syllable that contains a short vowel sound spelled with one vowel that ends the syllable.

27. What type of syllable unit is rab an example of?
   a. diphthong syllable
   b. open syllable
   c. vowel team syllable
   d. vowel-consonant-e syllable
   e. closed syllable
28. How many syllables does cabinet have?
   a. 7
   b. 5
   c. 3
   d. 6
   e. 4

29. What type of syllable unit is me an example of?
   a. diphthong syllable
   b. open syllable
   c. vowel team syllable
   d. vowel-consonant-e syllable
   e. closed syllable

30. Which word has an r-controlled syllable?
   a. trash
   b. flower
   c. strobe
   d. written
   e. rabbit

Note. Adapted from Moats (2000)
APPENDIX F.  PERCENTAGE CORRECT BY OBJECTIVE AND ITEMS FOR TCLK PILOT TESTS
Percentage Correct by Objective and Item for TCLK Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Objective A: Phonemes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>How many speech sounds are in <strong>thrown</strong>?</td>
<td>41</td>
</tr>
<tr>
<td>(a) 2 (b) 3 (c) 4 (d) 5 (e) 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Which word has a schwa vowel underlined?</td>
<td>26</td>
</tr>
<tr>
<td>(a) snowman (b) <strong>telephone</strong> (c) fragrant (d) hopping (e) There is no schwa vowel underlined.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>What is the third speech sound in <strong>protect</strong>?</td>
<td>48</td>
</tr>
<tr>
<td>(a) /ē/ (b) /t/ (c) /c/ (d) /ō/ (e) /r/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Which word has a consonant digraph underlined?</td>
<td>41</td>
</tr>
<tr>
<td>(a) <strong>clap</strong> (b) <strong>shrink</strong> (c) frog (d) wrought (e) There is no consonant digraph underlined.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Which word has a consonant digraph underlined?</td>
<td>12</td>
</tr>
<tr>
<td>(a) numb (b) napkin (c) knife (d) stress (e) <strong>There is no consonant digraph underlined.</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Objective B: Orthography

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>When adding a suffix to a word ending with silent e, what is the spelling rule?</td>
</tr>
<tr>
<td>(a) Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.</td>
<td></td>
</tr>
<tr>
<td>(b) <strong>Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.</strong></td>
<td></td>
</tr>
<tr>
<td>(c) Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.</td>
<td></td>
</tr>
<tr>
<td>(d) Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.</td>
<td></td>
</tr>
<tr>
<td>(e) Drop the e is the suffix begins with a consonant; keep the e if the suffix begins with a blend.</td>
<td></td>
</tr>
</tbody>
</table>

---

*Answers are indicated in boldface.

*Percent of respondents who answered item correctly (n=27).
### Percentage Correct by Objective and Item for TCLK Pilot Test

**Item**

**%**

12. When is ck used in spelling?  
   (a) The spelling ck is used when a /k/ sound follows a stressed, long vowel.  
   (b) The spelling ck is used when a /k/ sound follows an unstressed, short vowel.  
   (c) The spelling ck is used when a /k/ sound follows an unstressed, short vowel.  
   (d) The spelling ck is used when a /k/ sound follows a stressed diphthong.  
   (e) **The spelling ck is used when a /k/ sound follows a stressed, short vowel.**

14. What letters signal that c is pronounced /s/?  
   (a) e, i, or y  
   (b) a, i, or o  
   (c) i, o, or y  
   (d) e, i, or o  
   (e) e, i, or u

16. Which letters or groups of letters spell “long o”?  
   (a) o, oa, ow, oe, o-consonant-e, oi  
   (b) o, oa, ow, oe, o-consonant-a, ough  
   (c) o, ao, oe, ou, o-consonant-e, ough  
   (d) o, oa, ow, oe, o-consonant-e, ough  
   (e) o, oe, ou, o-consonant-e, ow

19. Which letters or groups of letters spell the consonant sound /f/?  
   (a) f, ff, ph, ough  
   (b) f, ff, gh, pf  
   (c) f, ff, gh, ph  
   (d) f, gh, pf, ph  
   (e) f, gh, ph, ough

**Objective C: Syllabication**

2. How many syllables does elephant have?  
   (a) 1  
   (b) 2  
   (c) 3  
   (d) 4  
   (e) 5
### Percentage Correct by Objective and Item for TCLK Pilot Test

<table>
<thead>
<tr>
<th>Item&lt;sup&gt;a&lt;/sup&gt;</th>
<th>%&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. What is a closed syllable?</td>
<td>44</td>
</tr>
<tr>
<td>(a) A syllable that contains a long vowel and ends in a digraph.</td>
<td></td>
</tr>
<tr>
<td>(b) <strong>A syllable that contains a short vowel and ends in a consonant.</strong></td>
<td></td>
</tr>
<tr>
<td>(c) A syllable that contains a long vowel and ends in a consonant.</td>
<td></td>
</tr>
<tr>
<td>(d) A syllable that contains a short vowel and ends in a vowel.</td>
<td></td>
</tr>
<tr>
<td>(e) A syllable that contains a long vowel and ends in a vowel.</td>
<td></td>
</tr>
<tr>
<td>8. How many syllables does unicorn have?</td>
<td>93</td>
</tr>
<tr>
<td>(a) 3</td>
<td>(b) 1</td>
</tr>
<tr>
<td>9. What is an open syllable?</td>
<td>33</td>
</tr>
<tr>
<td>(a) A syllable that contains a long vowel sound spelled with two vowel letters that end the syllable.</td>
<td></td>
</tr>
<tr>
<td>(b) A syllable that contains a short vowel sound spelled with two vowel letters that end the syllable.</td>
<td></td>
</tr>
<tr>
<td>(c) <strong>A syllable that contains a long vowel sound spelled with one vowel letter that ends the syllable.</strong></td>
<td></td>
</tr>
<tr>
<td>(d) A syllable that contains a short vowel sound spelled with one vowel letter that ends the syllable.</td>
<td></td>
</tr>
<tr>
<td>(e) A syllable that contains a diphthong spelled with at least two vowels that end the syllable.</td>
<td></td>
</tr>
<tr>
<td>15. How many syllables does bookworm have?</td>
<td>81</td>
</tr>
<tr>
<td>(a) 2</td>
<td>(b) 1</td>
</tr>
</tbody>
</table>

**Objective D: Morphology**

3. Which word contains an example of a bound root? 19
   (a) **bicycle** (b) division (c) country (d) possess (e) abnormal

7. Which word is an example of a compound noun? 74
   (a) Television (b) children (c) alligator (d) **sandpaper** (e) carnivorous
Percentage Correct by Objective and Item for TCLK Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.  How can you recognize an English word that came from Greek?</td>
<td></td>
</tr>
<tr>
<td>(a) It is likely to be a historical, scientific, or a mathematical term.</td>
<td>56</td>
</tr>
<tr>
<td>(b) It is likely to be a mythological, scientific, or a geographical term.</td>
<td></td>
</tr>
<tr>
<td>(c) It is likely to be a mythological, linguistic, or a mathematical term.</td>
<td></td>
</tr>
<tr>
<td>(d) It is likely to be a scientific, educational, or historical term.</td>
<td></td>
</tr>
<tr>
<td>(e) <strong>It is likely to be a mythological, scientific, or a mathematical term.</strong></td>
<td></td>
</tr>
<tr>
<td>18. How many morphemes does <strong>elephant</strong> have?</td>
<td>26</td>
</tr>
<tr>
<td>(a) 2 (b) 3 (c) 4 (d) 1 (e) 5</td>
<td></td>
</tr>
<tr>
<td>20. How many morphemes does <strong>unicorn</strong> have?</td>
<td>33</td>
</tr>
<tr>
<td>(a) 3 (b) 1 (c) 6 (d) 7 (e) 2</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Adapted from Moats (2000).*
### Percentage Correct by Objective and Item for Revised TCLK Pilot Test

<table>
<thead>
<tr>
<th>Itema</th>
<th>%b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective A: Orthography</strong></td>
<td></td>
</tr>
<tr>
<td>1. When adding a suffix to a word ending with silent e, what is the spelling rule?</td>
<td>29</td>
</tr>
<tr>
<td>(a) Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.</td>
<td></td>
</tr>
<tr>
<td>(b) <strong>Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.</strong></td>
<td></td>
</tr>
<tr>
<td>(c) Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.</td>
<td></td>
</tr>
<tr>
<td>(d) Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.</td>
<td></td>
</tr>
<tr>
<td>(e) Drop the e is the suffix begins with a consonant; keep the e if the suffix begins with a blend.</td>
<td></td>
</tr>
<tr>
<td>2. When is ck used in spelling?</td>
<td>21</td>
</tr>
<tr>
<td>(a) The spelling ck is used when a /k/ sound follows a stressed, long vowel.</td>
<td></td>
</tr>
<tr>
<td>(b) The spelling ck is used when a /k/ sound follows an unstressed, short vowel.</td>
<td></td>
</tr>
<tr>
<td>(c) The spelling ck is used when a /k/ sound follows an unstressed, short vowel.</td>
<td></td>
</tr>
<tr>
<td>(d) The spelling ck is used when a /k/ sound follows a stressed diphthong.</td>
<td></td>
</tr>
<tr>
<td>(e) <strong>The spelling ck is used when a /k/ sound follows a stressed, short vowel.</strong></td>
<td></td>
</tr>
<tr>
<td>3. What letters signal that c is pronounced /s/?</td>
<td>39</td>
</tr>
<tr>
<td>(a) e, i, or y</td>
<td></td>
</tr>
<tr>
<td>(b) a, i, or o</td>
<td></td>
</tr>
<tr>
<td>(c) i, o, or y</td>
<td></td>
</tr>
<tr>
<td>(d) e, i, or o</td>
<td></td>
</tr>
<tr>
<td>(e) e, i, or u</td>
<td></td>
</tr>
<tr>
<td>4. When spelling a two-syllable word, what is the rule for the vowel in the first syllable?</td>
<td>39</td>
</tr>
<tr>
<td>(a) A diphthong is followed by one consonant and a long vowel is followed by two consonants.</td>
<td></td>
</tr>
</tbody>
</table>

---

a Answers are indicated in boldface.
b Percent of respondents who answered item correctly (n=28).
Percentage Correct by Objective and Item for Revised TCLK Pilot Test

Item a

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>A short vowel is followed by two consonants and a long vowel is followed by one consonant.</td>
<td>21</td>
</tr>
<tr>
<td>(c)</td>
<td>A short vowel is followed by two consonants and a long vowel is followed by two consonants.</td>
<td>43</td>
</tr>
<tr>
<td>(d)</td>
<td>A short vowel is followed by one consonant and a long vowel is followed by two consonants.</td>
<td>43</td>
</tr>
<tr>
<td>(e)</td>
<td>A diphthong is followed by one consonant and a short vowel is followed by one consonant.</td>
<td></td>
</tr>
</tbody>
</table>

5. Which letters or groups of letters spell the consonant sound /tʃ/?
   (a) f, ff, gh, pf (b) f, gh, pf (c) f, ph, ough
   (d) f, gh, ph, ough (e) f, ff, gh, ph

6. Which spelling pattern typically indicates a short vowel?
   (a) consonant-vowel-consonant-e (b) consonant-vowel
   (c) consonant-vowel-consonant-vowel (d) consonant-vowel-consonant
   (e) consonant-vowel-vowel-consonant

7. In English spelling, which type of letter or letters does each syllable typically have?
   (a) blend (b) diphthong (c) vowel (d) digraph
   (e) consonant

8. Which letters or groups of letters spell “long o”?
   (a) o, oa, ow, oe, o-consonant-e, oi
   (b) o, oa, ow, oe, o-consonant-a, ough
   (c) o, oe, ou, o-consonant-e, ough
   (d) o, oa, ow, oe, o-consonant-e, ough
   (e) o, oe, ou, o-consonant-e, ow

9. Which spelling patterns typically indicate a long vowel?
   (a) consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   (b) consonant-vowel-consonant, consonant-vowel, consonant-vowel-consonant-vowel
   (c) consonant-vowel, consonant-vowel-consonant-vowel, consonant-vowel-vowel-consonant
Percentage Correct by Objective and Item for Revised TCLK Pilot Test

Item\textsuperscript{a} \hspace{10cm} \%\textsuperscript{b}

(d) consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-consonant
(e) consonant-vowel-consonant-e, consonant-vowel-consonant, consonant-vowel-vowel-consonant

10. When is the /k/ sound spelled with a k?
(a) When the word begins with a /k/ sound, the letter k is used before a, o, and u.
(b) When the word ends with a /k/ sound, the letter k is used.
(c) \textbf{When a word begins with a /k/ sound, the letter k is used before the vowels i and e.}
(d) When the word ends with a /k/ sound, the letter k is used if it is proceeded by a, o, and u.
(e) The /k/ sound is always spelled with a k.

Objective B: Syllabication

21. What is a closed syllable?
(a) \textbf{A syllable that contains a short vowel and ends in a consonant.}
(b) A syllable that contains a long vowel and ends in a digraph.
(c) A syllable that contains a long vowel and ends in a consonant.
(d) A syllable that contains a short vowel and ends in a vowel.
(e) A syllable that contains a long vowel and ends in a vowel.

22. How many syllables does literacy have?
(a) 3 (b) 2 (c) 6 (d) 4 (e) 8

23. Which word has an open syllable?
(a) mention (b) spurious (c) attention (d) trainer
(e) \textbf{program}

24. Which word has a vowel-consonant-e syllable?
(a) teachers (b) adapted (c) syllable (d) \textbf{conflate}
(e) literacy
Percentage Correct by Objective and Item for Revised TCLK Pilot Test

Item\(^a\)  %\(^b\)

25. How many syllables does backpack have?  71
   (a) 2 (b) 1 (c) 4 (d) 3 (e) 6

26. What is an open syllable?  36
   (a) A syllable that contains a long vowel sound spelled
      with two vowels that end the syllable.
   (b) A syllable that contains a short vowel sound
      spelled with two vowels that end the syllable.
   (c) A syllable that contains a long vowel sound
       spelled with one vowel that ends the syllable.
   (d) A syllable that contains a diphthong spelled with
       two vowels that end the syllable.
   (e) A syllable that contains a short vowel sound
       spelled with one vowel that ends the syllable.

27. What type of syllable unit is rab an example of?  71
   (a) diphthong syllable (b) open syllable
   (c) vowel team syllable (d) vowel-consonant-e syllable
   (e) closed syllable

28. How many syllables does cabinet have?  89
   (a) 7 (b) 5 (c) 3 (d) 6 (e) 4

29. What type of syllable unit is me an example of?  61
   (a) diphthong syllable (b) open syllable
   (c) vowel team syllable (d) vowel-consonant-e syllable
   (e) closed syllable

30. Which word has an r-controlled syllable?  36
   (a) trash (b) flower (c) strobe (d) written (e) rabbit

   Objective C: Morphology

11. Which word has a suffix?  79
    (a) philosophy (b) predictable (c) insufficient
    (d) consonant (e) snowman

12. How many morphemes does unicorn have?  61
    (a) 3 (b) 1 (c) 6 (d) 7 (e) 2
### Percentage Correct by Objective and Item for Revised TCLK Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Which word is an example of a compound noun?</td>
<td>79</td>
</tr>
<tr>
<td>(a) Television (b) children (c) alligator (d) <strong>sandpaper</strong> (e) carnivorous</td>
<td></td>
</tr>
<tr>
<td>14. How can you recognize an English word that came from Greek?</td>
<td>32</td>
</tr>
<tr>
<td>(a) It is likely to be a historical, scientific, or a mathematical term. (b) It is likely to be a mythological, scientific, or a geographical term. (c) It is likely to be a mythological, linguistic, or a mathematical term. (d) It is likely to be a scientific, educational, or historical term. (e) <strong>It is likely to be a mythological, scientific, or a mathematical term.</strong></td>
<td></td>
</tr>
<tr>
<td>15. What is a morpheme?</td>
<td>82</td>
</tr>
<tr>
<td>(a) A predictable phonetic variant of a phoneme. (b) The smallest meaningful unit of language. (c) The unit of pronunciation that is arranged around a vowel. (d) A speech sound that combines with others in a language system to make words. (e) A writing system.</td>
<td></td>
</tr>
<tr>
<td>16. Which word is an example of a compound noun?</td>
<td>96</td>
</tr>
<tr>
<td>(a) <strong>ladybug</strong> (b) family (c) mechanic (d) computer (e) limousine</td>
<td></td>
</tr>
<tr>
<td>17. Which word has one morpheme?</td>
<td>61</td>
</tr>
<tr>
<td>(a) amorous (b) jumped (c) <strong>woman</strong> (d) defected (e) incredible</td>
<td></td>
</tr>
<tr>
<td>18. How many morphemes does <strong>elephant</strong> have?</td>
<td>46</td>
</tr>
<tr>
<td>(a) 2 (b) 3 (c) 4 (d) 1 (e) 5</td>
<td></td>
</tr>
</tbody>
</table>
19. What is a prefix?
   (a) A morpheme that precedes a root word that contributes to or modifies the meaning of a word.
   (b) A phoneme that precedes a root word that contributes to or modifies the meaning of a word.
   (c) A syllable that precedes a root word that contributes to or modifies the meaning of a word.
   (d) An orthography that precedes a root word that contributes to or modifies the meaning of a word.
   (e) A morpheme that follows a root word that contributes to or modifies the meaning of a word.

20. How many morphemes does bookworm have?
   (a) 6 (b) 4 (c) 2 (d) 3 (e) 1

Note. Adapted from Moats (2000)
APPENDIX G. TEST OF COMPREHENSIVE LANGUAGE KNOWLEDGE (TCLK)
Directions: Please bubble the correct answer on the bubble sheet.

1. When adding a suffix to a word ending with silent e, what is the spelling rule?
   a. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.
   b. Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.
   c. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.
   d. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.
   e. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a blend.

2. When is ck used in spelling?
   a. The spelling ck is used when a /k/ sound follows a stressed, long vowel.
   b. The spelling ck is used when a /k/ sound follows an unstressed, short vowel.
   c. The spelling ck is used when a /k/ sound follows an unstressed, long vowel.
   d. The spelling ck is used when a /k/ sound follows a stressed diphthong.
   e. The spelling ck is used when a /k/ sound follows a stressed, short vowel.

3. Which letters signal that c is pronounced with an /s/ sound?
   a. e, i, or y
   b. a, i, or o
   c. i, o, or y
   d. e, i, or o
   e. e, i, or u

4. When spelling a two-syllable word, what is the rule for the vowel in the first syllable?
   a. A diphthong is followed by one consonant and a long vowel is followed by two consonants.
   b. A short vowel is followed by two consonants and a long vowel is followed by one consonant.
   c. A short vowel is followed by two consonants and a long vowel is followed by two consonants.
   d. A short vowel is followed by one consonant and a long vowel is followed by two consonants.
   e. A diphthong is followed by one consonant and a short vowel is followed by one consonant.
5. Which letters or groups of letters spell the consonant sound /f/?
   a. f, ff, gh, pf
   b. f, gh, pf, ph
   c. f, ff, ph, ough
   d. f, gh, ph, ough
   e. f, ff, gh, ph

6. Which spelling pattern typically indicates a short vowel?
   a. consonant-vowel-consonant-e
   b. consonant-vowel
   c. consonant-vowel-consonant-vowel
   d. consonant-vowel-consonant
   e. consonant-vowel-vowel-consonant

7. In English spelling, which type of letter or letters does each syllable typically have?
   a. blend
   b. diphthong
   c. vowel
   d. digraph
   e. consonant

8. Which letters or groups of letters spell “long o”?
   a. o, oa, oe, oi
   b. o, oa, oe, o-consonant-a
   c. o, oa, oi, ough
   d. o, oa, o-consonant-e, ough
   e. o, oe, o-consonant-ea, ow

9. Which spelling patterns typically indicate a long vowel?
   a. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   b. consonant-vowel-consonant, consonant-vowel, consonant-vowel-vowel-consonant-vowel
   d. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   e. consonant-vowel-consonant-e, consonant-vowel-consonant, consonant-vowel-vowel-consonant
10. When is the /k/ sound spelled with a k?
   a. When the word begins with a /k/ sound, the letter k is used before a, o, and u.
   b. When the word ends with a /k/ sound, the letter k is used.
   c. When a word begins with a /k/ sound, the letter k is used before the vowels i and e.
   d. When the word ends with a /k/ sound, the letter k is used if it is proceeded by a, o, and u.
   e. The /k/ sound is always spelled with a k.

11. Which word has a suffix?
   a. philosophy
   b. predictable
   c. insufficient
   d. consonant
   e. snowman

12. How many morphemes does unicorn have?
   a. 3
   b. 1
   c. 6
   d. 7
   e. 2

13. Which word is an example of a compound noun?
   a. television
   b. children
   c. alligator
   d. sandpaper
   e. carnivorous

14. How can you recognize an English word that came from Greek?
   a. It is likely to be a historical, scientific, or a mathematical term.
   b. It is likely to be a mythological, scientific, or a geographical term.
   c. It is likely to be a mythological, linguistic, or a mathematical term.
   d. It is likely to be a scientific, educational, or historical term.
   e. It is likely to be a mythological, scientific, or a mathematical term.

15. What is a morpheme?
   a. A predictable phonetic variant of a phoneme.
   b. The smallest meaningful unit of language.
   c. The unit of pronunciation that is arranged around a vowel.
   d. A speech sound that combines with others in a language system to make words.
   e. A writing system.
16. Which word is an example of a compound noun?
   a. ladybug
   b. family
   c. mechanic
   d. computer
   e. limousine

17. Which word has one morpheme?
   a. amorous
   b. jumped
   c. woman
   d. defected
   e. incredible

18. How many morphemes does elephant have?
   a. 2
   b. 3
   c. 4
   d. 1
   e. 5

19. What is a prefix?
   a. A morpheme that precedes a root word that contributes to or modifies the meaning of a word.
   b. A phoneme that precedes a root word that contributes to or modifies the meaning of a word.
   c. A syllable that precedes a root word that contributes to or modifies the meaning of a word.
   d. An orthography that precedes a root word that contributes to or modifies the meaning of a word.
   e. A morpheme that follows a root word that contributes to or modifies the meaning of a word.

20. How many morphemes does bookworm have?
   a. 6
   b. 4
   c. 2
   d. 3
   e. 1

21. What is a closed syllable?
   a. A syllable that contains a short vowel and ends in a consonant.
   b. A syllable that contains a long vowel and ends in a digraph.
   c. A syllable that contains a long vowel and ends in a consonant.
   d. A syllable that contains a short vowel and ends in a consonant.
   e. A syllable that contains a long vowel and ends in a vowel.
22. How many syllables does literacy have?
   a. 3
   b. 2
   c. 6
   d. 4
   e. 8

23. Which word has an open syllable?
   a. mention
   b. spurious
   c. attention
   d. trainer
   e. program

24. Which word has a vowel-consonant-e syllable?
   a. teachers
   b. adapted
   c. syllable
   d. conflate
   e. literacy

25. How many syllables does backpack have?
   a. 2
   b. 1
   c. 4
   d. 3
   e. 6

26. What is an open syllable?
   a. A syllable that contains a long vowel sound spelled with two vowels that end the syllable.
   b. A syllable that contains a short vowel sound spelled with two vowels that end the syllable.
   c. A syllable that contains a long vowel sound spelled with one vowel that ends the syllable.
   d. A syllable that contains a diphthong spelled with two vowels that end the syllable.
   e. A syllable that contains a short vowel sound spelled with one vowel that ends the syllable.

27. What type of syllable unit is rab an example of?
   a. diphthong syllable
   b. open syllable
   c. vowel team syllable
   d. vowel-consonant-e syllable
   e. closed syllable
28. How many syllables does cabinet have?
   a. 7
   b. 5
   c. 3
   d. 6
   e. 4

29. What type of syllable unit is me an example of?
   a. diphthong syllable
   b. open syllable
   c. vowel team syllable
   d. vowel-consonant-e syllable
   e. closed syllable

30. Which word has an r-controlled syllable?
   a. trash
   b. flower
   c. strobe
   d. written
   e. rabbit

Note. Adapted from Moats (2000)
Key

Answers are indicated in boldface.

1. When adding a suffix to a word ending with silent e, what is the spelling rule?
   a. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.
   b. **Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.**
   c. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.
   d. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.
   e. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a blend.

2. When is ck used in spelling?
   a. The spelling ck is used when a /k/ sound follows a stressed, long vowel.
   b. The spelling ck is used when a /k/ sound follows an unstressed, short vowel.
   c. The spelling ck is used when a /k/ sound follows an unstressed, long vowel.
   d. The spelling ck is used when a /k/ sound follows a stressed diphthong.
   e. **The spelling ck is used when a /k/ sound follows a stressed, short vowel.**

3. Which letters signal that c is pronounced with an /s/ sound?
   a. e, i, or y
   b. a, i, or o
   c. i, o, or y
   d. e, i, or o
   e. e, i, or u

4. When spelling a two-syllable word, what is the rule for the vowel in the first syllable?
   a. A diphthong is followed by one consonant and a long vowel is followed by two consonants.
   b. **A short vowel is followed by two consonants and a long vowel is followed by one consonant.**
   c. A short vowel is followed by two consonants and a long vowel is followed by two consonants.
   d. A short vowel is followed by one consonant and a long vowel is followed by two consonants.
   e. A diphthong is followed by one consonant and a short vowel is followed by one consonant.
5. Which letters or groups of letters spell the consonant sound /f/?
   a. f, ff, gh, pf
   b. f, gh, pf, ph
   c. f, ff, ph, ough
   d. f, gh, ph, ough
   e. f, ff, gh, ph

6. Which spelling pattern typically indicates a short vowel?
   a. consonant-vowel-consonant-e
   b. consonant-vowel
   c. consonant-vowel-consonant-vowel
   d. consonant-vowel-consonant
   e. consonant-vowel-vowel-consonant

7. In English spelling, which type of letter or letters does each syllable typically have?
   a. blend
   b. diphthong
   c. vowel
   d. digraph
   e. consonant

8. Which letters or groups of letters spell “long o”?
   a. o, oa, oe, oi
   b. o, oa, oe, o-consonant-a
   c. o, oa, oi, ough
   d. o, oa, o-consonant-e, ough
   e. o, oe, o-consonant-ea, ow

9. Which spelling patterns typically indicate a long vowel?
   a. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   b. consonant-vowel-consonant, consonant-vowel, consonant-vowel-vowel-consonant-vowel
   d. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   e. consonant-vowel-consonant-e, consonant-vowel-consonant, consonant-vowel-vowel-consonant
10. When is the /k/ sound spelled with a k?
   a. When the word begins with a /k/ sound, the letter k is used before a, o, and u.
   b. When the word ends with a /k/ sound, the letter k is used.
   c. When a word begins with a /k/ sound, the letter k is used before the vowels i and e.
   d. When the word ends with a /k/ sound, the letter k is used if it is proceeded by a, o, and u.
   e. The /k/ sound is always spelled with a k.

11. Which word has a suffix?
   a. philosophy
   b. predictable
   c. insufficient
   d. consonant
   e. snowman

12. How many morphemes does unicorn have?
   a. 3
   b. 1
   c. 6
   d. 7
   e. 2

13. Which word is an example of a compound noun?
   a. television
   b. children
   c. alligator
   d. sandpaper
   e. carnivorous

14. How can you recognize an English word that came from Greek?
   a. It is likely to be a historical, scientific, or a mathematical term.
   b. It is likely to be a mythological, scientific, or a geographical term.
   c. It is likely to be a mythological, linguistic, or a mathematical term.
   d. It is likely to be a scientific, educational, or historical term.
   e. It is likely to be a mythological, scientific, or a mathematical term.

15. What is a morpheme?
   a. A predictable phonetic variant of a phoneme.
   b. The smallest meaningful unit of language.
   c. The unit of pronunciation that is arranged around a vowel.
   d. A speech sound that combines with others in a language system to make words.
   e. A writing system.
16. Which word is an example of a compound noun?
   a. ladybug
   b. family
   c. mechanic
   d. computer
   e. limousine

17. Which word has one morpheme?
   a. amorous
   b. jumped
   c. woman
   d. defected
   e. incredible

18. How many morphemes does elephant have?
   a. 2
   b. 3
   c. 4
   d. 1
   e. 5

19. What is a prefix?
   a. A morpheme that precedes a root word that contributes to or modifies the meaning of a word.
   b. A phoneme that precedes a root word that contributes to or modifies the meaning of a word.
   c. A syllable that precedes a root word that contributes to or modifies the meaning of a word.
   d. An orthography that precedes a root word that contributes to or modifies the meaning of a word.
   e. A morpheme that follows a root word that contributes to or modifies the meaning of a word.

20. How many morphemes does bookworm have?
   a. 6
   b. 4
   c. 2
   d. 3
   e. 1

21. What is a closed syllable?
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30. Which word has an r-controlled syllable?
   a. trash
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   c. strobe
   d. written
   e. rabbit

Note. Adapted from Moats (2000).
APPENDIX H. TEST OF VOCABULARY KNOWLEDGE (TVK)
## Test of Vocabulary Knowledge

1. Something that is **devious** is  
   a. flexible  
   b. eternal  
   c. desirable  
   d. extraneous  
   e. sneaky

2. An **abrasion** is  
   a. a remedy  
   b. a copy  
   c. a scrape  
   d. an area  
   e. a problem

3. A **covenant** is a kind of  
   a. situation  
   b. behavior  
   c. conflict  
   d. punishment  
   e. agreement

4. **Diction** refers to  
   a. speech  
   b. literature  
   c. medicine  
   d. direction  
   e. education

5. A **pilgrimage** is a kind of  
   a. ship  
   b. person  
   c. journey  
   d. emblem  
   e. feast

6. **Disdainful** means  
   a. boastful  
   b. reluctant  
   c. understanding  
   d. bashful  
   e. scornful

7. **Visage** is another word for  
   a. honesty  
   b. face  
   c. monument  
   d. space  
   e. genius

8. Someone who is **penitent** is  
   a. depressed  
   b. responsible  
   c. impatient  
   d. remorseful  
   e. resourceful

9. Someone who is **slovenly** is  
   a. willful  
   b. slow  
   c. untidy  
   d. disagreeable  
   e. rigid

10. A **roster** is  
    a. a list  
    b. an answer  
    c. a plan  
    d. a pledge  
    e. an oath

11. A **portal** is a  
    a. knot  
    b. pillar  
    c. building  
    d. school  
    e. doorway

12. To **abridge** something is to  
    a. spoil it  
    b. accept it  
    c. shorten it  
    d. support it  
    e. release it

13. **Inadvertently** means  
    a. inadequately  
    b. enthusiastically  
    c. forcefully  
    d. accidentally  
    e. completely

14. Something that is **utilitarian** is  
    a. useful  
    b. pleasant  
    c. expendable  
    d. proper  
    e. concealed
15. To **adhere** is to
   a. absorb
   b. stick
   c. hasten
   d. polish
   e. dissolve

16. Something that is **synthetic** is
   a. natural
   b. foreign
   c. musical
   d. manufactured
   e. systematic

17. **Ostentatious** is another word for
   a. untouched
   b. flashy
   c. inconspicuous
   d. exciting
   e. exaggerated

18. To **ruminate** is to
   a. ignore
   b. vibrate
   c. congratulate
   d. contemplate
   e. reassure

19. **Flippant** means
   a. formal
   b. irreverent
   c. traditional
   d. active
   e. frustrated

20. Something that is **salient** is
   a. noticeable
   b. overt
   c. opaque
   d. salty
   e. interesting

Note. Adapted from the *Stanford Achievement Test, Ninth Edition* (1996).
**Key**

Answers are indicated in boldface.

<table>
<thead>
<tr>
<th>1. Something that is <strong>devious</strong> is</th>
<th>7. <strong>Visage</strong> is another word for</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. flexible</td>
<td>a. honesty</td>
</tr>
<tr>
<td>b. <strong>eternal</strong></td>
<td>b. <strong>face</strong></td>
</tr>
<tr>
<td>c. <strong>desirable</strong></td>
<td>c. monument</td>
</tr>
<tr>
<td>d. extraneous</td>
<td>d. space</td>
</tr>
<tr>
<td>e. <strong>sneaky</strong></td>
<td>e. genius</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. An abrasion is</th>
<th>8. Someone who is <strong>penitent</strong> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. a remedy</td>
<td>a. <strong>depressed</strong></td>
</tr>
<tr>
<td>b. a copy</td>
<td>b. responsible</td>
</tr>
<tr>
<td>c. <strong>a scrape</strong></td>
<td>c. <strong>impatient</strong></td>
</tr>
<tr>
<td>d. an area</td>
<td>d. <strong>remorseful</strong></td>
</tr>
<tr>
<td>e. a problem</td>
<td>e. resourceful</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. A <strong>covenant</strong> is a kind of</th>
<th>9. Someone who is <strong>slovenly</strong> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. situation</td>
<td>a. willful</td>
</tr>
<tr>
<td>b. behavior</td>
<td>b. slow</td>
</tr>
<tr>
<td>c. conflict</td>
<td>c. <strong>untidy</strong></td>
</tr>
<tr>
<td>d. punishment</td>
<td>d. disagreeable</td>
</tr>
<tr>
<td>e. <strong>agreement</strong></td>
<td>e. rigid</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. <strong>Diction</strong> refers to</th>
<th>10. A roster is</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. <strong>speech</strong></td>
<td>a. <strong>a list</strong></td>
</tr>
<tr>
<td>b. literature</td>
<td>b. an answer</td>
</tr>
<tr>
<td>c. medicine</td>
<td>c. a plan</td>
</tr>
<tr>
<td>d. direction</td>
<td>d. a pledge</td>
</tr>
<tr>
<td>e. education</td>
<td>e. an oath</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. A <strong>pilgrimage</strong> is a kind of</th>
<th>11. A portal is</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ship</td>
<td>a. knot</td>
</tr>
<tr>
<td>b. person</td>
<td>b. pillar</td>
</tr>
<tr>
<td>c. <strong>journey</strong></td>
<td>c. building</td>
</tr>
<tr>
<td>d. emblem</td>
<td>d. school</td>
</tr>
<tr>
<td>e. feast</td>
<td>e. <strong>doorway</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. <strong>Disdainful</strong> means</th>
<th>12. To <strong>abridge</strong> something is to</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. boastful</td>
<td>a. spoil it</td>
</tr>
<tr>
<td>b. reluctant</td>
<td>b. accept it</td>
</tr>
<tr>
<td>c. understanding</td>
<td>c. <strong>shorten it</strong></td>
</tr>
<tr>
<td>d. bashful</td>
<td>d. support it</td>
</tr>
<tr>
<td>e. <strong>scornful</strong></td>
<td>e. release it</td>
</tr>
</tbody>
</table>
13. Inadvertently means  
   a. inadequately  
   b. enthusiastically  
   c. forcefully  
   **d. accidentally**  
   e. completely  

14. Something that is utilitarian is  
   a. **useful**  
   b. pleasant  
   c. expendable  
   d. proper  
   e. concealed  

15. To adhere is to  
   a. absorb  
   **b. stick**  
   c. hasten  
   d. polish  
   e. dissolve  

16. Something that is **synthetic** is  
   a. natural  
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   c. musical  
   **d. manufactured**  
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17. Ostentatious is another word for  
   a. untouched  
   b. **flashy**  
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   a. ignore  
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   a. formal  
   **b. irreverent**  
   c. traditional  
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20. Something that is **salient** is  
   a. **noticeable**  
   b. overt  
   c. opaque  
   d. salty  
   e. interesting  

Note. Adapted from the *Stanford Achievement Test, Ninth Edition* (1996).
APPENDIX I. PERCENTAGE CORRECT BY OBJECTIVE AND ITEM FOR TVK PILOT TEST
Percentage Correct by Objective and Item for TVK Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Something that is <strong>devious</strong> is</td>
<td>75</td>
</tr>
<tr>
<td>a. flexible</td>
<td></td>
</tr>
<tr>
<td>b. eternal</td>
<td></td>
</tr>
<tr>
<td>c. desirable</td>
<td></td>
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<tr>
<td>d. extraneous</td>
<td></td>
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<tr>
<td>e. <strong>sneaky</strong></td>
<td></td>
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<tr>
<td>2. An <strong>abrasion</strong> is</td>
<td>86</td>
</tr>
<tr>
<td>a. a remedy</td>
<td></td>
</tr>
<tr>
<td>b. a copy</td>
<td></td>
</tr>
<tr>
<td>c. <strong>a scrape</strong></td>
<td></td>
</tr>
<tr>
<td>d. an area</td>
<td></td>
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<tr>
<td>e. a problem</td>
<td></td>
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<td>3. A <strong>covenant</strong> is a kind of</td>
<td>71</td>
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<td></td>
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<td>b. person</td>
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*a* Answers are indicated in boldface.  
*b* Percent of respondents who answered item correctly (n=28).
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<td></td>
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<td>b. <strong>face</strong></td>
<td></td>
</tr>
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<tr>
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<td>b. an answer</td>
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<tr>
<td>c. a plan</td>
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<tr>
<td>d. a pledge</td>
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<tr>
<td>e. an oath</td>
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<tr>
<td><strong>11. A portal</strong> is a</td>
<td>75</td>
</tr>
<tr>
<td>a. knot</td>
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<tr>
<td>b. pillar</td>
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<tr>
<td>c. building</td>
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<tr>
<td>d. school</td>
<td></td>
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<tr>
<td>e. <strong>doorway</strong></td>
<td></td>
</tr>
<tr>
<td><strong>12. To abridge</strong> something is to</td>
<td>46</td>
</tr>
<tr>
<td>a. spoil it</td>
<td></td>
</tr>
<tr>
<td>b. accept it</td>
<td></td>
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<tr>
<td>c. <strong>shorten it</strong></td>
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<tr>
<td>d. support it</td>
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<tr>
<td>e. release it</td>
<td></td>
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</table>
Percentage Correct by Objective and Item for TVK Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>13. Inadvertently means</td>
<td>71</td>
</tr>
<tr>
<td>a. inadequately</td>
<td></td>
</tr>
<tr>
<td>b. enthusiastically</td>
<td></td>
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<tr>
<td>c. forcefully</td>
<td></td>
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<td>d. <strong>accidentally</strong></td>
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<tr>
<td>e. completely</td>
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<tr>
<td>14. Something that is <strong>utilitarian</strong> is</td>
<td>54</td>
</tr>
<tr>
<td>a. <strong>useful</strong></td>
<td></td>
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<tr>
<td>b. pleasant</td>
<td></td>
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<tr>
<td>c. expendable</td>
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<td>d. proper</td>
<td></td>
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<tr>
<td>e. concealed</td>
<td></td>
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<tr>
<td>15. To <strong>adhere</strong> is to</td>
<td>64</td>
</tr>
<tr>
<td>a. absorb</td>
<td></td>
</tr>
<tr>
<td>b. <strong>stick</strong></td>
<td></td>
</tr>
<tr>
<td>c. hasten</td>
<td></td>
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<tr>
<td>d. polish</td>
<td></td>
</tr>
<tr>
<td>e. dissolve</td>
<td></td>
</tr>
<tr>
<td>16. Something that is <strong>synthetic</strong> is</td>
<td>75</td>
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<tr>
<td>a. natural</td>
<td></td>
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<tr>
<td>b. foreign</td>
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<tr>
<td>c. musical</td>
<td></td>
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<tr>
<td>d. <strong>manufactured</strong></td>
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<tr>
<td>e. systematic</td>
<td></td>
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<tr>
<td>17. Ostentatious is another word for</td>
<td>50</td>
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<tr>
<td>a. untouched</td>
<td></td>
</tr>
<tr>
<td>b. <strong>flashy</strong></td>
<td></td>
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<tr>
<td>c. inconspicuous</td>
<td></td>
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<td>d. exciting</td>
<td></td>
</tr>
<tr>
<td>e. exaggerated</td>
<td></td>
</tr>
<tr>
<td>18. To <strong>ruminate</strong> is to</td>
<td>43</td>
</tr>
<tr>
<td>a. ignore</td>
<td></td>
</tr>
<tr>
<td>b. vibrate</td>
<td></td>
</tr>
<tr>
<td>c. congratulate</td>
<td></td>
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<tr>
<td>d. <strong>contemplate</strong></td>
<td></td>
</tr>
<tr>
<td>e. reassure</td>
<td></td>
</tr>
</tbody>
</table>
Percentage Correct by Objective and Item for TVK Pilot Test

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Flippant means</td>
<td>57</td>
</tr>
<tr>
<td>a. formal</td>
<td></td>
</tr>
<tr>
<td>b. <strong>irreverent</strong></td>
<td></td>
</tr>
<tr>
<td>c. traditional</td>
<td></td>
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<tr>
<td>d. active</td>
<td></td>
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<tr>
<td>e. frustrated</td>
<td></td>
</tr>
<tr>
<td>20. Something that is <strong>salient</strong> is</td>
<td>14</td>
</tr>
<tr>
<td>a. <strong>noticeable</strong></td>
<td></td>
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<tr>
<td>b. overt</td>
<td></td>
</tr>
<tr>
<td>c. opaque</td>
<td></td>
</tr>
<tr>
<td>d. salty</td>
<td></td>
</tr>
<tr>
<td>e. interesting</td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX J. TESTS FORMATTED FOR TEACHERS
1. How many phonemes are in the word box?
   a. one
   b. two
   c. three
   d. four
   e. five

2. What do you call two adjacent consonants that represent one speech sound?
   a. schwa
   b. consonant blend
   c. phoneme
   d. consonant diphthong
   e. digraph

3. How many phonemes are in the word eight?
   a. one
   b. two
   c. three
   d. four
   e. five

4. Which word contains a long vowel sound?
   a. met
   b. give
   c. cough
   d. me
   e. cow

5. If you say the word ice, and then reverse the order of the sounds, what word would ice be?
   a. easy
   b. sea
   c. size
   d. sigh
   e. keys

6. Which word contains a consonant digraph?
   a. play
   b. chick
   c. flip
   d. desk
   e. flower

7. How many phonemes are in the word slip?
   a. two
   b. three
   c. four
   d. five
   e. six

8. Which word contains a consonant blend?
   a. desk
   b. this
   c. dish
   d. whale
   e. which

9. Which statement is true?
   a. Phonological awareness is a precursor to phonics.
   b. Phonological awareness is an oral language activity.
   c. Phonological awareness is a method of reading instruction that begins with individual letters and sounds.
   d. Both a and b.
   e. Both b and c.

10. If tife were a word, which word would probably have a similar “i” sound?
    a. find
    b. if
    c. beautiful
    d. ceiling
    e. sing
11. What is a phoneme?
   a. a single letter  
   b. a group of letters  
   c. a single speech sound  
   d. a single unit of meaning  
   e. a grapheme

12. How many phonemes are in the word fan?
   a. one  
   b. two  
   c. three  
   d. four  
   e. five

13. What do you call a combination of two or three consonants in which each letter keeps its own sound?
   a. consonant phoneme  
   b. silent consonant  
   c. consonant digraph  
   d. consonant diphthong  
   e. consonant blend

14. How many phonemes are in the word chip?
   a. one  
   b. two  
   c. three  
   d. four  
   e. five

15. If you say the word enough, and then reverse the order of the sounds, what word would enough be?
   a. fun  
   b. phone  
   c. one  
   d. often  
   e. funny

16. Which word contains a diphthong?
   a. coat  
   b. boy  
   c. battle  
   d. sing  
   e. been

17. Which word contains a consonant digraph?
   a. slip  
   b. ship  
   c. desk  
   d. frame  
   e. street

18. If you say the word peace, and then reverse the order of the sounds, what word would peace be?
   a. sigh  
   b. seize  
   c. keep  
   d. see  
   e. seep

19. Which word contains a diphthong?
   a. ointment  
   b. locomotion  
   c. receive  
   d. transportation  
   e. helicopter

20. Which word contains a consonant blend?
   a. flower  
   b. baseball  
   c. cheeseburger  
   d. literal  
   e. rather
21. When adding a suffix to a word ending with silent e, what is the spelling rule?
   a. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.
   b. Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.
   c. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.
   d. Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.
   e. Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a blend.

22. When is ck used in spelling?
   a. The spelling ck is used when a /k/ sound follows a stressed, long vowel.
   b. The spelling ck is used when a /k/ sound follows an unstressed, short vowel.
   c. The spelling ck is used when a /k/ sound follows an unstressed, long vowel.
   d. The spelling ck is used when a /k/ sound follows a stressed diphthong.
   e. The spelling ck is used when a /k/ sound follows a stressed, short vowel.

23. Which letters signal that c is pronounced with an /s/ sound?
   a. e, i, or y
   b. a, i, or o
   c. i, o, or y
   d. e, i, or o
   e. e, i, or u

24. When spelling a two-syllable word, what is the rule for the vowel in the first syllable?
   a. A diphthong is followed by one consonant and a long vowel is followed by two consonants.
   b. A short vowel is followed by two consonants and a long vowel is followed by one consonant.
   c. A short vowel is followed by two consonants and a long vowel is followed by two consonants.
   d. A short vowel is followed by one consonant and a long vowel is followed by two consonants.
   e. A diphthong is followed by one consonant and a short vowel is followed by one consonant.

25. Which letters or groups of letters spell the consonant sound /f/?
   a. f, ff, gh, pf
   b. f, gh, pf, ph
   c. f, ff, ph, ough
   d. f, gh, ph, ough
   e. f, ff, gh, ph
26. Which spelling pattern typically indicates a short vowel?
   a. consonant-vowel-consonant-e
   b. consonant-vowel
   c. consonant-vowel-consonant-vowel
   d. consonant-vowel-consonant
   e. consonant-vowel-vowel-consonant

27. In English spelling, which type of letter or letters does each syllable typically have?
   a. blend
   b. diphthong
   c. vowel
   d. digraph
   e. consonant

28. Which letters or groups of letters spell “long o”?
   a. o, oa, oe, oi
   b. o, oa, oe, o-consonant-a
   c. o, oa, oi, ough
   d. o, oa, o-consonant-e, ough
   e. o, oe, o-consonant-ea, ow

29. Which spelling patterns typically indicate a long vowel?
   a. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant
   b. consonant-vowel-consonant, consonant-vowel, consonant-vowel-consonant-vowel
   d. consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-consonant
   e. consonant-vowel-consonant-e, consonant-vowel-consonant, consonant-vowel-vowel-consonant

30. When is the /k/ sound spelled with a k?
   a. When the word begins with a /k/ sound, the letter k is used before a, o, and u.
   b. When the word ends with a /k/ sound, the letter k is used.
   c. When a word begins with a /k/ sound, the letter k is used before the vowels i and e.
   d. When the word ends with a /k/ sound, the letter k is used if it is proceeded by a, o, and u.
   e. The /k/ sound is always spelled with a k.

31. Which word has a suffix?
   a. philosophy
   b. predictable
   c. insufficient
   d. consonant
   e. snowman
32. How many morphemes does unicorn have?
   a. 3
   b. 1
   c. 6
   d. 7
   e. 2

33. Which word is an example of a compound noun?
   a. television
   b. children
   c. alligator
   d. sandpaper
   e. carnivorous

34. How can you recognize an English word that came from Greek?
   a. It is likely to be a historical, scientific, or a mathematical term.
   b. It is likely to be a mythological, scientific, or a geographical term.
   c. It is likely to be a mythological, linguistic, or a mathematical term.
   d. It is likely to be a scientific, educational, or historical term.
   e. It is likely to be a mythological, scientific, or a mathematical term.

35. What is a morpheme?
   a. A predictable phonetic variant of a phoneme.
   b. The smallest meaningful unit of language.
   c. The unit of pronunciation that is arranged around a vowel.
   d. A speech sound that combines with others in a language system to make words.
   e. A writing system.

36. Which word is an example of a compound noun?
   a. ladybug
   b. family
   c. mechanic
   d. computer
   e. limousine

37. Which word has one morpheme?
   a. amorous
   b. jumped
   c. woman
   d. defected
   e. incredible

38. How many morphemes does elephant have?
   a. 2
   b. 3
   c. 4
   d. 1
   e. 5
39. What is a prefix?
   a. A morpheme that precedes a root word that contributes to or modifies the
      meaning of a word.
   b. A phoneme that precedes a root word that contributes to or modifies the meaning
      of a word.
   c. A syllable that precedes a root word that contributes to or modifies the meaning
      of a word.
   d. An orthography that precedes a root word that contributes to or modifies the meaning
      of a word.
   e. A morpheme that follows a root word that contributes to or modifies the meaning
      of a word.

40. How many morphemes does bookworm have?
   a. 6
   b. 4
   c. 2
   d. 3
   e. 1

41. What is a closed syllable?
   a. A syllable that contains a short vowel and ends in a consonant.
   b. A syllable that contains a long vowel and ends in a digraph.
   c. A syllable that contains a long vowel and ends in a consonant.
   d. A syllable that contains a short vowel and ends in a vowel.
   e. A syllable that contains a long vowel and ends in a vowel.

42. How many syllables does literacy have?
   a. 3
   b. 2
   c. 6
   d. 4
   e. 8

43. Which word has an open syllable?
   a. mention
   b. spurious
   c. attention
   d. trainer
   e. program

44. Which word has a vowel-consonant-e syllable?
   a. teachers
   b. adapted
   c. syllable
   d. conflate
   e. literacy
45. How many syllables does backpack have?
   a. 2
   b. 1
   c. 4
   d. 3
   e. 6

46. What is an open syllable?
   a. A syllable that contains a long vowel sound spelled with two vowels that end the syllable.
   b. A syllable that contains a short vowel sound spelled with two vowels that end the syllable.
   c. A syllable that contains a long vowel sound spelled with one vowel that ends the syllable.
   d. A syllable that contains a diphthong spelled with two vowels that end the syllable.
   e. A syllable that contains a short vowel sound spelled with one vowel that ends the syllable.

47. What type of syllable unit is rab an example of?
   a. diphthong syllable
   b. open syllable
   c. vowel team syllable
   d. vowel-consonant-e syllable
   e. closed syllable

48. How many syllables does cabinet have?
   a. 7
   b. 5
   c. 3
   d. 6
   e. 4

49. What type of syllable unit is me an example of?
   a. diphthong syllable
   b. open syllable
   c. vowel team syllable
   d. vowel-consonant-e syllable
   e. closed syllable

50. Which word has an r-controlled syllable?
   a. trash
   b. flower
   c. strobe
   d. written
   e. rabbit
<p>| | |</p>
<table>
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<tbody>
<tr>
<td><strong>51.</strong> Something that is <strong>devious</strong> is</td>
<td><strong>58.</strong> Someone who is <strong>penitent</strong> is</td>
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<tr>
<td>a. flexible</td>
<td>a. depressed</td>
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<tr>
<td>b. eternal</td>
<td>b. responsible</td>
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<tr>
<td>c. desirable</td>
<td>c. impatient</td>
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<td>d. extraneous</td>
<td>d. remorseful</td>
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<td>e. sneaky</td>
<td>e. resourceful</td>
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<td><strong>52.</strong> An <strong>abrasion</strong> is</td>
<td><strong>59.</strong> Someone who is <strong>slovenly</strong> is</td>
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<tr>
<td>a. a remedy</td>
<td>a. willful</td>
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<td>b. a copy</td>
<td>b. slow</td>
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<td>c. a scrape</td>
<td>c. untidy</td>
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<td>d. an area</td>
<td>d. disagreeable</td>
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<td>e. a problem</td>
<td>e. rigid</td>
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<tr>
<td><strong>53.</strong> A <strong>covenant</strong> is a kind of</td>
<td><strong>60.</strong> A <strong>roster</strong> is</td>
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<tr>
<td>a. situation</td>
<td>a. a list</td>
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<tr>
<td>b. behavior</td>
<td>b. an answer</td>
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<tr>
<td>c. conflict</td>
<td>c. a plan</td>
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<td>d. punishment</td>
<td>d. a pledge</td>
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<tr>
<td>e. agreement</td>
<td>e. an oath</td>
</tr>
<tr>
<td><strong>54.</strong> <strong>Diction</strong> refers to</td>
<td><strong>61.</strong> A <strong>portal</strong> is a</td>
</tr>
<tr>
<td>a. speech</td>
<td>a. knot</td>
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<tr>
<td>b. literature</td>
<td>b. pillar</td>
</tr>
<tr>
<td>c. medicine</td>
<td>c. building</td>
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<tr>
<td>d. direction</td>
<td>d. school</td>
</tr>
<tr>
<td>e. education</td>
<td>e. doorway</td>
</tr>
<tr>
<td><strong>55.</strong> A <strong>pilgrimage</strong> is a kind of</td>
<td><strong>62.</strong> To <strong>abridge</strong> something is to</td>
</tr>
<tr>
<td>a. ship</td>
<td>a. spoil it</td>
</tr>
<tr>
<td>b. person</td>
<td>b. accept it</td>
</tr>
<tr>
<td>c. journey</td>
<td>c. shorten it</td>
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<tr>
<td>d. emblem</td>
<td>d. support it</td>
</tr>
<tr>
<td>e. feast</td>
<td>e. release it</td>
</tr>
<tr>
<td><strong>56.</strong> <strong>Disdainful</strong> means</td>
<td><strong>63.</strong> <strong>Inadvertently</strong> means</td>
</tr>
<tr>
<td>a. boastful</td>
<td>a. inadequately</td>
</tr>
<tr>
<td>b. reluctant</td>
<td>b. enthusiastically</td>
</tr>
<tr>
<td>c. understanding</td>
<td>c. forcefully</td>
</tr>
<tr>
<td>d. bashful</td>
<td>d. accidentally</td>
</tr>
<tr>
<td>e. scornful</td>
<td>e. completely</td>
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<tr>
<td><strong>57.</strong> <strong>Visage</strong> is another word for</td>
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<tr>
<td>a. honesty</td>
<td>a. useful</td>
</tr>
<tr>
<td>b. face</td>
<td>b. pleasant</td>
</tr>
<tr>
<td>c. monument</td>
<td>c. expendable</td>
</tr>
<tr>
<td>d. space</td>
<td>d. proper</td>
</tr>
<tr>
<td>e. genius</td>
<td>e. concealed</td>
</tr>
</tbody>
</table>
65. To adhere is to
   a. absorb
   b. stick
   c. hasten
   d. polish
   e. dissolve

66. Something that is synthetic is
   a. natural
   b. foreign
   c. musical
   d. manufactured
   e. systematic

67. Ostentatious is another word for
   a. untouched
   b. flashy
   c. inconspicuous
   d. exciting
   e. exaggerated

68. To ruminate is to
   a. ignore
   b. vibrate
   c. congratulate
   d. contemplate
   e. reassure

69. Flippant means
   a. formal
   b. irreverent
   c. traditional
   d. active
   e. frustrated

70. Something that is salient is
   a. noticeable
   b. overt
   c. opaque
   d. salty
   e. interesting

Part 4
Directions: Bubble the answer that represents you the best.

71. What is your gender?
   a. female
   b. male

72. What is your age?
   a. 21-30
   b. 31-40
   c. 41-50
   d. 51-60
   e. >60

73. What is your race?
   a. African American
   b. Caucasian
   c. Latino
   d. Native American
   e. Other

74. How many years have you taught?
   a. 0-5
   b. 6-10
   c. 11-15
   d. 16-20
   e. >20

75. What is your highest earned degree?
   a. Bachelor’s
   b. Master’s
   c. Specialist
   d. Doctorate

76. When did you receive your last degree?
   a. before 1970
   b. 1970-1979
   c. 1980-1989
   d. 1990-1999
   e. 2000-present

77. How many reading courses have you taken?
   a. 0-1
   b. 2-3
   c. 4-5
   d. 6-7
APPENDIX K. TEACHER CONSENT LETTER
Dear Florida Educator,

I am a former first-grade teacher and current doctoral candidate in the College of Education at Florida State University. I am conducting a research study to explore the relationship between teacher knowledge about beginning reading and student outcomes in beginning reading. The title of my project is “The Relationship Between Teacher Knowledge and Student Reading Outcomes”. Many earlier studies have investigated how students should be taught to read, but little attention has been paid to what teachers need to know to effectively teach reading. Your participation will provide valuable insight into the nature of teacher knowledge about beginning reading. I hope the results of this study will have valuable implications regarding how to implement the most effective teacher preparation and professional development programs in beginning reading instruction.

With permission from your superintendent, I am requesting your participation. This will involve completing a paper and pencil test about your knowledge of various aspects of reading. The total time commitment will be about 45 minutes. Your participation in this study is strictly voluntary. Your name and school will not be known or reported in any published research that results from this study. There are no foreseeable risks to you if you agree to participate in this study. If you do choose to participate, you will be compensated for your time with $20 that can be used to purchase classroom supplies.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. It will not affect your standing within your school, district, with Florida State University. The results of the research study may be published, but your name will not be used. Parental permission, thus, is not required. By using only the last four digits of your teacher identifier number (your social security number) and your school name on your bubble sheet, I will be able to link your responses to student data, but not your name to your responses or student data. The last four digits of your teacher identifier number will be kept confidential to the extent allowed by law and stored in a secure location at the Florida Center for Reading Research. The researcher will be the only one with access to the information and it will be destroyed at the completion of this study, which will occur within the next year.

If you have any questions concerning this research study, please call Staci Walton Duggar at (850) 385-6349 or email me at sduggar@fcrr.org. Thank you.

Sincerely,

Staci Walton Duggar, M.Ed.

If you have any questions about your rights as a participant in this, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633.

I consent to participate in this research study.

Signature _____________________________ Date ____________________________
APPENDIX L. PERCENTAGE CORRECT BY ITEM FOR TEACHER KNOWLEDGE TESTS
### Percentage Correct by Objective and Item for the TEKAP

<table>
<thead>
<tr>
<th>Objective A: Phonemic Awareness Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9. Which statement is true?</strong></td>
</tr>
<tr>
<td>(a) Phonological awareness is a precursor to phonics.</td>
</tr>
<tr>
<td>(b) Phonological awareness is an oral language activity.</td>
</tr>
<tr>
<td>(c) Phonological awareness is a method of reading instruction that begins with individual letters and sounds.</td>
</tr>
<tr>
<td>(d) <strong>Both a and b.</strong> (e) Both b and c.</td>
</tr>
</tbody>
</table>

| **11. What is a phoneme?** | 88 |
| (a) a single letter |  |
| (b) a group of letters |  |
| (c) **a single speech sound** |  |
| (d) a single unit of meaning |  |
| (e) a grapheme |  |

### Objective B: Phonics Terminology

| **3.2. What do you call two adjacent consonants that represent one speech sound?** | 52 |
| (a) schwa |  |
| (b) consonant blend |  |
| (c) phoneme |  |
| (d) **digraph** |  |
| (e) consonant diphthong |  |

| **13. What do you call a combination of two or three consonants in which each letter keeps its own sound?** | 58 |
| (a) consonant phoneme |  |
| (b) silent consonant |  |
| (c) consonant digraph |  |
| (d) consonant diphthong |  |
| (e) **consonant blend** |  |

### Objective C: Phonemic Awareness Application (Segmentation)

| **1. How many phonemes are in the word box?** | 17 |
| (a) one |  |
| (b) two |  |
| (c) three |  |
| (d) **four** |  |
| (e) five |  |

| **3. How many phonemes are in the word eight?** | 75 |
| (a) one |  |
| (b) **two** |  |
| (c) three |  |
| (d) four |  |
| (e) five |  |

---

*a Answers are indicated in boldface.

*b Percentage of respondents who answered item correctly (n=69).
Percentage Correct by Objective and Item for the TEKAP

Item\(^a\) \hspace{1cm} \%\(^b\)

7. How many phonemes are in the word slip? 68  
   (a) two (b) three (c) **four** (d) five (e) six

12. How many phonemes are in the word fan? 91  
   (a) one (b) two (c) **three** (d) four (e) five

14. How many phonemes are in the word chip? 91  
   (a) one (b) two (c) **three** (d) four (e) five

Objective D: Phonemic Awareness Application (Manipulation)

5. If you say the word ice, and then reverse the order of the sounds, what word would ice be? 67  
   (a) easy (b) sea (c) size (d) **sigh** (e) keys

15. If you say the word enough, and then reverse the order of the sounds, what word would enough be? 70  
   (a) fun (b) phone (c) **funny** (d) one (e) often

18. If you say the word peace, and then reverse the order of the sounds, what word would peace be? 91  
   (a) sigh (b) seize (c) keep (d) see (e) **seep**

Objective E: Phonics Application (Vowels)

6.4. Which word contains a long vowel sound? 91  
   (a) met (b) give (c) cough (d) **me** (e) cow

10. If tife were a word, which word would probably have a similar “i” sound? 94  
    (a) if (b) beautiful (c) **find** (d) ceiling (e) sing

16. Which word contains a diphthong? 61  
    (a) coat (b) **boy** (c) battle (d) sing (e) been

19. Which word contains a diphthong? 72  
    (a) **ointment** (b) locomotion (c) receive  
    (d) transportation (e) helicopter

Objective F: Phonics Application (Consonants)
Percentage Correct by Objective and Item for the TEKAP

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.6. Which word contains a consonant digraph? (a) play (b) chick (c) flip (d) desk (e) flower</td>
<td>75</td>
</tr>
<tr>
<td>8. Which word contains a consonant blend? (a) this (b) dish (c) desk (d) whale (e) which</td>
<td>61</td>
</tr>
<tr>
<td>17. Which word contains a consonant digraph? (a) slip (b) ship (c) desk (d) frame (e) street</td>
<td>64</td>
</tr>
<tr>
<td>20. Which word contains a consonant blend? (a) baseball (b) cheeseburger (c) <strong>flower</strong> (d) literal (e) rather</td>
<td>78</td>
</tr>
</tbody>
</table>

Note. Adapted from Mather et al., 2001.
Percentage Correct by Objective and Item for TCLK

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective A: Orthography</strong></td>
<td></td>
</tr>
<tr>
<td>1. When adding a suffix to a word ending with silent e, what is the spelling rule?</td>
<td>52</td>
</tr>
<tr>
<td>(a) Drop the e if the suffix begins with a consonant; keep the e if the suffix begins with a vowel.</td>
<td></td>
</tr>
<tr>
<td>(b) <strong>Drop the e if the suffix begins with a vowel; keep the e if the suffix begins with a consonant.</strong></td>
<td></td>
</tr>
<tr>
<td>(c) Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a short vowel.</td>
<td></td>
</tr>
<tr>
<td>(d) Drop the e if the suffix begins with a long vowel; keep the e if the suffix begins with a consonant.</td>
<td></td>
</tr>
<tr>
<td>(e) Drop the e is the suffix begins with a consonant; keep the e if the suffix begins with a blend.</td>
<td></td>
</tr>
<tr>
<td>2. When is ck used in spelling?</td>
<td>36</td>
</tr>
<tr>
<td>(a) The spelling ck is used when a /k/ sound follows a stressed, long vowel.</td>
<td></td>
</tr>
<tr>
<td>(b) The spelling ck is used when a /k/ sound follows an unstressed, short vowel.</td>
<td></td>
</tr>
<tr>
<td>(c) The spelling ck is used when a /k/ sound follows an unstressed, short vowel.</td>
<td></td>
</tr>
<tr>
<td>(d) The spelling ck is used when a /k/ sound follows a stressed diphthong.</td>
<td></td>
</tr>
<tr>
<td>(e) <strong>The spelling ck is used when a /k/ sound follows a stressed, short vowel.</strong></td>
<td></td>
</tr>
<tr>
<td>3. What letters signal that c is pronounced /s/?</td>
<td>81</td>
</tr>
<tr>
<td>(a) e, i, or y (b) a, i, or o (c) i, o, or y (d) e, i, or o (e) e, i, or u</td>
<td></td>
</tr>
</tbody>
</table>

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^a Answers are indicated in boldface.

^b Percentage of respondents who answered item correctly (n=69).
### Percentage Correct by Objective and Item for TCLK

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
</tr>
</thead>
</table>
| 4. When spelling a two-syllable word, what is the rule for the vowel in the first syllable?  
(a) A diphthong is followed by one consonant and a long vowel is followed by two consonants.  
(b) A short vowel is followed by two consonants and a long vowel is followed by one consonant.  
(c) A short vowel is followed by two consonants and a long vowel is followed by two consonants.  
(d) A short vowel is followed by one consonant and a long vowel is followed by two consonants.  
(e) A diphthong is followed by one consonant and a short vowel is followed by one consonant. | 51 |
| 5. Which letters or groups of letters spell the consonant sound /f/?  
(a) f, ff, gh, pf  
(b) f, gh, pf  
(c) f, ff, ph, ough  
(d) f, gh, ph, ough  
(e) f, ff, gh, ph | 59 |
| 6. Which spelling pattern typically indicates a short vowel?  
(a) consonant-vowel-consonant-e  
(b) consonant-vowel  
(c) consonant-vowel-consonant  
(d) consonant-vowel-consonant-vowel  
(e) consonant-vowel-vowel-consonant | 86 |
| 7. In English spelling, which type of letter or letters does each syllable typically have?  
(a) blend  
(b) diphthong  
(c) vowel  
(d) digraph  
(e) consonant | 80 |
| 8. Which letters or groups of letters spell "long o"?  
(a) o, oa, ow, oe, o-consonant-e, oi  
(b) o, oa, ow, oe, o-consonant-a, ough  
(c) o, oo, oe, ou, o-consonant-e, ough  
(d) o, oa, ow, oe, o-consonant-e, ough  
(e) o, oe, ou, o-consonant-e, ow | 46 |
### Percentage Correct by Objective and Item for TCLK

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
</table>
| 9. Which spelling patterns typically indicate a long vowel?  
(a) consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-vowel-consonant  
(b) consonant-vowel-consonant, consonant-vowel, consonant-vowel-vowel-consonant  
(c) consonant-vowel, consonant-vowel-consonant-vowel, consonant-vowel-vowel-consonant  
(d) consonant-vowel-consonant-e, consonant-vowel, consonant-vowel-consonant  
(e) consonant-vowel-consonant-e, consonant-vowel-vowel-consonant, consonant-vowel-vowel-consonant | 74  |
| 10. When is the /k/ sound spelled with a k?  
(a) When the word begins with a /k/ sound, the letter k is used before a, o, and u.  
(b) When the word ends with a /k/ sound, the letter k is used.  
(c) **When a word begins with a /k/ sound, the letter k is used before the vowels i and e.**  
(d) When the word ends with a /k/ sound, the letter k is used if it is proceeded by a, o, and u.  
(e) The /k/ sound is always spelled with a k. | 74  |

**Objective B: Syllabication**

21. What is a closed syllable?  
(a) A syllable that contains a short vowel and ends in a consonant.  
(b) A syllable that contains a long vowel and ends in a digraph.  
(c) A syllable that contains a long vowel and ends in a consonant.  
(d) A syllable that contains a short vowel and ends in a vowel.  
(e) A syllable that contains a long vowel and ends in a vowel. | 67  |

22. How many syllables does literacy have?  
(a) 3  
(b) 2  
(c) 6  
(d) 4  
(e) 8 | 80  |
Percentage Correct by Objective and Item for TCLK

<table>
<thead>
<tr>
<th>Item</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Which word has an open syllable?</td>
<td>45</td>
</tr>
<tr>
<td>(a) mention (b) spurious (c) attention (d) trainer (e) program</td>
<td></td>
</tr>
<tr>
<td>24. Which word has a vowel-consonant-e syllable?</td>
<td>80</td>
</tr>
<tr>
<td>(a) teachers (b) adapted (c) syllable (d) <strong>conflate</strong> (e) literacy</td>
<td></td>
</tr>
<tr>
<td>25. How many syllables does <strong>backpack</strong> have?</td>
<td>77</td>
</tr>
<tr>
<td>(a) 2 (b) 1 (c) 4 (d) 3 (e) 6</td>
<td></td>
</tr>
<tr>
<td>26. What is an open syllable?</td>
<td>65</td>
</tr>
<tr>
<td>(a) A syllable that contains a long vowel sound spelled with two vowels that end the syllable. (b) A syllable that contains a short vowel sound spelled with two vowels that end the syllable. (c) <strong>A syllable that contains a long vowel sound spelled with one vowel that ends the syllable.</strong> (d) A syllable that contains a diphthong spelled with two vowels that end the syllable. (e) A syllable that contains a short vowel sound spelled with one vowel that ends the syllable.</td>
<td></td>
</tr>
<tr>
<td>27. What type of syllable unit is <strong>rab</strong> an example of?</td>
<td>78</td>
</tr>
<tr>
<td>(a) diphthong syllable (b) open syllable (c) vowel team syllable (d) vowel-consonant-e syllable (e) <strong>closed syllable</strong></td>
<td></td>
</tr>
<tr>
<td>28. How many syllables does <strong>cabinet</strong> have?</td>
<td>94</td>
</tr>
<tr>
<td>(a) 7 (b) 5 (c) 3 (d) 6 (e) 4</td>
<td></td>
</tr>
<tr>
<td>29. What type of syllable unit is <strong>me</strong> an example of?</td>
<td>77</td>
</tr>
<tr>
<td>(a) diphthong syllable (b) <strong>open syllable</strong> (c) vowel team syllable (d) vowel-consonant-e syllable (e) closed syllable</td>
<td></td>
</tr>
<tr>
<td>30. Which word has an r-controlled syllable?</td>
<td>51</td>
</tr>
<tr>
<td>(a) trash (b) <strong>flower</strong> (c) strobe (d) written (e) rabbit</td>
<td></td>
</tr>
</tbody>
</table>

Objective C: Morphology
### Percentage Correct by Objective and Item for TCLK

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Which word has a suffix? (a) philosophy (b) predictable (c) insufficient (d) consonant (e) snowman</td>
<td>91</td>
</tr>
<tr>
<td>12. How many morphemes does unicorn have? (a) 3 (b) 1 (c) 6 (d) 7 (e) 2</td>
<td>35</td>
</tr>
<tr>
<td>13. Which word is an example of a compound noun? (a) Television (b) children (c) alligator (d) sandpaper (e) carnivorous</td>
<td>90</td>
</tr>
<tr>
<td>14. How can you recognize an English word that came from Greek? (a) It is likely to be a historical, scientific, or a mathematical term. (b) It is likely to be a mythological, scientific, or a geographical term. (c) It is likely to be a mythological, linguistic, or a mathematical term. (d) It is likely to be a scientific, educational, or historical term. (e) It is likely to be a mythological, scientific, or a mathematical term.</td>
<td>41</td>
</tr>
<tr>
<td>15. What is a morpheme? (a) A predictable phonetic variant of a phoneme. (b) The smallest meaningful unit of language. (c) The unit of pronunciation that is arranged around a vowel. (d) A speech sound that combines with others in a language system to make words. (e) A writing system.</td>
<td>67</td>
</tr>
<tr>
<td>16. Which word is an example of a compound noun? (a) ladybug (b) family (c) mechanic (d) computer (e) limousine</td>
<td>99</td>
</tr>
<tr>
<td>17. Which word has one morpheme? (a) amorous (b) jumped (c) woman (d) defected (e) incredible</td>
<td>32</td>
</tr>
</tbody>
</table>
Percentage Correct by Objective and Item for TCLK

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage Correct</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.  How many morphemes does elephant have?</td>
<td>42</td>
<td>(a) 2 (b) 3 (c) 4 (d) 1 (e) 5</td>
</tr>
<tr>
<td>19.  What is a prefix?</td>
<td>57</td>
<td>(a) A morpheme that precedes a root word that contributes to or modifies the meaning of a word. (b) A phoneme that precedes a root word that contributes to or modifies the meaning of a word. (c) A syllable that precedes a root word that contributes to or modifies the meaning of a word. (d) An orthography that precedes a root word that contributes to or modifies the meaning of a word. (e) A morpheme that follows a root word that contributes to or modifies the meaning of a word.</td>
</tr>
<tr>
<td>20.  How many morphemes does bookworm have?</td>
<td>70</td>
<td>(a) 6 (b) 4 (c) 2 (d) 3 (e) 1</td>
</tr>
</tbody>
</table>

Note. Adapted from Moats (2000).
## Percentage Correct by Item for TVK

<table>
<thead>
<tr>
<th>Item</th>
<th>% Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Something that is devious is</td>
<td>94</td>
</tr>
<tr>
<td>(a) flexible (b) eternal (c) desirable (d) extraneous</td>
<td></td>
</tr>
<tr>
<td>(e) <strong>sneaky</strong></td>
<td></td>
</tr>
<tr>
<td>2. An abrasion is</td>
<td>96</td>
</tr>
<tr>
<td>(a) a remedy (b) a copy (c) <strong>a scrape</strong> (d) an area</td>
<td></td>
</tr>
<tr>
<td>(e) a problem</td>
<td></td>
</tr>
<tr>
<td>3. A covenant is a kind of</td>
<td>88</td>
</tr>
<tr>
<td>(a) situation (b) behavior (c) conflict (d) punishment</td>
<td></td>
</tr>
<tr>
<td>(e) <strong>agreement</strong></td>
<td></td>
</tr>
<tr>
<td>4. Diction refers to</td>
<td>88</td>
</tr>
<tr>
<td>(a) <strong>speech</strong> (b) literature (c) medicine (d) direction</td>
<td></td>
</tr>
<tr>
<td>(e) education</td>
<td></td>
</tr>
<tr>
<td>5. A pilgrimage is a kind of</td>
<td>96</td>
</tr>
<tr>
<td>(a) ship (b) person (c) <strong>journey</strong> (d) emblem (e) feast</td>
<td></td>
</tr>
<tr>
<td>6. Disdainful means</td>
<td>80</td>
</tr>
<tr>
<td>(a) boastful (b) reluctant (c) understanding (d) bashful</td>
<td></td>
</tr>
<tr>
<td>(e) <strong>scornful</strong></td>
<td></td>
</tr>
<tr>
<td>7. Visage is another word for</td>
<td>59</td>
</tr>
<tr>
<td>(a) honesty (b) <strong>face</strong> (c) monument (d) space</td>
<td></td>
</tr>
<tr>
<td>(e) genius</td>
<td></td>
</tr>
<tr>
<td>8. Someone who is penitent is</td>
<td>80</td>
</tr>
<tr>
<td>(a) depressed (b) responsible (c) impatient</td>
<td></td>
</tr>
<tr>
<td>(d) <strong>remorseful</strong> (e) resourceful</td>
<td></td>
</tr>
<tr>
<td>9. Someone who is slovenly is</td>
<td>71</td>
</tr>
<tr>
<td>(a) willful (b) slow (c) untidy (d) disagreeable (e) rigid</td>
<td></td>
</tr>
<tr>
<td>10. A roster is</td>
<td>99</td>
</tr>
<tr>
<td>(a) <strong>a list</strong> (b) an answer (c) a plan (d) a pledge</td>
<td></td>
</tr>
<tr>
<td>(e) an oath</td>
<td></td>
</tr>
<tr>
<td>11. A portal is a</td>
<td>86</td>
</tr>
<tr>
<td>(a) knot (b) pillar (c) building (d) school (e) <strong>doorway</strong></td>
<td></td>
</tr>
<tr>
<td>12. To abridge something is to</td>
<td>77</td>
</tr>
<tr>
<td>(a) spoil it (b) accept it (c) <strong>shorten it</strong> (d) support it</td>
<td></td>
</tr>
<tr>
<td>(e) release it</td>
<td></td>
</tr>
<tr>
<td>13. Inadvertently means</td>
<td>93</td>
</tr>
<tr>
<td>(a) inadequately (b) enthusiastically (c) forcefully</td>
<td></td>
</tr>
<tr>
<td>(d) <strong>accidentally</strong> (e) completely</td>
<td></td>
</tr>
</tbody>
</table>

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*a Answers are indicated in boldface.

b Percent of respondents who answered item correctly (n=69).
Percentage Correct by Item for TVK

Item\(^a\) ........................................ %\(^b\)

14. Something that is utilitarian is ........................................ 81
   (a) useful (b) pleasant (c) expendable (d) proper
   (e) concealed

15. To adhere is to ........................................ 96
   (a) absorb (b) stick (c) hasten (d) polish (e) dissolve

16. Something that is synthetic is ........................................ 93
   (a) natural (b) foreign (c) musical (d) manufactured
   (e) systematic

17. Ostentatious is another word for ........................................ 67
   (a) untouched (b) flashy (c) inconspicuous (d) exciting
   (e) exaggerated

18. To ruminate is to ........................................ 68
   (a) ignore (b) vibrate (c) congratulate (d) contemplate
   (e) reassure

19. Flippant means ........................................ 72
   (a) formal (b) irreverent (c) traditional (d) active
   (e) frustrated

20. Something that is salient is ........................................ 33
   (a) noticeable (b) overt (c) opaque (d) salty
   (e) interesting

APPENDIX M. BIVARIATE CORRELATIONS FOR TEACHER KNOWLEDGE AND
STUDENT OUTCOMES
<table>
<thead>
<tr>
<th></th>
<th>TEKAP</th>
<th>TCLK</th>
<th>TVK</th>
<th>PSF1</th>
<th>NWF1</th>
<th>ORF1</th>
<th>PSF2</th>
<th>NWF2</th>
<th>ORF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEKAP</td>
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*Significant at the 0.05 level.
APPENDIX N. MEANS AND STANDARD DEVIATIONS FOR TEACHER KNOWLEDGE, STUDENT OUTCOMES, AND TEACHER DEMOGRAPHICS
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* Standard deviation is relevant for the teacher demographic categorical variables.
REFERENCES


National Reading Panel. (2000). *Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction*. Washington, DC: National Academy Press.


Torgesen, J. K. (2002a). Lessons learned from intervention research in reading: A way to go before we rest. Learning and Teaching Reading, 1, 89-203.


BIOGRAPHICAL SKETCH

Staci Walton Duggar was born on September 20, 1976, in Chapel Hill, North Carolina, to Linda and Gene Walton. She grew up in Tallahassee, Florida, where she graduated from Leon High School in 1994. She attended the University of North Carolina at Chapel Hill, and studied abroad in London and Florence with Florida State University. She graduated from UNC with a Bachelor of Science in Biology in 1998.

She was a 1998 Teach For America corps member in New Orleans where she taught for three years including one year of seventh grade math and science and two years of first grade. While teaching in Louisiana, Staci earned her post baccalaureate certification in elementary education and her master’s degree in curriculum and instruction with reading specialist certification at the University of New Orleans. She also presented workshops on teaching reading and classroom management and served as a mentor to new teachers.

Upon her return to Tallahassee, Staci taught first grade for one year at Pineview Elementary School. Staci then taught LAE 4314: Language Arts in the Elementary School and RED 4510: Teaching Reading to preservice teachers at Florida State University. Staci was a graduate fellow at the Florida Center for Reading Research where she developed tests to assess reading ability and administered reading assessments to a variety of ages of students and then was a research project manager for Colleague in the Classroom at the Florida State University. Staci is currently an educational consultant for SRA/McGraw-Hill.

Staci enjoys spending time with her high school sweetheart and husband, Thomas, and twin daughters, Elisabeth and Madelynn.