TEACHER KNOWLEDGE OF BASIC LANGUAGE CONCEPTS AND DYSLEXIA: ARE TEACHERS PREPARED TO TEACH STRUGGLING READERS?

A Dissertation

by

ERIN KUHL WASHBURN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2009

Major Subject: Curriculum and Instruction

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Approved by:

Chair of Committee,	R. Malatesha Joshi
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	Victor Willson
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ABSTRACT

Teacher Knowledge of Basic Language Concepts and Dyslexia: Are Teachers Prepared to Teach Struggling Readers? (December 2009)

Erin Kuhl Washburn, B.A., Baylor University;

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Chair of Advisory Committee: Dr. R. Malatesha Joshi

The National Institute of Child Health and Human Development (NICHD) has declared reading failure a national public health issue. Approximately 15-20 % of the US population displays one or more symptoms of dyslexia: a specific learning disability that affects an individual's ability to process language. Consequently, elementary school teachers are teaching students who struggle with inaccurate or slow reading, poor spelling, poor writing, and other language processing difficulties. However, studies have indicated both preservice and inservice teachers lack essential knowledge needed to teach struggling readers, particularly children with dyslexia. Few studies have sought to assess teachers', either preservice or inservice, knowledge and perceptions about dyslexia in conjunction with knowledge of basic language concepts related to reading instruction. Thus, the purpose of this dissertation was to examine elementary school preservice and inservice teachers' knowledge of basic language concepts and their knowledge and perceptions about dyslexia. Three separate studies were conducted, all addressing the overarching question:

Are elementary teachers (K-5) prepared to teach struggling readers? In study one, research that has addressed teacher knowledge of basic language concepts was reviewed systematically. In studies two and three, a basic language constructs survey was used to assess the self-perceptions/knowledge of basic language concepts and knowledge/perceptions about the nature of dyslexia of preservice, first year, and more experienced teachers involved in teaching reading in grades K-5.

DEDICATION

To my beloved children, William Andrew and baby boy:

May you always thirst for knowledge, have a deep affection for reading, and an active passion for loving and serving others.

Praecedo ministro.

ACKNOWLEDGEMENTS

First of all, I am thankful for God's unconditional love, grace, and mercy which have carried me through the joyful and difficult times in life and in this doctoral experience. I am also grateful for the many gifts that God has given me, particularly the gift of a loving and supportive family. Mom and Dad, thank you for sharing your passion for learning and serving others, I only hope that I too can pass on such fervor to my children, my students, and my colleagues. Additionally, I am thankful for the consistent support from my brothers, Eric and Ryan, and their precious families. And of course, to my sweet son and graduate school baby, William Andrew, thank you for loving Mommy unconditionally. You challenge and inspire me to be a better Mommy, every day, and you help me put life into its proper perspective. Finally, I want to thank my husband, Derek, better known as Superman to our family and friends. The sacrifices you have made to help make this experience happen for me are immeasurable. Your unwavering love, encouragement, grace, mercy, and prayers daily remind me of how good God is and how gracious He is to let me call you husband and friend. Without you, this undertaking would have been impossible.

I am also very grateful for the many professional mentors I have had the privilege of learning from and working with at Texas A&M University. First, I would like to thank my committee chair, Dr. Joshi, whose immense knowledge,

support and encouragement not only taught me the importance of good and ethical teaching and research, but who also taught me that no one's epitaph says "I wish I had made more time for work". Thank you too to Dr. McTigue for sharing your fresh perspective on teaching, learning, research and life. It was good to learn from you and laugh with you. A special thanks also goes to Dr. Liew, who graciously served on my committee and unselfishly shared his time and expertise. And of course, Dr. Willson, thank you for the hours you spent in the EREL lab helping me better understand Canonical Correlation Analysis. Your time and efforts are much appreciated and will not be forgotten.

Thanks also go to my graduate student friends, Kellie, Emily, Chyllis, Rhonda, April, Diane, Suzanne, Susan, Dr. Lori Graham, Leigh and the TLAC and EPSY department faculties and staff for making my time at Texas A&M University a great and memorable experience. I learned as much from you all as I did in my own studies.

Finally, I also want to extend my gratitude to all the students I have worked with in the past ten years, from toddlers to graduating college seniors, your zeal for life has provided me with the inspiration to be a better educator.

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CHAPTER I

INTRODUCTION

In recent decades, much attention has been given to combating reading failure and raising the level of reading proficiency in school-aged children. The No Child Left Behind Act of 2001 (NCLB) (PL 107-110), an extension of the Reading Excellence Act of 1998, was sanctioned with the expectation that all students will read proficiently by the end of third grade. Prior to the authorization of NCLB, Congress convened the National Reading Panel (NRP) (NICHD, 2000), a group of reading research experts, to conduct a two-year-long meta-analysis to find out how children best learn to read. Five essential components of successful reading instruction were identified, which included systematic and explicit instruction in: phonemic awareness, the ability to manipulate individual sounds, or phonemes, in spoken words; phonics, instruction that teaches how letters correspond with sounds; fluency, accurate reading at a reasonable rate with proper expression; vocabulary; and text comprehension. As a result of the NRP findings, over 6 billion dollars has been awarded to states and school districts through the Reading First program to implement scientifically-based reading instruction in the five components listed by the NRP (US Department of Education, 2008). However, regardless of federal mandates, monetary incentives, and a solid framework for reading instruction (Adams, 1990; Chall, 1983; NRP, 2000) reading failure persists.

This dissertation follows the style of *Reading and Writing: An Interdisciplinary Journal*.

Statement of the Problem

Recent scores from the National Assessment of Educational Progress (NAEP) indicate only 38% of children in the fourth grade read at the proficient level and in many low income urban school districts around 70 % of fourth grade students read at a basic level (NCES, 2007). Twenty-seven percent of the nation's eighth graders read at the proficient level and 2 % at the advanced level (NCES, 2007). Moreover, in a series of statements made before the Commission of Education and the Workforce, Lyon (2001) reported some consequences due to reading failure:

- By middle school, children who read well can read at least 10,000,000 words during the school year and children who struggle with reading read only 100,000 words during the school year (one percent of what good readers can read).
- Over 75 percent of students who drop out (ten to 15 percent) will report difficulties in reading.
- Two percent of students receiving special or compensatory education for difficulties learning to read will complete a four-year college program.
- At least half of young adults with criminal records have reading difficulties, and in some states the size of prisons a decade in the future is predicted by fourth grade reading failure rates.
- Half of the children and adolescents with a history of substance abuse have reading problems.

- 20 million school aged children have experienced reading failure and only 2.3 million have received special education services for reading failure.

Thus it is not surprising the National Institute of Child Health and Human Development (NICHD) declared reading failure to be a national public health issue (Lyon, 2001). Additionally, over 6% of school-aged children qualify for special education with 80% receiving services specifically for reading (NCES, 2006). Furthermore, it is likely that children who struggle with basic reading skills and concepts in first grade will continue to struggle beyond fourth grade (Juel, 1988). Thus, children who start off with poor literacy skills can remain poor readers (Stanovich, 1986). As societal literacy demands increase (Braunger & Lewis, 2005; Leu, Castek, Henry, Coiro, & McMullan, 2004; Neuman, 2001; Snow, Burns, & Griffin, 1998), the abovementioned statistical information is troubling and problematic.

Though it has been suggested that there is no one "quick fix" for reading failure (Allington & Walmsley, 2007), studies have identified early identification and intervention as key factors in children's later reading success (Torgesen et al., 1999; Vellutino et al., 1996). Also, it has been argued that knowledgeable teachers of reading, particularly those influential in early grades, have the potential to prevent reading failure with effective instruction (Moats, 1994; Taylor, Pearson, Clark, & Walpole, 1999; Snow et al., 1998). The National Research Council concluded that "quality classroom instruction in kindergarten and the primary grades is the single best weapon against reading failure" (Snow et al., 1998, p. 343). Hence a growing amount of attention has been given to teacher quality (Cirino, Pollard-Durodola, Foorman, Colson, & Francis,

2007; Taylor et al., 1999), teacher knowledge (Bos et al., 2001; Cunningham et al., 2004; Moats, 1994; Spear-Swerling & Brucker, 2003), and teacher preparation programs (Darling-Hammond, 2000; Joshi et al., in press b). Many of the abovementioned studies have focused investigations on understanding the knowledge base of elementary reading teachers (i.e., basic language concepts related to literacy) as well as teachers' perceptions of knowledge and skill, instructional philosophies, and teaching ability. This small, but growing body of research has revealed that both preservice and inservice teachers lack basic understandings of the English language that are needed to teach reading, particularly to struggling readers.

Purpose of the Study and Research Questions

As an educator involved in teacher preparation of reading instruction, the consensus from the abovementioned studies is disconcerting and challenging. Therefore, in an attempt to add to the existing body of teacher knowledge research, the following questions were posed for three separate studies: (1) What do teachers know about basic language concepts related to reading instruction? (2) Are preservice teachers (K-5) prepared to teach struggling readers? and (3) Are elementary teachers (K-5) prepared to teach struggling readers? In order to address the first research question research question a systematic review of all published teacher knowledge of basic language concepts was performed. The second and third research questions differ from previously mentioned studies because in addition to assessing teacher knowledge of basic language concepts needed to teach reading, teacher knowledge and perceptions concerning the nature of dyslexia was also examined.

As all three studies address teacher knowledge needed to teach struggling readers, three important terms are explicitly defined. First, "struggling reader(s)" will be defined as elementary-aged readers (in grades K-5) who experience unexpected reading difficulty resulting chiefly in inaccurate and/or slow word recognition. The term "struggling reader(s)" has been specifically chosen, as opposed to more current phasing such as "striving reader" (Brozo & Simpson, 2007), not to reflect fixed ability but rather to parallel literature used to support the proposed studies. Next, dyslexia will be defined using the current definition from the International Dyslexia Association (IDA, 2007):

> Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (para. 1, IDA, 2007)

The above definition of dyslexia was chosen to reflect a more inclusive definition of dyslexia that incorporates spelling and other language processing difficulties, whereas more narrow definitions only encompass word recognition as the distinguishing characteristic (for a discussion on the definitions of dyslexia see Sanders, 2001).

Lastly, "basic language concepts" is an umbrella term which includes the following elements of the English language: phonology, phonemics, alphabetic

principle/phonics, and morphology (affixes, roots, base words, and derivatives). Phonology will be defined as a set of skills and explicit understanding of the different ways in which spoken language can be broken down and manipulated; phonemics will be defined as the skills and knowledge related to the ability to notice, think about, or manipulate the individual sounds in words (phonemes); alphabetic principle/phonics will be defined as an understanding of how written letters are systematically and predictably linked to spoken sounds (phonemes) and an understanding of how to apply that knowledge for the purposes of decoding and reading; and morphology will be defined as an understanding of meaningful word parts (affixes, base words, derivatives) and their role in decoding and reading (NICHD, 2000).

CHAPTER II

SYSTEMATIC LITERATURE REVIEW

In recent decades attention has been given to combating reading failure and raising the level of reading proficiency in school-aged children. The No Child Left Behind Act of 2001 (NCLB) (PL 107-110), an extension of the Reading Excellence Act of 1998, was sanctioned with the expectation that all students will read proficiently by the end of third grade. Prior to the authorization of NCLB, Congress convened the National Reading Panel (NRP) (NICHD, 2000), a group of reading research experts, to conduct a two-year-long meta-analysis to find out how children best learn to read. Five essential components of effective reading instruction were identified, which included systematic and explicit instruction in: phonemic awareness, the ability to manipulate individual sounds, or phonemes, in spoken words; phonics, instruction that teaches how letters correspond with sounds; fluency, accurate reading at a reasonable rate with proper expression; vocabulary; and text comprehension. As a result of the NRP findings, over 6 billion dollars has been awarded to states and school districts through the Reading First program to implement scientifically-based reading instruction in the five components listed by the NRP (US Department of Education, 2008) and for professional development of early reading teachers. With such federal and state initiatives an estimated ten to twenty percent (IDA, 2007) of children experiencing difficulty reading, researchers have turned their attention to teacher quality as well as teacher knowledge, particularly those influential in the early reading grades (K-5). Therefore, in the past 15 years a substantial amount of research has been done to examine what teachers know

about basic language concepts related to reading instruction for beginning readers and struggling readers. A good deal of this research has been focused on teachers' knowledge of linguistic or language-related concepts that underlie the English language. Therefore, the purpose of this literature review was to systematically synthesize all studies that have examined teacher knowledge of "basic language concepts". In reviewing the studies, three specific areas of each study were identified and synthesized: (1) characteristics, (2) methodological quality, and (3) findings. Characteristics of each study included basic design components such as participant and measures descriptions, whereas, methodological quality pertains to issues of internal and external validity. To guide the synthesis of the studies' findings, the following research question was constructed: *What knowledge do preservice and/or inservice teachers have of basic language concepts needed to teach reading to beginning readers and/or struggling readers?*

In general, "basic language concepts" is an umbrella term which includes the following elements of the English language: phonology, phonemics, alphabetic principle/phonics, and morphology (affixes, roots, base words, and derivatives). Phonology refers to the skills and explicit understanding of the different ways in which spoken language can be broken down and manipulated. Phonological skills include: rhyming and alliteration, sentence segmentation, syllable segmentation, onset-rime manipulation, and phonemic awareness - the ability to notice, think about, or manipulate the individual sounds in words (phonemes). However, in the context of this review, phonology and phonemics will be analyzed and presented separately because some

studies measured both concepts and skills related to phonology and phonemics and some studies only measured concepts and skills related to phonemics. The alphabetic principle/phonics is thought of as an understanding of how written letters are systematically and predictably linked to spoken sounds (phonemes) and an understanding of how to apply that knowledge for the purposes of decoding and reading. Finally, morphology is the use of meaningful word parts (affixes, base words, derivatives) for decoding and reading instruction (NICHD, 2000).

Method

Search Procedures

The aim of the present study was two-fold, first to synthesize teacher knowledge of basic language concepts research in the past 30 years and second to help inform educators, administrators, and researchers in teacher preparation programs and/or professional development endeavors. At the present moment, and after an exhaustible search, a published systematic literature review about teacher knowledge of basic language concepts has not been found. Consequently, because previous systematic reviews have been unfound, the searching procedure for the review consisted of electronic database searching and hand searching. Relevant electronic databases included: ERIC (Educational Resources Information Center), PsycINFO (a database of psychological information), ISI Web of Knowledge, JSTOR, and Google Scholar. As the review was written about the basic language concepts in English, studies were restricted to English language research literature. Sensitive key words for the search of studies assessing teacher knowledge of basic language concepts included: teacher

knowledge* reading instruction*, and teacher knowledge* literacy instruction. After an extensive electronic search, a hand search of the following journals was done to ensure that all published articles were found: *Annals of Dyslexia, Journal of Learning Disabilities,* and *Reading and Writing: An Interdisciplinary Journal*. The above journals were chosen because they had frequently been cited as sources of literature on the topic of teacher knowledge and reading instruction.

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were created on the basis of the research question. Because the research question is focused on what teachers' know about basic language concepts, teacher knowledge must have been measured and reported for the study to be considered in the review; measurement was likely to be done through a survey, questionnaire, or test of knowledge. Second, because obtained data were likely to be in reported in at least percentages it was necessary that studies include quantitative analysis; though mixed method studies are not excluded, qualitative data was noted (but not scored) in the extraction process and discussed briefly in the results section. Also, studies were only included if they had been published in peer reviewed journals. The last exclusion/inclusion criteria are that studies must have been conducted between 1979 and 2009 and the samples must include preservice and/or inservice teachers in grades Kindergarten through fifth grade and/or teacher educators involved in preparation of K-5 teachers. Lastly, studies which were directed at teachers of children in pre-kindergarten or past 5th grade as these grade levels are beyond the scope of the research question.

As suggested by Petticrew and Roberts (2006) and Torgerson (2003), an abstraction form was used to systematically record and assess various methodological characteristics having to do with internal and external validity. Assessment was done by awarding points for certain methodological characteristics; the highest number of points was 23. Table 1 displays the criteria used for assessment and the number of possible points. During the construction process of the abstraction form, two different senior researchers and experts within their fields of reading and research methodology examined the abstraction form for face-validity. Three different drafts of the abstraction form were revised with the third used in the present study (see Table 1 for the final abstraction form).

Table 1

Abstraction Form

Criterion	**Definition**	**Weighting Factor**
<u>Study Design</u> Research Question/Objectives	Research questions, objectives, and/or hypothesis is explicitly or implicitly stated.	Yes – 1, No – 0
Population	Population is described and relevant.	Yes – 1, No - 0
Participant description	Sample is explicitly described and relevant.	Yes – 1, No - 0
Sample Size	Small (n<30) Medium(30<n<100) Large (n>100)	1 2 3
Sampling	Sampling was of convenience. Sampling was systematic	0 1

Table 1, continued

Criterion	Definition	Weighting Factor
Sampling, continued	Sampling was random.	2
	Sampling is likely to affect the results.	Yes – 0, No – 1
Control/Comparison	Control group was present.	2
	Comparison group was present.	1
	No control or comparison group is present.	0
	Nonrandom control groups are statistically controlled with a covariate or matching.	Yes – 1, No – 0
Measurement Variables	Variables for measurement are explicitly described and are relevant to the objectives of the study.	Yes – 1, No – 0
Operationalized measures	Dependent measures were described in detail/appropriately used for the dependent variables.	Yes – 1, No – 0
Reliability of measures reported	Internal reliability of the measure(s) is available	Yes – 1, No - 0
Test-retest	Test-retest of pre/post measures could threaten interpretation of dependent variables.	Yes – (-1), No – 1, N/A- 0
Statistical Analysis/Results	Choice for statistical techniques was explicitly explained and caveats were discussed.	Yes – 1, No – 0
	Effect sizes were reported.	Yes – 1, No – 0
	Tables and figures appropriately display data.	Yes – 1, No – 0
Conclusion	Conclusions were tied to relevant literature.	Yes – 1, No – 0
	Limitations to the study were identified and explicitly discussed.	Yes – 1, No – 0
	Implications for practitioners/policy were discussed.	Yes – 1, No – 0

Results

Studies' Characteristics

Twenty-five studies from peer reviewed journals were reviewed. Eight journals, representing both the fields of literacy and learning disabilities, published studies on teacher knowledge of basic language concepts. Only one of the 25 studies was conducted outside of the United States and was done so in Australia (Fielding-Barnsley & Purdie, 2005). Though each study was unique and had varying research purposes and questions, there were many similarities. However, to present an overview of the studies' characteristics, Table 2 has been constructed to briefly summarize study content.

Table 2

Studies' Characteristics

Study *(published in chronological order)*	Population: *Inservice (IST), Preservice (PST)*	Teacher Certification: *GEN = General Education (K-5), SPED = Special Education*	Constructs Measured: *PA = Phonology; PE = Phonemics; PH = Phonics, M = Morphology*
Troyer & Yopp (1990)	*IST*	*GEN*	*PE*
Moats (1994)	*IST & PST*	*GEN & SPED*	*PA, PE, PH, M*
Lyon & Moats (1996)	*IST & PST*	*GEN & SPED*	*PA, PE, PH, M*
Bos, Mather, Friedman Narr, & Babur (1999)	*IST*	*GEN*	*PA, PE, PH*
McCutchen & Berninger (1999)	*IST*	*GEN & SPED*	*PA, PE, PH, M*
Bos, Mather, Dickson, Podhajski, & Chard (2001)	*IST & PST*	*GEN & SPED*	*PA, PE, PH*

Table 2, continued

Study *(published in chronological order)*	Population: *Inservice (IST), Preservice (PST)*	Teacher Certification: *GEN = General Education (K-5), SPED = Special Education*	Constructs Measured: *PA = Phonology; PE = Phonemics; PH = Phonics, M = Morphology*
Mather, Bos, & Babur (2001)	*IST & PST*	*GEN*	*PA, PE, PH*
McCutchen, Abbott, et al. (2002)	*IST*	*GEN & SPED*	*PA, PE, PH, M*
McCutchen, Harry, et al. (2002)	*IST*	*GEN & SPED*	*PA, PE, PH, M*
Moats & Foorman (2003)	*IST*	*GEN*	*PA, PE, PH, M*
Spear-Swerling & Brucker (2003)	*PST & IST*	*SPED*	*PA, PE, PH*
Cunningham, Perry, Stanovich & Stanovich (2004)	*IST*	*GEN & SPED*	*PA, PE, PH*
Foorman & Moats (2004)	*IST*	*GEN*	*PA, PE, PH, M*
Spear-Swerling & Brucker (2004)	*PST*	*SPED*	*PA, PE, PH*
Fielding-Barnsley & Purdie (2005)	*IST & PST*	*GEN & SPED*	*PA, PE, PH, M*
Spear-Swerling, Brucker, & Alfano (2005)	*IST & PST*	*GEN & SPED*	*PA, PE, PH, M*
Al Otaiba & Lake (2007)	*PST*	*SPED*	*PA, PE, PH*
Brady et al. (2009)	*IST*	*GEN*	*PA, PE, PH*
Carlisle, Correnti, Phelps, & Zing (2009)	*IST*	*GEN*	*PA, PE, PH*
McCutchen, Green, Abbott, & Sanders (2009)	*IST*	*GEN*	*PA, PE, PH, M*

Table 2, continued

Study *(published in chronological order)*	Population: *Inservice (IST), Preservice (PST)*	Teacher Certification: *GEN = General Education (K-5), SPED = Special Education*	Constructs Measured: *PA = Phonology; PE = Phonemics; PH = Phonics, M = Morphology*
Piasta, McDonald Conner, Fishman, & Morrison (2009)	*IST*	*GEN*	*PA, PE, PH, M*
Cunningham, Zibulsky, Stanovich, & Stanovich (2009)	*IST*	*GEN*	*PH*
Joshi, Binks, Hougen, Dalhgren et al. (2009)	*UE*	-	*PA, PE, PH, M*
Podhajski, Mather, Nathan, & Sammons (2009)	*IST*	*GEN*	*PA, PE, PH, M*
Spear-Swerling (2009)	*PST*	*SPED*	*PA, PE, PH, M*

Table 2, continued

Study *(published in chronological order)*	Intervention Study: *PD=Professional Development, UC=University Coursework*	Student Reading Achievement Measured: *Y = yes, N=no*	Other Measured Variables: *P=Teachers' Perceptions; A=Teachers' Attitudes/Beliefs; O=Teacher Observation; I=Teacher Interviews; R=Teacher Reflections (Journal)*
Troyer & Yopp (1990)	-	*N*	-
Moats (1994)	-	*N*	-
Lyon & Moats (1996)	-	*N*	-
Bos, Mather, Friedman Narr, & Babur (1999)	*PD*	*Y*	*A*
McCutchen & Berninger (1999)	*PD*	*Y*	*O*
Bos, Mather, Dickson, Podhajski, & Chard (2001)	-	*Y*	*P*
Mather, Bos, & Babur (2001)	-	*N*	*P*
McCutchen, Abbott, et al. (2002)	*PD*	*Y*	*O*
McCutchen, Harry, et al. (2002)	-	*Y*	*P, O*
Moats & Foorman (2003)	-	*Y*	*O*
Spear-Swerling & Brucker (2003)	*UC*	*N*	-

Table 2, continued

Study *(published in chronological order)*	Intervention Study: *PD=Professional Development, UC=University Coursework*	Student Reading Achievement Measured: *Y = yes, N=no*	Other Measured Variables: *P=Teachers' Perceptions; A=Teachers' Attitudes/Beliefs; O=Teacher Observation; I=Teacher Interviews; R=Teacher Reflections (Journal)*
Cunningham, Perry, Stanovich & Stanovich (2004)	-	*N*	*P`*
Foorman & Moats (2004)	*PD*	*Y*	*I, O*
Spear-Swerling & Brucker (2004)	*UC*	*Y*	-
Fielding-Barnsley & Purdie (2005)	-	*N*	*A*
Spear-Swerling, Brucker, & Alfano (2005)	-	*N*	*P*
Al Otaiba & Lake (2007)	*UC*	*Y*	*P, R*
Brady et al. (2009)	*PD*	*N*	*A*
Carlisle, Correnti, Phelps, & Zing (2009)	-	*Y*	-
McCutchen, Green, Abbott, & Sanders (2009)	*PD*	*Y*	*O*

Table 2, continued

Study *(published in chronological order)*	Intervention Study: *PD=Professional Development, UC=University Coursework*	Student Reading Achievement Measured: *Y = yes, N=no*	Other Measured Variables: *P=Teachers' Perceptions; A=Teachers' Attitudes/Beliefs; O=Teacher Observation; I=Teacher Interviews; R=Teacher Reflections (Journal)*
Piasta, McDonald Conner, Fishman, & Morrison (2009)	-	*Y*	*O*
Cunningham, Zibulsky, Stanovich, & Stanovich (2009)	-	*N*	-
Joshi, Binks, Hougen, Dalhgren et al. (2009)	-	*N*	-
Podhajski, Mather, Nathan, & Sammons (2009)	*PD*	*Y*	-
Spear-Swerling (2009)	*UC*	*Y*	*P*

Description of Participants. Three different types of educators were assessed and therefore represented in the 25 studies: (1) preservice teachers (PSTs), educators who are in preparation to teach elementary aged children (kindergarten – 5th grade); (2) inservice teachers (ISTs), either general or special educators who at the time of the study were teaching in elementary schools; and (3) teacher educators involved in teacher

preparation. Three studies included only PSTs, 14 included only ISTs, seven included both PSTs and ISTs, and only one study included teacher educators. With regard to teaching credentials, 12 studies included participants who either held a teaching credential or who were in the process of obtaining general education certification, whereas only four studies examined the knowledge of teachers in preparation for special education. However, eight studies included general and special educators and only one examined the knowledge of teacher educators.

Format and Content of Teacher Knowledge Measures. All studies measured teacher knowledge of basic language concepts related to reading instruction using a survey/questionnaire or assessment. The content make-up of the majority of measures used in the reviewed studies was reflective of the earliest teacher knowledge studies (i.e., Troyer &Yopp, 1990; Moats, 1994). Troyer and Yopp (1990) measured only teachers' knowledge and skills related to as well as perceptions of phonemic awareness, whereas, Moats' 1994 study used a researcher-designed survey, *The Informal Survey of Linguistic Knowledge*, which included items constructed to measure knowledge and skill of phonology, phonics, and morphology. The overwhelming majority (~92%) of reviewed studies used measures that assessed teacher knowledge of more than one basic language concept. Twenty-three studies measured both skill and knowledge of phonology, 24 measured phonemics, 24 measured alphabetic principle/phonics, and 14 measured morphology.

Measures often included items of both knowledge and skill; however, the manner in which teachers were asked to respond to items varied. Most studies included items

that had teachers identify correct answers to knowledge and skill items via multiple choice, but there were several studies that had teachers demonstrate their knowledge and skill as well. For example, Moats (1994) and Cunningham, Perry, Stanovich, and Stanovich (2004) had teachers count and list phonemes in a given word. In addition to counting phonemes, Joshi, Binks, Hougen, Dalhgren et al. (2009) had teacher educators list all known morphemes in a given word. Spear-Swerling and Brucker (2003, 2004) also had preservice teachers list the syllable type associated with a given word. See Table 2 for content breakdown of measures in reviewed studies.

The basis for measuring teacher knowledge differed within the individual contexts of the studies. For example, almost half of the studies (11 in all) examined teacher knowledge using surveys/questionnaires to pre-and post-test participants after either a collaborative professional development (for ISTs) or university coursework (for PSTs). Additionally, though all studies included descriptive information concerning teacher knowledge of various basic language concepts (as mentioned above), 14 studies also measured student reading achievement. Of the 14 studies that included student reading achievement as a dependent variable, seven were conducted within the context of professional development for ISTs and three within the context of university coursework and outside tutoring for PSTs.

Also, another point of interest to researchers - which will only briefly be described as it is outside the scope of the research question - was teachers' perceptions, beliefs, and/or attitudes towards teaching reading in conjunction with knowledge of basic language concepts. Almost half of the studies (11 in all) measured teachers'

perceptions, beliefs and/or attitudes. Studies done by Bos and colleagues (Bos, Mather, Friedman Narr, & Babur, 1999; Bos, Mather, Dickson, Podhajski, & Chard, 2001; Mather, Bos,& Babur, 2001) measured teachers' perceptions/attitudes toward reading instruction using the *Teacher Perceptions Toward Early Reading and Spelling* (TPERS), a researcher-designed measure which was adapted from an instrument originally developed by DeFord (1985). The TPERS included items that reflected the whole-language or implicit instructional orientation toward teaching reading, items that reflected the code-base or explicit instructional orientation, and items that were "more neutral…and not strongly representative of any particular theoretical orientation" (Mather et al., 2001). Fielding-Barnsely and Purdie (2005) and McCutchen, Harry, et al. (2002) also sought to measure teachers' theoretical orientation toward teaching reading. Other researchers (Cunningham et al., 2004; Cunningham, Zibulsky, Stanovich, & Stanovich, 2009; Joshi, Binks, Hougen, Dalhgren et al., 2009; Spear-Swerling, Brucker, & Alfano, 2005; Spear-Swerling, 2009) were interested in how well teachers or preservice teachers were able to calibrate their own knowledge of certain basic language concepts. Cunningham et al. (2004) asserted that "if teachers of beginning reading are well calibrated in their disciplinary knowledge, they presumably will be more receptive to seeking out and/or receiving information they do not posses" (p. 144). Bos et al. (2001) examined preservice and inservice teachers' perceptions of preparedness to teach reading and differing approaches to reading. Al Otaiba and Lake (2007) examined preservice teachers' perceptions of preparedness to teach certain basic language concepts. Furthermore, 10 studies included a qualitative component into the research

design by observing teachers in their classrooms (for ISTs) or tutoring environments (for PSTs), interviewing teachers, and/or asking for written reflection (i.e., reflective journals from teachers). Observation of teachers was often in the context of a professional development program or university coursework, in which the researchers were looking for certain teaching behaviors and content (e.g., number of minutes spent explicitly teaching phonemic awareness).

Studies' Methodological Quality

To analyze the methodological quality of the studies, an abstraction form was constructed based on issues central to internal and external validity and which were based on the work of Cook and Campbell (1979). Twelve individual criterion were included in the abstract form that were created to help the researcher analyze study design, measurement instruments, statistical analyses/results, and conclusions. Additionally, each criterion was assigned a corresponding weighting factor based on study design and characteristics (please refer to Table 3 for a breakdown of all internal and external validity criteria for all reviewed studies). For example, a study that did not explicitly or implicitly state research questions, objectives, or hypotheses was not awarded a point, whereas a study that did received 1 point.

Table 3

Studies Cross-referenced with External and Internal Validity Criteria

Study	Research Questions	Population Description	Sample Description	Sample Size	Sampling Technique *(Sampling affect results)*
Troyer & Yopp (1990)	Y	N	Y	L	Systematic
Moats (1994)	Y	N	Y	M	Convenience *(Y)*
Moats & Lyon (1996)	Y	N	Y	L	Convenience *(Y)*
Bos, Mather, Narr, & Babur (1999)	Y	N	Y	M	Convenience *(Y)*
McCutchen & Berninger (1999)	Y	Y	Y	S	Convenience *(Y)*
Bos, Mather, Dickson, & Chard (2001)	Y	N	Y	L	Convenience *(Y)*
Mather, Bos & Babur (2001)	Y	N	Y	L	Convenience *(Y)*
Mc Cutchen, Abbott, et al. (2002)	Y	N	Y	L	Convenience *(Y)*
Mc Cutchen, Harry, et al. (2002)	Y	N	Y	M	Convenience *(Y)*

Table 3, continued

Study	Research Questions	Population Description	Sample Description	Sample Size	Sampling Technique *(Sampling affect results)*
Moats & Foorman (2003)	Y	N	Y	L	Convenience *(Y)*
Spear-Swerling & Brucker (2003)	Y	N	Y	M	Convenience *(Y)*
Cunningham, Perry, Stanovich, & Stanovich (2004)	Y	N	Y	L	Convenience *(Y)*
Foorman & Moats (2004)	Y	N	N	M	Convenience *(Y)*
Spear-Swerling & Brucker (2004)	Y	N	Y	L	Convenience *(Y)*
Fielding-Barnsley & Purdie (2005)	Y	N	Y	L	Convenience *(Y)*
Spear-Swerling, Brucker, & Alfano (2005)	Y	N	Y	L	Convenience *(Y)*
Al Otaiba & Lake (2007)	Y	N	Y	S	Convenience *(Y)*
Brady et al. (2009)	Y	Y	Y	M	Convenience *(Y)*
Carlisle et al. (2009)	Y	Y	Y	L	Convenience *(Y)*

Table 3, continued

Study Questions	Research Description	Population Description	Sample Size	Sample	Sampling Technique *(Sampling affect results)*
Cunningham, Zibulsky, Stanovich, & Stanovich (2009)	Y	N	Y	L	Convenience *(Y)*
Mc Cutchen, Green, Abbott, & Sanders (2009)	Y	N	Y	M	Convenience *(Y)*
Piasta, Mc Donald, Fishman, & Morrison (2009)	Y	N	Y	L	Systematic *(N)*
Joshi, Binks, Hougen, Dahlgren et al. (2009)	Y	N	Y	L	Convenience *(Y)*
Podhajski, Mather, et al. (2009)	Y	N	Y	M	Convenience *(Y)*
Spear-Swerling (2009)	Y	N	Y	M	Convenience *(Y)*

Table 3, continued

Study	Group Assignment *(Non-random groups matched)*	Variables Described	Operationalized Measures	Reliability Reported	Test/ Retest
Troyer & Yopp (1990)	N	Y	Y	N	N/A
Moats (1994)	N	Y	Y	N	N/A
Moats & Lyon (1996)	N	Y	Y	N	N/A
Bos, Mather, Narr, & Babur (1999)	COMP *(N)*	Y	Y	Y	N
McCutchen & Berninger (1999)	COMP *(Y)*	Y	Y	N	N
Bos, Mather, Dickson, & Chard (2001)	N	Y	Y	Y	N/A
Mather, Bos, & Babur (2001)	N	Y	Y	Y	N
Mc Cutchen, Abbott, et al. (2002)	CONT *(Y)*	Y	Y	Y	N

Table 3, continued

Study	Group Assignment *(Non-random groups matched)*	Variables Described	Operationalized Measures	Reliability Reported	Test/ Retest
Moats & Foorman (2003)	N	Y	Y	N	N/A
Spear-Swerling & Brucker (2003)	COMP *(N)*	Y	Y	Y	N
Cunningham, Perry, Stanovich, & Stanovich (2004)	N	Y	Y	Y	N/A
Foorman & Moats (2004)	N	Y	Y	N	N
Spear-Swerling & Brucker (2004)	COMP *(N)*	Y	Y	Y	N
Fielding-Barnsley & Purdie (2005)	N	Y	Y	N	N/A
Spear-Swerling, Brucker, & Alfano (2005)	N	Y	Y	Y	N/A
Al Otaiba & Lake (2007)	N	Y	Y	Y	N

Table 3, continued

Study	Group Assignment *(Non-random groups matched)*	Variables Described	Operationalized Measures	Reliability Reported	Test/ Retest
Brady et al. (2009)	N	Y	Y	Y	N
Mc Cutchen, Harry, et al. (2002)	N	Y	Y	Y	N/A
Carlisle et al. (2009)	N	Y	Y	Y	N
Cunningham Zibulsky, Stanovich, & Stanovich (2009)	N	Y	Y	Y	N/A
Mc Cutchen, Green, Abbott, & Sanders (2009)	CONT *(Y)*	Y	Y	Y	Y
Piasta, Mc Donald, Fishman, & Morrison (2009)	CONT *(Y)*	Y	Y	Y	N/A
Joshi, Binks, Hougen, Dahlgren et al. (2009)	N	Y	Y	Y	N/A

Table 3, continued

Study	Group Assignment *(Non-random groups matched)*	Variables Described	Operationalized Measures	Reliability Reported	Test/ Retest
Podhajski, Mather, et al. (2009)	CONT *(N)*	Y	Y	N	N
Spear-Swerling (2009)	N	Y	Y	Y	N

Table 3, continued

Study	Statistical Techniques Explained	Statistical Techniques Appropriate	Effect Sizes Reported or computable
Troyer & Yopp (1990)	Y	Y	N
Moats (1994)	N	Y	N
Moats & Lyon (1996)	Y	Y	N
Bos, Mather, Narr, & Babur (1999)	Y	Y	Y
McCutchen & Berninger (1999)	Y	Y	Y
Bos, Mather, Dickson, & Chard (2001)	Y	Y	Y
Mather, Bos, & Babur (2001)	Y	Y	Y
Mc Cutchen, Abbott, et al. (2002)	Y	Y	Y
Mc Cutchen, Harry, et al. (2002)	Y	Y	Y
Moats & Foorman (2003)	Y	Y	Y

Table 3, continued

Study	Statistical Techniques Explained	Statistical Techniques Appropriate	Effect Sizes Reported or computable
Spear-Swerling & Brucker (2003)	Y	Y	Y
Cunningham, Perry, Stanovich, & Stanovich (2004)	Y	Y	Y
Foorman & Moats (2004)	Y	Y	Y
Spear-Swerling & Brucker (2004)	Y	Y	Y
Fielding-Barnsley & Purdie (2005)	Y	Y	Y
Spear-Swerling, Brucker, & Alfano (2005)	Y	Y	Y
Al Otaiba & Lake (2007)	N	Y	Y
Brady et al. (2009)	Y	Y	Y
Carlisle et al. (2009)	Y	Y	Y

Table 3, continued

Study	Statistical Techniques Explained	Statistical Techniques Appropriate	Effect Sizes Reported or computable
Cunningham, Zibulsky, Stanovich, & Stanovich (2009)	Y	Y	Y
Mc Cutchen, Green, Abbott, & Sanders (2009)	Y	Y	Y
Piasta, Mc Donald, Fishman, & Morrison (2009)	Y	Y	Y
Joshi, Binks, Hougen, Dahlgren et al. (2009)	Y	Y	Y
Podhajski, Mather, et al. (2009)	Y	Y	Y
Spear-Swerling (2009)	Y	Y	Y

Table 3, continued

Study	Tables/Figures	Conclusions Relevant	Limitations Discussed	Implications Discussed	Weighted Score *(Percentage)*
Troyer & Yopp (1990)	Y	Y	N	Y	14 *(61%)*
Moats (1994)	Y	Y	N	Y	10 *(43%)*
Moats & Lyon (1996)	Y	Y	N	Y	11 *(48%)*
Bos, Mather, Narr, & Babur (1999)	Y	Y	N	Y	16 *(70%)*
McCutchen & Berninger (1999)	Y	Y	N	Y	16 *(70%)*
Bos, Mather, Dickson, & Chard (2001)	Y	Y	Y	Y	15 *(65%)*
Mather, Bos, & Babur (2001)	Y	Y	Y	Y	16 *(70%)*
Mc Cutchen, Abbott, et al. (2002)	Y	Y	Y	Y	19 *(83%)*

Table 3, continued

Study	Tables/Figures	Conclusions Relevant	Limitations Discussed	Implications Discussed	Weighted Score *(Percentage)*
Mc Cutchen, Harry, et al. (2002)	Y	Y	Y	Y	14 *(61%)*
Moats & Foorman (2003)	N	Y	Y	Y	13 *(57%)*
Spear-Swerling & Brucker (2003)	Y	Y	Y	Y	16 *(70%)*
Cunningham, Perry, Stanovich, & Stanovich (2004)	Y	Y	Y	Y	15 *(65%)*
Foorman & Moats (2004)	Y	Y	Y	Y	13 *(57%)*
Spear-Swerling & Brucker (2004)	Y	Y	Y	Y	17 *(74%)*
Fielding-Barnsley & Purdie (2005)	Y	Y	Y	Y	14 *(61%)*
Spear-Swerling, Brucker, & Alfano (2005)	Y	Y	Y	Y	15 *(65%)*
Al Otaiba & Lake (2007)	Y	Y	Y	Y	13 *(57%)*

Table 3, continued

Study	Tables/Figures	Conclusions Relevant	Limitations Discussed	Implications Discussed	Weighted Score *(Percentage)*
Brady et al. (2009)	Y	Y	Y	Y	16 *(70%)*
Carlisle et al. (2009)	Y	Y	Y	Y	17 *(74%)*
Cunningham, Zibulsky, Stanovich, & Stanovich (2009)	Y	Y	Y	Y	15 *(65%)*
Mc Cutchen, Green, Abbott, & Sanders (2009)	Y	Y	Y	Y	16 *(70%)*
Piasta, Mc Donald, Fishman, & Morrison (2009)	Y	Y	Y	Y	20 *(87%)*
Joshi, Binks, Hougen, Dahlgren et al. (2009)	Y	Y	N	Y	14 *(61%)*
Podhajski, Mather, et al. (2009)	Y	Y	Y	Y	16 *(70%)*
Spear-Swerling (2009)	Y	Y	Y	Y	15 *(65%)*

All 25 studies explicitly or implicitly stated research objectives, questions and/or hypotheses. Therefore, it was clear that researchers intended to measure teacher knowledge of basic language concepts. Explanation of participants, however, differed. Though all studies explicitly defined the study sample, the population to which an attempt at generalization could be made was almost never defined. Two studies did, however, provide information concerning participants' demographics in relation to the area of generalization. McCutchen and Berninger (1999) and Brady et al. (2009) described in detail both participant demographics (teachers and students) and the demographics of the state from which the sample was taken, thus making generalization much more acceptable at the state level. Carlisle, Correnti, Phelps, and Zeng (2009) included population comparison information for only the student sample (not teachers). However, as the majority (88%) did not include population descriptions or comparisons, it can be hypothesized that this could be due in part to convenience sampling, thus the sample may not have been representative of the greater population. With regard to sample size, over half of the studies (14 in all) had fairly large sample sizes ($n < 100$); therefore, the potential for greater statistical power was likely to exist, particularly when using such comparative statistics as one sample paired t-tests and two independent sample t-tests. Nine studies had medium sample sizes ($30 < n < 100$) and only two had small sample sizes ($n < 30$). However, twenty-three studies used a means of convenience sampling to obtain data, one was systematic, and one used random assignment. Therefore, results for the overwhelming majority of studies are likely to have been affected, because it is unknown whether or not the data is representative of the

teacher or preservice teacher population measured. The majority of studies (15 of 25 studies) used some form of recruitment as a means of conveniently obtaining a sample of inservice teachers or teacher educators (Brady et al., 2009; Bos et al., 1999; Bos et al., 2001; Carlisle et al., 2009; Cunningham, Zibulsky, Stanovich, & Stanovich, 2009; Cunningham et al., 2004; Foorman & Moats, 2004; Joshi, Binks, Hougen, Dalhgren et al., 2009; Mather et al., 2001; McCutchen & Berninger, 1999; McCutchen, Abbott et al., 2002; McCutchen, Harry et al., 2002; McCutchen, Green, Abbott, & Sanders, 2009; Moats & Foorman, 2003; Podhajski et al., 2009). Recruitment varied but the most popular method included sending letters to individual schools and/or school districts requesting participation in reading related professional development. For example, Brady et al. (2009) sent letters to principals of schools who had a majority of lower socio-economic students, recruiting first grade teachers to participate in a year-long reading related professional development. (However, it should be noted that Brady et al. used random assignment of their participants to intervention and control conditions after a sample was obtained.) Eight studies, however, (Al Otaiba & Lake, 2007; Fielding-Barnsley & Purdie, 2005; Moats, 1994; Moats & Lyon, 1996; Spear-Swerling, 2009; Spear-Swerling & Brucker, 2003, 2004; Spear-Swerling et al., 2005) used preservice teachers enrolled in either graduate or undergraduate level reading preparation courses as their convenience sample. One problem that can result from recruiting teachers is that a sample could consist of teachers who are eager for instruction, which may or may not be wholly reflective of a population of teachers. Additionally, using a sample of preservice teachers from one university may only reflect the type of student attending that

institution. Therefore, the threat of selection must be considered when interpreting such studies' results. Though sampling is clearly a problem in the majority of studies reviewed, researchers in 18 of the studies explicitly stated or implicitly implied sampling as a limitation.

As convenience sampling was the most prevalent means of collecting data, the majority of studies (17 in all) did not have a control or comparison group. However, four studies did have a control group in which non-random control groups were statistically controlled for by matching of school demographics (i.e., free-reduced lunch) in three of the four. The remaining four studies had a comparison group of either preservice teachers in other university classrooms (Spear-Swerling & Brucker, 2003; 2004) or other teachers who did not participate in a targeted professional development (Bos et al., 1999; Mc Cutchen & Bernginger, 1999). Interestingly, all studies included explicit information about measured variables. In fact, some researchers went to great length to provide justification for measuring specific variables such as phonological and phonemic awareness (see Moats, 1994 for an example). Additionally, all reviewed studies described questionnaires/surveys in great detail; however, not all reported internal reliability. Eight studies did not report the internal reliability of the measure(s) used. Four were the earliest studies (McCutchen & Berninger, 1999; Moats, 1994; Moats & Lyon, 1996; Troyer & Yopp, 1990) and were descriptive and exploratory in design, and the other four studies were published later (Fielding-Barnsley & Purdie, 2005, Foorman & Moats, 2004; Moats & Foorman, 2003; Podhajski, Mather, Nathan, & Sammons, 2009) and included more inferential statistical analyses. Because teacher

knowledge data was collected in 13 of the studies within the context of professional development or university coursework, participants in those studies were pre-and post-tested. Only 1 of the studies posed a possible threat to the internal validity of the study by way of testing or re-testing. McCutchen et al. (2009) recruited 30 upper elementary teachers (grades 3-5) to participate in a ten-day intervention aimed at increasing teacher knowledge of literacy instruction including linguistic knowledge. Alternate forms of the *Informal Survey of Linguistic Knowledge* (Moats, 1994) were administered pre-and post-intervention, thus were given ten days apart. It is arguable that administering alternate forms of the survey could control for any possible threat, however, though the survey may have differing items, the underlying concepts measured via the survey are still the same. Given the short time period of 10 days, it could also be argued that the pre-test items prepped teachers for the intervention, thus alerting them to pay attention to information which appeared on the pre-test. The latter explanation could change the interpretation of the dependent variable of teacher knowledge.

With regard to statistical analysis, all studies, as deemed by the author, chose and applied statistical techniques appropriate to answer the research questions, objectives, and/or hypotheses of the perspective study. All researchers included at least descriptive statistics (means and standard deviations) for the teachers' scores on the teachers' knowledge survey/questionnaire. However, 16 studies also included descriptive statistics such as percentages for specific survey/questionnaire items. And almost all (22 studies) calculated inferential statistics such as t-tests, analysis of variance (ANOVA), multivariate analysis of variance (MANOVA), multiple regression, and hierarchal linear

modeling. Additionally, all but one study displayed statistical data suitably by way of tables and figures. The lone study that did not use any tables or figures to present data was Moats and Foorman (2003). Moats and Foorman (2003), in the context of a large and four-year longitudinal study, conducted 3 surveys of teacher knowledge of reading-related concepts in low-performing, high poverty urban schools to "explore the type and level of questions that would begin to discriminate more capable from less capable teachers" (Moats & Foorman, 2003, p. 23). Though the researchers provided description of findings for each survey conducted at great length, a table for each set of findings would have been helpful for the reader to organize and visualize the data.

Reporting effect sizes has grown increasing common and many journals require and/or strongly encourage authors to report effect sizes (American Psychological Association, [APA], 2001; Thompson, 1998). An effect size is a measure of strength between two measured variables and allows for comparison of practical significance among a group of studies. Though the most commonly reported effect size is Cohen's *d* (used for comparative statistics such as t-tests), there are several other effect sizes such as R^2 for multiple regression, and η^2 for multivariate designs. Three of the reviewed studies did not report effect sizes and/or effect sizes were unable to be computed (due to research design). In Moats (1994), Moats and Lyon (1996), and Troyer and Yopp (1990) effect sizes were not reported and not computable because the reported statistics were only descriptive in nature. Eleven studies (Al Otaiba & Lake, 2007; Bos et al., 1999; Brady et al., 2009; Foorman & Moats, 2004; McCutchen & Berninger, 1999; McCutchen, Abbott, et al., 2002; Podhajski, Mather, Nathan, & Sammons, 2009; Spear-

Swerling, 2009; Spear-Swerling & Brucker, 2003, 2004) included an intervention aimed at increasing teacher knowledge, and effect sizes for all these studies were either reported or calculable. The remaining eleven studies either reported effect sizes (or effect sizes were calculable) for student learning (Carlisle et al., 2009; Moats & Foorman, 2003; Piasta et al., 2009) or for comparisons within a sample (Bos et al., 2001; Cunningham et al., 2004; Cunningham et al., 2009; Fielding-Barnsley & Purdie, 2005; Joshi, Binks, Hougen, Dalhgren et al., 2009; Mather et al., 2001; McCutchen, Harry et al., 2002; Spear-Swerling, Brucker, & Alfano, 2005).

The authors of all 25 studies included conclusions which were linked to relevant literature. In turn, all authors suggested implications for teacher education programs, teacher professional development, and education policy based on the findings of each study. Additionally, the majority of authors (19 in all) included some explanation of limitation(s) to their studies; however, six did not do so in an explicit manner. Five such studies were the earliest investigations of teacher knowledge (Bos et al., 1999; McCutchen & Berninger, 1999; Moats, 1994; Moats & Lyon, 1996; Troyer & Yopp, 1990). The sixth study, however, was a more recent study by Joshi, Binks, Hougen, Dalhgren et al. (2009). Though APA does not require authors to state any and/or all limitations that may weaken a study's methodological quality, such transparent information can be helpful in the interpretation process and also for possible replication.

With regard to the final weighted scores of each study, a study could be awarded a possible total of 23 points based on methodological quality. In this review, weighted scores ranged from 10 to 20 with the mean score at 15.04 (SD = 2.17) and a mode score

of 16. Thus, the studies reviewed in this paper, on average, received ~65% of the points possible. Refer to the last criterion on Table 3 for a list of weighted scores and percentage of points awarded.

Studies' Findings About Teacher Knowledge of Basic Language Concepts

The present study had three distinct purposes with the first to describe the reviewed studies, the second to analyze and report methodological quality of the studies, and third to synthesize and report what teachers know basic language concepts related to reading instruction. In the following sections, results of teacher knowledge are reported for each basic language concept as well as the effect of intervention on teacher knowledge and the effect of teacher knowledge on student reading achievement.

Phonological. Phonological knowledge and/or skills were measured in 23 of the studies. Inservice and preservice teachers both did particularly well with the implicit skill of syllable counting. For example, Mather, Bos and Babur (2001) reported that though preservice teachers "were not very knowledgeable about concepts related to English language structure" (p. 478), the majority were able to correctly count the number of syllables in the words. However, an interesting trend was found in a few studies (Moats, 1994; Joshi, Binks, Hougen, Dalhgren et al., 2009; Mather et al., 2001), in which teachers had difficulty counting the syllables in some seemingly transparent words, which consequently all included an inflectional ending. In Moats (1994), 23% of graduate level participants - including general and special education teachers and speech pathologists - incorrectly counted the number of syllables in "talked". In Mather et al. (2001) 14% of preservice teachers and 8% of inservice teachers incorrectly counted the

number of syllables in the word *"pies"* (p. 480). And in Joshi, Binks, Hougen, Dalhgren et al. (2009) 12% of teacher educators incorrectly counted the number of syllables in *"frogs"*. Though teachers fared well with syllable counting, it seemed that they had difficulty defining the term "syllable". In Bos et al. (2001) only 53% of preservice and 64% of inservice teachers were able to correctly identify the definition of a syllable. A similar finding was reported in Mather et al. (2001). In Cunningham et al. (2004) teachers who had perceived their knowledge of phonological awareness to be high had a lower percentage of participants (44.8%) who could correctly identify the definition of a syllable than those who had lower perceived knowledge (48.5%). In Australia, Fielding-Barnsley and Purdie (2005) found that special educators (76% correctly identified) were more familiar than general educators (53% correctly identified) and preservice teachers (47% correctly identified) with the concept of a syllable. In Joshi, Binks, Hougen, Dalhgren et al. (2009) 40 teacher educators were asked in an interview to define the term phonological awareness. Interestingly, 80% of teacher educators defined phonological awareness as letter-sound correspondences. A similar finding in Mather et al. (2001) revealed that 22% of preservice and 36% of inservice teachers were able to indicate false to the statement: "*Phonological awareness is a method of reading instruction that begins with individual letters and sounds*." (p. 479).

Phonemics. Twenty-four of studies sought to measure teachers' knowledge and skill related to phonemics. The earliest study found to measure teachers' familiarity with the language concept of phonemic awareness was Troyer and Yopp (1990). Troyer and Yopp's measure of phonemic awareness differed from later studies in that they did

not ask teachers to display skill by counting or identifying phonemes. Rather Troyer and Yopp surveyed participants' knowledge and beliefs about the nature of phonemic awareness and phonemic awareness instruction for early and struggling readers. The researchers found that 51% of the less experienced participants (teachers who had less than 5 years teaching experience) were familiar with the term "*phonemic awareness*", whereas only 24% of teachers with 6-15 years teaching experience were familiar with the term, and only 32% of veteran teachers of 15+ years teaching were familiar with phonemic awareness. Consequently, all participants rated the ability to segment phonemes as a less important emergent literacy skill.

Teachers demonstrated differing knowledge about terminology associated with phonemic awareness. Ninety percent of preservice and 88% of inservice teachers in Bos et al. (2001) were able to correctly identify the definition associated with the term "phoneme". In Mather et al. (2001) 73% of preservice teachers and 88% of inservice teachers were able to correctly identify the term "phoneme". However, Joshi, Binks, Hougen, Dalhgren et al. (2009) reported that just over a half (54%) of participating teacher educators were able to correctly identify the definition of phonemic awareness.

Whereas authors reported teachers' doing well with syllable counting, in general, teachers had less success with phoneme counting and/or identification. Words with less transparent grapheme-phoneme correspondence such as those containing the letter "*x*" appeared to give teachers the most difficulty. For example, in Moats (1994) only 25% of the 89 participants were able to count three sounds or phonemes in the word "*ox*". In Bos et al. (2001) only 8% of preservice teachers and 15% of inservice teachers were able

to correctly identify that there are four speech sounds in the word "*box*". A similar, but slightly higher, result was found by Fielding-Barnsley and Purdie (2005) in that 15% of all preservice teachers, 26% of general education teachers, and 37% of special education teachers correctly identified the number of speech sounds in the word "*box*". Al Otaiba and Lake (2007) did not specify how many of the 18 preservice teacher participants were unable to correctly identify the number of speech sounds in "*box*", but the researchers did indicate that it was at least one-third of the sample. Spear-Swerling, Brucker, and Alfano (2005) reported that graduate level special education preservice teachers had difficulty counting the correct number of phonemes in "*mix*". Cunningham et al. (2004) reported that only 2.6% of 722 kindergarten through third grade teachers correctly counted the number of speech sounds in "*exit*" (five).

In addition to measuring teachers' knowledge of terms related to phonemic awareness and teachers' own phonemic skills, some researchers (Brady et al., 2009; Bos et al., 2001; Mather et al., 2001) asked teachers to identify instructional activities commonly used for teaching phonemic awareness. Bos et al. (2001) gave preservice and inservice teachers an example of a phonemic awareness task (deletion) and asked them to correctly identify the name given to the task, 42% of preservice and 59% of inservice teachers were able to complete the task with success. The majority of preservice and inservice teachers in Mather et al. (2001) were able to identify both phoneme segmentation and phoneme blending activities. Brady et al. (2009) had two tasks aimed at measuring teachers' ability to detect tasks that would help develop a child's phonemic awareness. On the pre-test scores teachers had difficulty identifying the correct answers

to the tasks with only 24.6% answering correctly on the first task and 4.6% on the second task. However, post-test scores (after a professional development aimed at increasing teachers' knowledge of language concepts) were statistically significantly higher on both tasks (first task – 81.5% correctly identifying, second task – 53.8% correctly identifying).

Alphabetic Principle/Phonics. Researchers in all but one study (Troyer & Yopp, 1990) measured a variety of teachers' knowledge of and skill related to the alphabetic principle and/or phonics instruction. Teachers were asked to identify terminology and principles associated with phonics instruction as well as produce or identify the six common syllable types and irregular and regular words for reading. Terminology associated with phonics instruction was an area of weakness for the majority of teachers in the reported studies. Two terms with which teachers consistently had difficulty were "*digraph*" and "*blend*". In Bos et al. (2001) 23% of preservice teachers and just under a half of inservice teachers (48%) correctly recognized the definition of a digraph. Participants in Moats (1994) and Moats and Lyon (1996) also had difficulty differentiating a digraph from a blend. For example, 10-20% of participants in both studies were able to consistently underline consonant blends in words and often underlined digraphs instead. Brady et al. (2009) found that a greater percentage of teachers were able to correctly identify blends at the beginning of a word than at the end of a word. Moats and Foorman (2003) also found teachers had more difficulty identifying a word ending with a blend. Consequently, phonics knowledge of even the most reliable principles also proved to be quite poor for the range of educators in the

reviewed studies. Thirty percent of teachers in Moats (1994) were able to explain when to use the digraph "*ck*" for the /k/. Mather et al. (2001) found that 50% of preservice and 77% of inservice teachers were able to correctly identify when to use digraph *"ck"* in spelling. Whereas, Joshi, Binks, Hougen, Dalhgren et al. (2009) reported that 50% of teacher educators correctly identified when to use "*c*" for the /k/ and 21% correctly identified when to use "*k*" for the /k/.

The use of the six syllable types in the English language for systematic phonics instruction has been supported by several researchers (Brady & Moats, 1997; Moats, 1999; Spear-Swerling & Sternberg, 2000). Therefore, Brady et al. (2009), Moats,(1994); Spear-Swerling and Brucker (2003, 2004) and Spear-Swerling, Brucker, and Alfano (2005) all measured teachers' knowledge of syllable types. In Spear-Swerling and Brucker (2003, 2004) the researchers noticed in both studies, through error anlaysis, that preservice teachers prior to a university coursework based intervention would classify words as being a "*vowel –r*" syllable type although the given word did not contain an "*r*". However, the researchers noted that at post-test participants did not demonstrate such errors. In Spear-Swerling et al. (2005) participants were able to correctly classify words that contained the "*silent-e*" and "*consonant-le*" syllable types but had great difficulty with words that contained the "*vowel-pair*" type. And Spear-Swerling (2009) reported that findings for knowledge of syllable types with a different group of preservice teachers were similar to those in previous published studies (Spear-Swerling & Brucker, 2003, 2004).

Lastly, in a series of studies with education students, both at the undergraduate and graduate levels, Spear-Swerling and colleagues (Spear-Swerling & Brucker, 2003; Spear-Swerling & Brucker, 2004; Spear-Swerling, Brucker, & Alfano, 2005; Spear-Swerling, 2009) found that teachers' knowledge of phonetically regular and irregular words for reading was poor. In all of these studies, preservice teachers were asked to identify regular and irregular words for reading. Despite an intervention consisting of instruction focusing on word-structure and weekly tutoring of at-risk elementary aged readers, preservice teachers in Spear-Swerling and Brucker (2004) scored below ceiling on the irregular word task at both pre-test and post-test (though the intervention group did score significantly higher than the non-intervention group at post-test). Spear-Swerling et al. (2005) also reported preservice teachers, regardless of prior experience and preparation, scored below ceiling on the irregular and regular word task. In a study with inservice teachers, Cunningham et al. (2004) also measured teachers' ability to recognize common irregular words. Eleven percent of the 722 teachers were able to identify all 11 irregular words and nearly 60% were able to identify the most common irregular words. Interestingly enough the most difficult irregular words for teachers to identify were "*have*", "*pint*" and *"give*".

Morphology. Thirteen studies measured teachers' knowledge of morphology. However, only six (Joshi, Binks, Hougen, Dalhgren et al., 2009; Moats, 1994; Moats & Lyon, 1996; Moats & Foorman, 2003; Spear-Swerling, 2009; Spear-Swerling et al., 2005) of the thirteen studies provided detail about teachers' demonstrated knowledge on morphology items. Morphology, however, proved to be the most difficult language

concept for teachers. In the earliest study to measure teachers' knowledge of and skill related to morphology, Moats (1994) found that only 27% of the participants were able to identify morphemes in "transparent" words and despite the important role morphology can play in helping children read multisyllabic words, many teachers commented that they had "never been asked to analyze words at this level" (p. 92). Moats and Lyon (1996) reported similar findings with regard to teachers' knowledge of and experience with morphology. In a later study, Moats and Foorman (2003) found that second and third grade teachers had great difficulty with inflectional endings that had more than one pronunciation such as *–s* and *–ed*. Spear-Swerling et al. (2005) and Spear-Swerling (2009) both measured preservice teachers' knowledge and perceptions of morpheme awareness. In both studies, preservice teachers, regardless of reported prior preparation and experience, rated their perceived morpheme awareness the lowest of the five measured basic language concepts related to reading instruction. Additionally, preservice teachers in both studies demonstrated low scores for morpheme counting (with a mean percentage correct at ~45%). In Joshi, Binks, Hougen, Dalhgren et al. (2009), teacher educators had great difficulty counting morphemes in five words: *heaven* (40% correctly counted), *observer* (26% correctly counted), *teacher* (48% correctly counted), *frogs* (29% correctly counted), and *spinster* (19% correctly counted).

The Effect of Intervention on Teacher Knowledge. Eleven of the studies reviewed incorporated an intervention aimed at exposing inservice and preservice teachers to knowledge needed to teach struggling readers and provide opportunities for guided practice. Four studies focused on identifying the effect of university coursework for

preservice reading teachers (Al Otaiba & Lake, 2007; Spear-Swerling, 2009; Spear-Swerling & Brucker, 2003, 2004), whereas seven studies integrated a professional development program (PD) for inservice teachers (Bos, Mather, Friedman Narr, & Babur, 1999; Brady et al., 2009; Foorman & Moats, 2004; McCutchen, Green, & Abbot, 2009; McCutchen & Berninger, 1999; McCutchen, Abbot et al., 2002; Podhajski et al., 2009). Table 4 displays a summary of each intervention study with regard to type of intervention, the sample used in the study, the measure used to abstract and compare teacher knowledge and the effect size (either reported or calculated based on reported information). As the table provides information regarding each study only a few will be summarized.

Spear-Swerling and Brucker (2003) measured teacher education students' knowledge about word structure and the improvements made in their knowledge as a result of instruction as well as the effect of prior preparation (number of reading classes and literacy-related training) and teaching experience (tutoring, teacher's aide, etc…). The intervention included six classroom hours of word structure instruction. The researchers found that participants with prior preparation performed better on two out of three pretest tasks than those students who had no prior preparation. However, the one task that neither did well on was the graphophonemic segmentation task; most participants appeared to be confused on what constitutes a phoneme.

Table 4

Description of all Intervention Studies Aimed at Increasing Teachers' Knowledge of Basic Language Concepts

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Bos, Mather, Friedman Narr, & Babur (1999)	Intervention: Project RIME – a Year long professional development (PD) with 2 ½ weeks of PD prior to school and then on-going teacher collaboration once a month (with researchers) Purpose of intervention: to increase teacher knowledge of basic language concepts. Sample: 11 (k-3) teachers in PD; 17 (k-3) teachers in comparison group Measure: *The Knowledge Assessment: Structure of Language* (adapted from Lerner, 1997; Moats, 1994; Rath, 1994) (Cronbach's α = .83)	Effect Size: Cohen's $d = 1.37$ Teacher knowledge post-intervention scores for both intervention and comparison group. Means and standard deviations reported: INT group ($M = 19.18$, $SD = 2.9$) COMP group ($M = 15.12$, $SD = 3.02$)
McCutchen & Bernnger (1999)	Intervention: 2-week summer institute for teachers with three 1-day follow up sessions throughout the year. Purpose of intervention: to increase teacher knowledge of basic language concepts based on recommendations by Brady and Moats (1997)	Effect Size: Cohen's $d = 1.95_a$ Teacher knowledge scores pre- and post- intervention t-value reported: $t(40) = 6.19$, $p < .001$

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
McCutchen & Bernnger (1999), continued	Sample: 59 volunteer teachers: 24 – K; 27 – 1st & 2nd; 8 – SPED. A comparison group is noted, but a number of not given. Measure: *Informal Survey of Linguistic Knowledge* (Moats, 1994) (no reliability reported)	
McCutchen, Abbott, et al. (2002)	Intervention: 2-week summer institute for teachers with 3 follow-up visits in November, February, and May from research team to provide consolation. Purpose of intervention: to increase teacher knowledge of basic language concepts based on recommendations by Brady and Moats (1997). Sample: 44 Kindergarten and 1st grade teachers (24 in experimental group & 20 in the control group) Measure: *Informal Survey of Linguistic Knowledge* (Moats, 1994) (Cronbach's α = .84 for Kindergarten teachers & Cronbach's α = .79 for 1st grade teachers)	Effect Size: Cohen's d = 0.60 Teacher knowledge post-intervention scores for both intervention and control group. Means and standard deviations reported: INT group (M = 53.6, SD = 10.8) CONT group (M = 46.6, SD = 12.3)

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Spear-Swerling & Brucker (2003)	Intervention: 2 weeks of word-structure instruction in the context of a university-based preparation program for special educators. Day intervention group received four sessions of 1 and ½ hours each. Evening intervention group - two sessions of three hours each. Purpose of intervention: to increase teacher education students' knowledge of word structure. Sample: 77 teacher education students 3 groups: day intervention group (n=17 – mostly undergrad); evening intervention group (n=31 – mostly grad); comparison group (n=29 - split) Measure: *Test of Word-structure Knowledge*. Consisted of 3 tasks: (1) grapho-phonemic segmentation task (Cronbach's α = .775 for phoneme counting & .781 for phoneme segmentation); (2) syllable types task (Cronbach's α = .768); and (3) irregular word task (Cronbach's α = .630	Effect Size: Cohen's $d = 0.83$ Teacher knowledge pre- and post-intervention scores for both intervention and comparison groups. F-score reported for pre- and post-test scores based on instructional group: $F(6, 138) = 12.03$, $p < .001$

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Foorman & Moats (2004)	Intervention: Professional development at 2 sites Washington D.C.: PD lasted 4 workshop days with stipends for completing PD courses (2-3 credits each year), literacy coaches, and consultants. Houston: PD 4 workshop days delivered by master teachers (PA, phonics, spelling, vocabulary, comprehension, & writing) Purpose of intervention: to increase teacher knowledge of basic language concepts. Sample: 48 Kindergarten-4th grade teachers in D.C.; 38 Kindergarten-4th grade teachers in Houston Measure: *Teacher Knowledge Survey* (no reliability reported)	Effect Size: Between Groups at post-intervention: Cohen's *d* = -0.28 Teacher knowledge post-intervention scores for both D.C. and Houston groups. Means and standard deviations reported: D.C. group (post-test *M* = 15.18, *SD* = 2.79) Houston group (post-test *M* = 14.13, *SD* = 3.45)

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Spear-Swerling & Brucker (2004)	Intervention: 2 weeks of word-structure instruction in the context of a university-based preparation program for special educators. Two groups received 6 hours of university based classroom instruction and 1 group did not. Purpose: to increase teacher education students' knowledge of word structure (i.e., basic language concepts) and to promote the transfer of learned knowledge to elementary aged tutees. Sample: 128 novice teachers from SPED certification program 3 groups: intervention & tutoring group (n=37); intervention only group (n=43) comparison group (n=48) Measure: *Test of Word-structure Knowledge*. Consisted of 3 tasks: (1) grapho-phonemic segmentation task (Cronbach's α = .78); (2) syllable types task (Cronbach's α = .77); and (3) irregular word task (Cronbach's α = .63)	Effect Size: Cohen's $d = 0.92$ Teacher knowledge pre- and post-intervention scores for intervention and comparison groups. F-score reported for pre- and post-test scores based on instructional group: $F(2, 119) = 24.994$, $p < .001$

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Al Otaiba & Lake (2007)	Intervention: Semester long undergraduate reading methods course for preservice teachers aimed at teaching evidence-based practices (as delineated by the National Reading Panel), assessment, and monitoring of student progress. Purpose of intervention: to increase preservice teacher knowledge of basic language concepts related to evidence-based reading instruction. Sample: 18 preservice teachers (all participated in tutoring at-risk 2nd grade students) Measure: *The Teacher Knowledge Assessment: Structure of Language* (Mather, Bos, & Babur, 2001) (Cronbach's α = .83)	Effect Size: Cohen's $d = 2.58_b$ Teacher knowledge scores pre- and post- intervention
Brady et al. (2009)	Intervention: Project MRIn: a professional development for inservice teachers consisting of 2-day summer institute; monthly workshops, and weekly in-class mentoring Purpose of intervention: to increase teacher knowledge of basic language concepts.	Effect Size: $\eta^2 = 0.88_c$ Teacher knowledge scores pre- and post- intervention

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Brady et al. (2009), continued	Sample: 65 first grade teachers from 38 different low-income schools in Connecticut Measure: *Teacher Knowledge Survey* (pre-test: Cronbach's α = .63; post-test: Cronbach's α = .81)	
McCutchen, Green, Abbott, & Sanders (2009)	Intervention: 10-day long professional development for inservice teachers teaching grades 3-5 with 3 follow-up workshops. Purpose of intervention: to increase teacher knowledge of basic language concepts as well knowledge of strategies to support comprehension and composition. Sample: 30 teachers from 17 schools Pacific NW (16 = intervention, 14 = control) Measure: Alternate forms of the *Informal Survey of Linguistic Knowledge* (Moats, 1994) (Cronbach's α ranged from .70 to .84)	Effect Size: Cohen's $d = 0.50_d$ Teacher knowledge scores pre- and post- intervention

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Podhajski, Mather, Nathan, & Sammons (2009)	Intervention: Project TIME: a 35 hour professional development course for inservice teachers designed to share evidence-based practices in reading assessment and intervention. A year-long mentorship is also part of the intervention (30 minutes once a month for 10 months). Purpose of intervention: to increase teacher knowledge of basic language concepts specifically phonology and phonics. Sample: 6 teachers: *Experimental teachers:* 2 - 1st grade, 1 – 1st/2nd grade; *Control teachers*: 1 – 1st grade, 1 – 2nd grade, 1 – 1st/2nd grade Measure: *The Survey of Teacher Knowledge* (adapted from Lerner, 1997; Moats, 1994; Rath, 1994) (no reliability reported)	Effect Sizes: Intervention teachers: Cohen's $d = -15.33_e$ Control teachers: Cohen's $d = -4.89$ Intervention teachers pre- and post-test scores t-value reported for Intervention teachers: $t(3) = -13.28$, $p = .001$ Control teachers pre-and post-test scores t-value reported for Control teachers: $t(2) = -3.46$, $p = .074$

Table 4, continued

Study *(in chronological order)*	**Description of Study**	**Effect Size(s)**
Spear-Swerling (2009)	Intervention: 3-hour credit Language Arts based course for undergraduate and graduate level students; texts for the course included *CORE Teaching Reading Sourcebook* Purpose of intervention: to increase teacher education students' knowledge of word structure (i.e., basic language concepts) and to promote the transfer of learned knowledge to elementary aged tutees. Sample: 45 teacher candidates (16 = graduate; 29 = undergraduate) Measure: *Test of Word-structure Knowledge*. **Consisted of 5 tasks**: (1) grapho-phonemic segmentation task (Cronbach's $\alpha = .78$); (2) syllable types task (Cronbach's $\alpha = .77$); (3) irregular word task (Cronbach's $\alpha = .63$); (4) morpheme segmentation (Cronbach's $\alpha = .64$); and (5) General knowledge about reading (Cronbach's $\alpha = .96$)	Effect Sizes: (1) G-P task: $\eta^2 = 0.56_f$ (2) ST task: $\eta^2 = 0.82$ (3) IR task: $\eta^2 = 0.53$ (4) M-S task: $\eta^2 = 0.61$ (5) G-K task: $\eta^2 = 0.69$ Teacher knowledge scores pre- and post- intervention on the five tasks

Table 4, continued

Note. [a] Only teachers involved in the intervention were surveyed in the post-test, therefore a paired t-test value was used to compute the effect size. [b] Effect size is reported as it was published in Al Otaiba and Lake (2007). [c] Effect size is reported as it was published in Brady et al. (2009). A multivariate analysis of variance (MANOVA) was calculated by Brady et al. on the total pre-and post-test scores and pre-and post-test scores for four subtests on the *Teacher Knowledge Survey*. [d] Effect size is reported as it was published in McCutchen et al. (1999). Only pre-and post-test scores for intervention scores were used to calculate Cohen's d. [e] Podhajski et al. (in press) reported two separate paired t-test values: one for the intervention group and one for the control group. Therefore, the reported t-values were used to compute effect sizes for each group. [f] Effect sizes are reported as published in Spear-Swerling (2009). A MANOVA was calculated by Spear-Swerling (2009) on the pre-and post-test scores for the five subtests of the *Test of Word-structure Knowledge.*

And none of the participants performed at a high level on the pre-test on any tasks and only a few performed at a high level on any task in the post-test. Spear-Swerling and Brucker concluded that six hours of classroom instruction was beneficial but not enough for preservice teachers to have the knowledge and skills needed to teach struggling readers.

Al Otaiba and Lake (2007), Spear-Swerling (2009), and Spear-Swerling and Brucker (2004) all examined the effect of university coursework aimed at increasing knowledge of basic language concepts on both preservice teachers' knowledge and student performance within the context of tutoring. Spear-Swerling and Brucker (2004) implemented six hours of university based word-structure instruction with two of three groups of preservice teachers. One group received instruction and tutored elementary aged struggling readers, one group received instruction only, and the third group did not receive instruction or tutor. A statistically significant effect for instructional group was found. Therefore, preservice teachers engaged in word structure instruction did

significantly better on segmenting and counting phonemes, labeling syllable types, and identifying irregular words for reading on post-test scores than preservice teachers who did not received word-structure instruction. Additionally, tutees of the preservice teachers showed the most growth in many of the areas the preservice teachers demonstrated increased and accurate knowledge on the post-test. In a study published five years later, Spear-Swerling (2009) reported very similar results to Spear-Swerling and Brucker (2004). Al Otaiba and Lake (2007) also found that preservice teachers made significant growth on scores of teacher knowledge after a semester long course in reading methods while tutoring struggling readers weekly. Although the preservice teachers' tutees did not demonstrate significant reading growth on measures of word identification, word attack and comprehension, the tutees' fluency scores, on average, did significantly improved.

For research with inservice teachers, Bos et al. (1999) studied the knowledge base of 11 K-3 general and special education teachers involved in an interactive, collaborative, a year-long PD and compared their performance to a group of 17 K-3 teachers who did not participate in the PD. The goals of the PD were to provide teachers with opportunities to "gain knowledge and understanding of how the English language is constructed and how speech sounds relate to print" (p. 228). Bos and colleagues found that teachers involved in the PD benefited from the program with a statistically significant difference in teacher knowledge and attitude (toward explicit instruction) scores from pre-PD to post-PD compared to the group that did not participate in the PD. Students of PD teachers made statistically significant gains in letter –sound identification

(kindergarteners), reading fluency (second graders), spelling (kindergarteners and first graders) and dictation (kindergarteners, first graders, and second graders).

McCutchen and Berninger (1999) also implemented a year-long professional development but focused the core curriculum of the intervention on the components mentioned in Brady and Moats' (1997) and provided teachers with research-based reading instructional techniques. *The Informal Linguistic Survey* by Moats (1994) was used to measure teacher knowledge (pre-/post-PD). Pre-PD tests revealed that teachers' knowledge of linguistic constructs was relatively low compared to their knowledge of children's literature, yet scores on the post-PD tests were statistically significantly different. From observation data, PD teachers were engaged in more instruction directed toward the alphabetic principle than non-PD teachers. Students who had PD teachers showed more growth than their peers in non-PD classrooms in the following: Kindergarten - PA and orthographic fluency; first grade –PA, word reading, comprehension, spelling, composition fluency; second grade – composition fluency. McCutchen, Abbott et al. (2002) reported very similar findings to McCutchen and Berninger (1999) in that teachers involved in the professional development intervention scored statistically significantly higher on the post-test survey than the teachers who did not participate in the intervention.

Brady et al. (2009) also found that teachers who had participated in a year-long professional development program consisting of summer institutes, monthly meetings, and in-class mentoring by trained researchers scored statistically significantly higher on a post-intervention measure of teacher knowledge. Additionally, teachers scored

significantly higher on all four subtests of the teacher knowledge measure (phonemic awareness, code-based items [phonics related], fluency, and oral language) with fairly consistent effect sizes.

Teacher Knowledge and Student Reading Achievement. Just over a half of the studies reviewed, 14 in total, measured the effect of teacher knowledge on student reading achievement. In the context of a four-year, longitudinal study in two high-poverty, low-performing populations of students, Foorman and Moats (2004) examined the association of teacher knowledge, in the context of a professional development, on student reading outcomes (as measured by the Woodcock Johnson Basic Reading and Broad Reading). Teachers were given knowledge assessments, adapted from Moats (1994), before and after the professional development and were also observed during classroom reading instruction. Observations were used to measure teacher competence-which was based on the amount of explicit decoding instruction witnessed. Small, yet significant correlations were found among teachers' knowledge, competence, and student reading outcomes. Regression analysis was used to examine the extent to which variables (post professional development teacher knowledge scores, teacher competence, and population location) helped explain variance in student reading outcomes. A main effect was found for teacher knowledge scores on Broad Reading and a weak but significant interaction effect was found for teacher knowledge and site (one site received a greater number of professional development sessions – thus there were many post-PD scores at ceiling). Teacher competence also was small but significantly associated with Basic and Broad Reading scores.

McCutchen et al. (2009) found, using hierarchal linear models, that teachers' linguistic knowledge - as measured by the *Informal Survey of Linguistic Knowledge* (Moats, 1994) - uniquely predicted lower-performing end-of-year scores on measures of vocabulary, narrative composition, spelling, and word attack skills. Additionally, lower-performing students who had teachers with greater linguistic knowledge, specified as one standard deviation above the group mean on the survey, had approximately a nine point advantage on the vocabulary measure than students who had teachers who scored closer to the group mean on the survey. Piasta et al. (2009) also used hierarchal-linear modeling to examine the effect of teacher knowledge on student growth in word-reading. Though teacher knowledge alone did not have a significant effect on student word-reading gains, a significant interaction effect for teacher knowledge and number of observations of explicit decoding instruction was found. Thus, students who had teachers who were both knowledgeable and devoted more time to explicit decoding instruction made significantly higher gains in word reading. Another interesting finding was that students of teachers who were less knowledgeable but who spent greater amounts of time in explicit instruction actually had weaker decoding skills than their peers with more knowledgeable teachers.

With outcomes differing from the previously summarized studies, Carlisle et al. (2009), in the context of a large-scale study involving first-third grade teachers and students involved in Michigan's Reading First Initiative, examined the contribution of teacher knowledge on first and third grade students' word analysis and reading comprehension using hierarchal linear modeling. In the data analysis students' socio-

demographics and prior reading achievement was controlled for along with teachers' professional and personal characteristics – as defined by teachers' knowledge, race, background, and training. Teachers were coded as having low, medium, and high knowledge based on performance on the teacher knowledge measure, *Language and Reading Concepts*. No statistically significant effect was found for teacher knowledge for either word analysis or reading comprehension scores for students in 1st or 2nd grade, however, a marginally significant effect of teacher knowledge was found for 3rd graders reading comprehension. Therefore, students who had teachers classified as being "highly knowledgeable" had slightly higher scores, on average, on the measure of reading comprehension than students who had teachers who had "medium" or "low" knowledge.

Conclusions

This review adds to the fields of literacy and teacher knowledge research in two ways. First, this paper provides a systematic synthesis of all studies found to measure teacher knowledge of basic language or linguistic concepts related to reading; as to date there are no published systematic reviews or meta-analyses on this topic. Second, each study was analyzed for methodological quality. Therefore, this review differs from a traditional review where the findings are summarized but characteristics and issues dealing with internal and external validity are often not systematically analyzed and presented. More specifically, summarized findings concerning methodological quality can potentially help researchers avoid potential threats to validity in future research studies.

As with other studies, this review too has specific limitations that the reader must be made aware. Though the instrument used to abstract and rate information concerning internal and external validity was designed with published guidelines (Petticrew & Roberts, 2006; Torgersen, 2003) and with the help of senior researchers, it was not tested for validity. Additionally, this review was done by one individual. Therefore, it would be wise to have the abstraction form assessed for inter-rater reliability. Also, this review only included studies that were published in peer-reviewed journals; therefore as Torgersen (2003) warned, publication bias was likely influential in the present review.

Twenty-five studies were found to fit all inclusion and exclusion criteria and were published between the years of 1990 and 2009. There appears to be two main methodological flaws present in the majority of the studies that hamper any conclusive findings. First, the majority of studies did not include important population information. Because the population of teachers, preservice teachers, and/or teacher educators was not explicitly described generalizability of the particular findings is difficult and is likely only to be representative of that sample. This is particularly worrisome in intervention studies where professional development or university coursework was used as a means to increase teacher knowledge. Though researchers may have reported a statistically significant increase in teacher knowledge post intervention, it is still important to ask: Can public school administrators, teacher educators, etc. make a sound judgment that such an intervention will be beneficial with their population if they are unaware of the researched population? Additionally, convenience sampling was the sampling technique used by 92% of the studies, which also makes generalizability quite difficult, as it is non-

probability sampling. Because of methodological flaws such as convenience sampling and omitting population description, it is impossible to gleam a clear picture of what teachers in the United States at the elementary level or those who are in preparation for such a role know about concepts such as phonological awareness, phonics, and morphology from the present review. However, with the findings from this review future researchers can design studies to include a representative and random sample to possibly help fill this gap in literacy and teacher knowledge research.

With regard to the summary of findings, four clear results emerged from the body of reviewed work, though because of less-rigorous sampling methods, results must be interpreted with caution. First, teachers, preservice teachers, and teacher educators tend to have more success with implicit skill items such as syllable counting. However, as syllable counting is recognized as one of the easier phonological skills (Liberman, Shankweiler, Fisher, & Carter, 1974), this finding is not necessarily unexpected. It was somewhat surprising the majority of teachers had difficulty with concepts and skills pertaining to phonemic awareness, such as correctly identifying the definition of phonemic awareness and counting phonemes, as there is a great deal of research that has been made public concerning the benefit of phonemic awareness training for beginning and struggling readers. Second, teachers, in general, did not demonstrate accurate knowledge and skill in the concepts of alphabetic principle/phonics and morphology. Teachers' knowledge of terminology associated with phonics instruction as well as their knowledge of phonics principles' - even those found to be most reliable - was quite poor. One possible reason could be teachers' own instructional orientations toward reading. In

the past, phonics instruction has been highly debated among many in the education realm. Additionally, how to effectively and systematically teach letter-sound correspondences has often been misconstrued and misunderstood by the education community at large (Moats, 2007). Therefore, teachers' knowledge could have been influenced by such popular thought. However, as a result of possible resistance to phonics instruction, access to such knowledge could also be limited in preparation programs and in school districts - despite national policy and initiatives. On the other hand, it is not all together surprising that teachers' had difficulty with concepts and skills related to etymology and morphology. As Joshi, Binks, Hougen, Dahlgren et al. (2009) reported, even teacher educators had difficulty counting morphemes in given words. Therefore, as Joshi, Binks, Hougen, Graham et al. (2009) have hypothesized, it is unlikely that teachers and/or preservice teachers cannot be expected to know and/or learn what those teaching them do not know themselves. Third, teacher knowledge of basic language concepts can be increased via more intense and collaborative professional development. Studies that reported not only statistically significant findings but fairly impressive effect sizes were those in which the professional development incorporated both instruction and modeling but also collaborative feedback and mentoring. However, it is important to take each study's methodological quality and design into consideration when interpreting the findings from intervention studies. Fourth and final, teacher knowledge of basic language concepts does seem to be a significant factor in student reading performance. However, as found in a large scale and more rigorous study (Piasta et al. 2009) teacher knowledge alone did not affect student reading progress, but

rather teacher knowledge paired with the amount of time spent in explicit decoding instruction. In conclusion, it seems logical to suggest and recommend that future investigators of teacher knowledge of basic language concepts take into account some of the details found in the more rigorous studies synthesized in this paper when designing their research studies.

CHAPTER III

PRESERVICE TEACHER KNOWLEDGE

Recent scores from the National Assessment of Educational Progress (NAEP) indicate only 38% of children in the fourth grade read at the proficient level and in many low income urban school districts around 70 % of fourth grade students read at a basic level (NCES, 2007). Twenty-seven percent of the nation's eighth graders read at the proficient level and 2 % at the advanced level (NCES, 2007). Moreover, in a series of statements made before the Commission of Education and the Workforce, Lyon (2001) reported some consequences due to reading failure:

- By middle school, children who read well can read at least 10,000,000 words during the school year and children who struggle with reading read only 100,000 words during the school year (one percent of what good readers can read).
- Over 75 percent of students who drop out (ten to 15 percent) will report difficulties in reading.
- Two percent of students receiving special or compensatory education for difficulties learning to read will complete a four-year college program.
- At least half of young adults with criminal records have reading difficulties, and in some states the size of prisons a decade in the future is predicted by fourth grade reading failure rates.
- Half of the children and adolescents with a history of substance abuse have reading problems.

- 20 million school aged children have experienced reading failure and only 2.3 million have received special education services for reading failure.

Thus, it is not surprising the National Institute of Child Health and Human Development (NICHD) declared reading failure to be a national public health issue (Lyon, 2001). Additionally, over 6% of school-aged children qualify for special education with 80% receiving services specifically for reading (NCES, 2006). Furthermore, it is likely that children who struggle with basic reading skills and concepts in first grade will continue to struggle beyond fourth grade (Juel, 1988). As societal literacy demands increase (Braunger & Lewis, 2005; Leu, Castek, Henry, Coiro, & McMullan, 2004; Neuman, 2001; Snow, Burns, & Griffin, 1998), the abovementioned statistical information is troubling and problematic.

Evidence to Solve the Problem

In 1997, the US Congress organized a panel to "assess the status of research-based knowledge, including the effectiveness of various approaches to teaching children to read" (National Reading Panel, NRP, [NICHD], 2000, p. 1). The National Reading Panel (NRP), building upon the previous work of the National Research Council, concluded, after a two-year meta-analysis of reading research, that all children can benefit from explicit, systematic and sequential instruction in the areas of (1) phonemic awareness, (2) phonics, (3) fluency, (4) vocabulary, and (5) text comprehension strategies. The executive summary stated the following:

> …effective reading instruction includes teaching children to break apart and manipulate the sounds in words (phonemic awareness), teaching them that

these sounds are represented by letters of the alphabet which can then be blended together to form words (phonics), having them practice what they have learned by reading aloud with guidance and feedback (guided oral reading), and applying reading comprehension strategies to guide and improve reading comprehension. (p. 2)

In addition to a solid framework for reading instruction, studies have recognized early identification and intervention as key factors in children's later reading success (Torgesen et al., 1999; Vellutino et al., 1996). Also, it has been argued that knowledgeable teachers of reading, particularly those influential in early grades, have the potential to prevent reading failure with effective instruction (Moats, 1994; Taylor, Pearson, Clark, & Walpole, 1999; Snow et al., 1998). The National Research Council concluded that "quality classroom instruction in kindergarten and the primary grades is the single best weapon against reading failure" (Snow et al., 1998, p. 343), yet they also argued that poor classroom instruction is a significant reason for reading difficulties. Taylor et al. (1999) purported in their report for the Center for Improvement of Early Reading Achievement (CIERA) that effective reading teachers were able to beat literacy odds such as students with poor previous literacy exposure and poverty status with good instruction. Additionally, Neuman (2001) supported the notion of providing high quality literacy instruction early and consistently, particularly for "high risk children", as possibly being: "the deciding factor between success or failure that will follow them all their lives" (p. 474). In summary and according to Snow et al. (1998; 2005), effective reading teachers are able to implement instruction that is research based, identify

struggling readers, and differentiate instruction depending on individual students' needs. Therefore, teachers need to have a solid understanding of basic components of the English language (Brady & Moats, 1997; Moats, 1994), comprehension of the complete reading process (Braunger & Lewis, 2005; Snow et al., 2005), and an understanding of the nature of reading difficulties such as dyslexia (Brady & Moats, 1997; Pollock & Waller, 1997; Snow et al., 1998).

Hence a growing amount of attention has been given to teacher quality (Cirino, Pollard-Durodola, Foorman, Colson, & Francis, 2007; Taylor et al., 1999), teacher knowledge (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Cunningham, Perry, Stanovich, & Stanovich, 2004; Moats, 1994; Spear-Swerling & Brucker, 2003), and teacher preparation programs (Darling-Hammond, 2000; Joshi, Binks, Graham et al., 2009; Walsh, Glaser, & Wilcox, 2006). Many of the abovementioned studies have focused investigations on understanding the knowledge base of elementary reading preservice and inservice teachers (i.e., basic language concepts related to literacy) as well as perceptions of knowledge and skill, instructional philosophies, and teaching ability. The present study has a similar aim and continues to ask the question whether or not preservice teachers are receiving instruction geared toward an explicit understanding of basic language concepts such as phonology, phonics, and morphology, which is needed to teach struggling readers. And, how do preservice teachers perceive their ability to teach such basic language concepts? And lastly, what do they know about dyslexia? Though these questions are difficult to answer and generalize with the findings from one study, it is reasonable to pursue investigation. Therefore, the purpose of the

present study was to examine preservice teacher knowledge of basic language concepts, perceived teaching ability of basic language concepts, and knowledge of dyslexia. The following sections will focus on the knowledge needed to teach reading and the knowledge needed to understand struggling readers, specifically children with dyslexia.

Knowledge Needed to Teach Struggling Readers

Many (Cunningham, Zibulsky, Stanovich, & Stanovich, 2009; Moats & Foorman, 2003; Stanovich, 2000) believe that the findings of the NRP, along with other various research reports (Adams, 1990; Braunger & Lewis, 2005; Snow, 2002; Taylor et al., 1999), have substantial implications for teacher knowledge and consequently teacher preparation and professional development. Moats (2004) proposed that teachers who teach reading need to understand the phonological structure of words (e.g., understanding that the word 'cat' is made up of three individual sounds or phonemes: /c/ /a/ /t/) and how to direct students' attention to the contrasts in speech-sound sequences. This is extremely important because one of the major problems of students who experience reading difficulty is insufficient phoneme awareness, or the ability to detect and/or manipulate individual spoken sounds (phonemes) in spoken words (Brady & Moats, 1997). Moats (2004) added that teachers who know and understand phonemes and their distinction from letters (graphemes) and letter names are more capable of demonstrating this knowledge in their classrooms than teachers who do not have such understanding. More recently, Brady et al. (2009) provided a comprehensive list of needed teacher knowledge related to the concepts of phoneme awareness:

> (a) What the speech sounds of English are; (b) how phonological awareness develops and the characteristics of advanced levels of phoneme awareness; (c) what kinds of activities foster development; (d) what speech sounds are easier for children to segment and identify, as well as which are harder and why; (e) what constitutes an adequate level of phoneme awareness for literacy purposes; and (f) how weaknesses in phoneme awareness are evident in reading and spelling errors.

Additionally, Moats (2009) purported that if systematic phonics instruction is a necessary component of early reading instruction, it is vital that teachers have an understanding of phoneme/grapheme (sound/symbol) correspondences; particularly because English does not share the one-to-one phoneme/grapheme correspondence that other languages do (e.g., Finnish, Spanish). Additionally, as Spear-Swerling and Brucker (2003) commented "many common words in English are irregular (i.e., they violate typical spelling-sound correspondences and phonic principles)" (p. 76), it is important that teachers are able to identify irregular words so that such words are not used as teaching examples and instruction of such words in reading and spelling is appropriate. Snow et al. (2005) further noted support for teacher knowledge of orthography and morphology by stating: "to move beyond the basic limitations of phonics instruction, teachers must be able to appreciate and explain the morphemic structure of words" (p. 81). Wong-Fillmore and Snow (2000) also extended the notion of teaching basic language concepts to pre-service teachers, particularly to those involved in teaching early literacy skills. They contended that teachers must know that

spoken language is made up of units of different sizes, including the phoneme (smallest unit of sound), the morpheme (smallest unit of distinct meaning), words, sentences, and discourses. The National Research Council (Snow et al., 1998) supported all of the above arguments by acknowledging excellent reading instruction in the primary grades to be that which is administered by highly knowledgeable and well prepared teachers.

Knowledge Needed to Understand Struggling Readers

For many children who experience reading difficulty in the early grades (K-3), problems exist at the word level (Scarborough, 2003; Siegal, 2004). Difficulty with word recognition is thought to be a result of difficulty with the alphabetic principle (Liberman, Shankweiler, & Liberman, 1989; Liberman & Liberman, 1990; Snow et al., 1998). Children who do not posses good word recognition skills will read slowly and/or inaccurately which is likely to result in poor text comprehension (Lyon, Shaywitz, & Shaywitz, 2003). As children move beyond the early grades (K-3) reading is ideally used as a means of acquiring new learning (Chall, 1983). However, without solid initial decoding instruction children are likely to fall behind their typically-developing peers and as mentioned earlier the consequences are grim.

Some children experience reading difficulty that is neurological in origin (Velluntino, Fletcher, Snowling, & Scanlon, 2004). These children are referred to as having a specific learning disability called dyslexia. Dyslexia is often misunderstood and educators may have attributed the cause of dyslexia to a visual perception deficit (Allington, 1982; Hudson, High, & Al Otaiba, 2007; Wadlington & Wadlington, 2005). However, dyslexia is a language based specific learning disability (IDA, 2007; Lyon et

al., 2003) which is characterized by poor phonological processing. Children with dyslexia generally have good listening comprehension, but tend to struggle with accurate and fluent single word reading, usually due to poor phonological processing (Adams, 1990; IDA 2007; Lyon, 1998; Lyon et al., 2003; Spear-Swerling & Sternberg, 2001). Because these struggling readers have difficulty with phonological awareness tasks (Adams, 1990; Moats, 1994), or tasks that require them to detect the sound structure of words they tend to have a weak foundation for learning an alphabetic writing system (Liberman et al., 1989), the process of decoding and instant word recognition is difficult.

Though children do not outgrow dyslexia, it is a "highly treatable" condition (Sanders, 2001, p. 54). Thus, children who are identified early and receive appropriate classroom and individualized instruction fare better than children who are not identified, are identified later (in adolescence), and/or who receive poor classroom instruction (Sanders, 2001). Brady and Moats (1997) purported that children with dyslexia (as well as all children) ought to receive direct, explicit, and systematic instruction in the structure of the English language, including phonology, orthography, morphology and text structure. Children with dyslexia are less likely to do well in classrooms in which the reading instruction is implicit rather than explicit (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Lyon, 1998). In addition, teachers also need to understand that dyslexia impacts children differently and some will need more intensive instruction than others (IDA, 2007). It is also important to note that dyslexia occurs in children of all intelligence levels, including children who are labeled gifted, thus, dyslexia is not due to intelligence level. Additionally, dyslexia is often found occurring

within families (IDA, 2007); therefore it is wise that teachers investigate familial reading histories.

Research of Teacher Knowledge Related to Reading Instruction

Clearly a conceptual base to support teacher knowledge of basic language concepts related to reading instruction and dyslexia exists. Thus, recently, teacher knowledge has been examined to understand what teachers of reading, both at the preservice and inservice levels, know about basic language components of reading (Moats, 1994; Moats & Foorman, 2003), children's literature (McCutchen, Harry et al., 2002), code-based and implicit means of teaching reading (Fielding-Barnsley & Purdie, 2005), teachers' understanding of the nature of dyslexia (Wadlington & Wadlington, 2005), teachers' perceived ability to teach certain components of reading (Bos et al., 2001; Cunningham et al., 2004) and the effect of professional development targeted at increasing teacher knowledge in reading concepts (Brady et al., 2009; Bos, Mather, Narr, & Babur, 1999; Joshi, Binks, Hougen, et al., 2009; McCutchen, Abbott et al., 2002; McCutchen & Berninger, 1999; McCutchen, Green, & Abbott,2009; Moats & Foorman, 2003; Podhajski, Mather, Nathan, & Sammons, 2009; Spear-Swerling & Brucker, 2003). In addition, other studies have examined content of teacher preparation programs (Joshi, Binks, Graham, et al. 2009; Walsh et al., 2006). Findings indicated preservice and inservice elementary school teachers lack essential knowledge needed to teach reading, especially to children with reading difficulties such as dyslexia. This increasing body of research may be considered controversial (in some circles), yet findings from studies of teacher knowledge have the potential to help post-secondary educators involved in

teacher preparation revise course content and teaching methods to maximize the likelihood of fostering knowledgeable and effective teachers who are prepared to teach all kinds of readers.

Moats (1994), in her early and well noted study, assessed 89 teachers (with an equal distribution of reading teachers, classroom teachers, special education teachers, speech-language pathologists classroom, teaching assistants and graduate students) to determine the specificity and depth of their knowledge of language elements, such as phonemes and morphemes, and how these elements are represented in writing, such as sound-symbol correspondence. Moats created a survey instrument titled *The Informal Survey of Linguistic Knowledge* (variations of the survey have been used in subsequent studies) which consisted of items that asked teachers to define terms, locate or give examples of phonic, syllabic, and morphemic units, and analyze words into speech sounds.

Results indicated a lack of teacher knowledge, specifically highlighting weaknesses in the areas of terminology, phonic knowledge, and phoneme and morpheme awareness, all of which are needed to effectively instruct struggling readers. Teachers were unaware of terminology associated with morphology, phonology, and phonics and were unable to distinguish between a *compound* and *affixed* word form. Though most had heard of *phonological awareness* they were unable to identify the number of phonemes in a word. Phonic knowledge was also weak with only 10 to 20 % of all subjects were able to consistently identify consonant blends in written words and very few were able to consistently identify a consonant digraph. Measures of phoneme and

morpheme awareness revealed that only 27 % of subjects were able to identify the number of morphemes in a word. Only 25 % knew that the word *ox* has 3 speech sounds. And some of the most common misconceptions were: (1) that the letters *ng* represent an amalgam of /n/ and /g/; (2) that the letter *x* corresponds to /z/; (3) that the silent letters in the words *comb* and *balk* should be pronounced; and (4) digraphs such as *th* represent a melting of two individuals phonemes rather than one unique phoneme.

This early study indicated that though teachers may be literate, experienced, and educated in a university setting they still may lack essential knowledge of language elements and structure that is needed to explicitly teach beginning readers as well as effectively assess and remediate struggling readers. Several research studies (Bos et al., 1999; Cunningham et al., 2004; Mather, Bos, & Babur, 2001; McCutchen & Berninger, 1999) have assessed teacher knowledge in the fashion in which Moats (1994) did and had similar results. However, because the purpose of this study is to examine preservice teacher knowledge, only studies that involved preservice teachers will be discussed below.

Bos et al. (2001) used two measures to collect data: a perceptions survey and a knowledge assessment. Two-hundred and fifty-two preservice and 286 inservice teachers (elementary: general and Special education) participated in the study. All were asked to rate their level of preparedness to teach reading, teach struggling readers, and use specific approaches to reading (phonological awareness/phonics, guided reading/reading recovery, and whole language). Additionally teachers completed a

knowledge assessment (which assessed phonological awareness and phonics) and a perceptions survey.

Results of the knowledge assessment indicated that preservice teachers scored just above 50 % on the knowledge assessment and inservice teachers scored close to 60 % on the knowledge assessment. For both groups, approximately 50 % of the participants were unable to identify deletion, segmentation, and blending tasks. As for the perceptions survey, both preservice and inservice teachers agreed with explicit code instruction and mildly agreed with implicit code instruction. However, all groups had scores falling below two-thirds correct indicating that general education teachers as well as special education teachers may not be adequately prepared to teach students with reading difficulties. The findings also suggested that "general education teachers may not be adequately prepared to instruct students with dyslexia and reading related problems" (Bos et al., 2001, p. 117).

Spear-Swerling and Brucker (2003) examined the affect of instruction of basic language concepts, specifically word structure, on teacher education students' knowledge. Two out of three groups of teacher education students, ninety students in all, received direct instruction in basic language concepts and the third group served as the comparison and did not receive any instruction. Additionally, one of the two instructional groups was involved in a supervised tutoring program. Prior preparation, such as certifications or specific training courses (e.g., Orton-Gillingham or Reading Recovery), and prior experience (e.g., tutoring, teacher's aide) were noted. To assess knowledge, a test of word-knowledge, which required students to: (1) segment words,

(2) classify pseudowords according to syllable type, and (3) detect irregular words, was administered twice (pre/post-test) with alternate forms. Results from the pre-test and post-test indicated that students with prior preparation outperformed those who did not on two of three tasks; however, prior experience was not a significant predictor. Though students with prior preparation scored significantly higher, neither groups' scores were very high, particularly on the detection of irregular words. Results from this study suggested that though students in instructional groups made gains, one instructional time period in word structure is not enough, instruction as well as opportunity to practice knowledge is needed beginning in preservice preparation and on-going through inservice professional development.

The Australian government, much like the US, has placed considerable attention on teacher quality and literacy instruction. Therefore, Fielding-Barnsley and Purdie (2005) examined preservice and inservice teacher knowledge of basic language skills (referred to as metalinguistic skills in this study) and teacher attitudes toward explicit reading instruction. Fielding-Barnsley and Purdie administered surveys (adapted from Moats, 1994) to 340 teachers in which 3 groups emerged: (1) final year preservice teachers (n = 93); (2) primary school inservice teachers (n = 209); and (3) special education teachers (n = 38). Participants could make a possible score of 10 on the metalinguisitics portion of the survey; results indicated the overall participant mean score was 6.12 (SD = 1.86). Knowledge of short vowels and syllable counting were two particular strengths for all 3 groups of teachers, however identifying phonemes and terms related to phonology were two considerable weakness. Scores on the attitude

survey indicated that teachers had positive attitudes toward both implicit and explicit means of reading instruction, with statistically significantly higher attitude toward explicit reading instruction. Interestingly enough there were no statistically significant differences among the three groups of teachers in knowledge or attitudes; though one might hypothesize that special educators might have more working knowledge of linguistics to work with struggling readers.

Research of Teacher Preparation Programs

As Lyon and Weiser (2009) point out, teachers are likely to first learn concepts related to reading instruction in their preparation programs, thus, the initial teacher preparation is indeed important. On a similar note, Darling-Hammond (2000) purported that novice teachers come to the classroom with little more than the knowledge and experience obtained in their preparation programs. However, reports from the National Commission on Teaching and America's Future (NCTAF) (2007) reported that novice teachers (teachers in their first year of teaching) in lower performing schools, which consequently have a higher number of students at-risk for reading failure, were less prepared than teachers at high performing schools. Additionally, evidence from recent studies indicates that university based preparation programs may not be teaching research-based reading practices.

In 2006, the National Council for Teacher Quality (NCTQ) published a study in which Walsh et al. examined syllabi content from courses focused on reading instruction for elementary aged children. Seventy-two university based preparation programs were randomly selected and only 11 (15%) were found to contain content aligned with the

findings of current scientific reading research. Additionally, Joshi, Binks, Graham, et al. (2009) found, in the context of a content analysis study of literacy-related textbooks used in teacher preparation programs, that the majority of such textbooks did not contain up-to-date scientific research on reading. Also, in a different study, Joshi, Binks, Hougen, et al. (2009) surveyed 78 university instructors to investigate their knowledge of basic language concepts including knowledge about phonology, phonics, morphology as well as knowledge associated with best instructional practices for comprehension. Findings indicated that instructors performed best on phonology-based items (such as syllable counting) but had more difficulty with phonics-based items (such as phoneme counting) and the most difficulty with morphology-based items (identifying affixes and roots). Knowledge of comprehension was only slightly higher than morphology. Furthermore, Joshi, Binks, Dean and Graham (2006), in a different but related study, demonstrated that university instructors who were active in a series of professional development sessions had more knowledgeable preservice teachers.

The Present Study

In the present research study, preservice teachers' (PSTs) knowledge of basic language concepts, perceived teaching ability of typically developing readers, struggling readers, phonemic awareness, alphabetic principle/phonics, and vocabulary as well as knowledge about dyslexia were examined. All participating PSTs were involved in a university based preparation program for early childhood to late elementary education (Kindergarten through 5th). To measure PSTs' knowledge of basic language concepts, perceived teaching ability, and knowledge of dyslexia a survey consisting of 39 items

refined from a former 52-item survey used by Joshi, Binks, Hougen, et al. (2009) was used, however certain items were not analyzed in the present study because the content of the item(s) was beyond the scope of the present study (e.g., items assessing knowledge about comprehension).

For the present study, three important terms are defined. First, "struggling readers" are defined as elementary-aged readers (in grades K-5) who experience unexpected reading difficulty resulting chiefly in inaccurate and/or slow word recognition. The term "struggling readers" has been specifically chosen, as opposed to more current phasing such as "striving reader" (Brozo & Simpson, 2007), not to reflect fixed ability but rather to parallel literature used to support the proposed studies. Next, basic language concepts, the main focus of assessment are defined in this study as the following elements of the English language: phonological, phonemics, alphabetic principle/phonics, and morphology (affixes, roots, base words, and derivatives). Phonological concepts are defined as a set of skills and explicit understanding of the different ways in which spoken language can be broken down and manipulated; phonemics is defined as the skills and knowledge related to the ability to notice, think about, or manipulate the individual sounds in words (phonemes); alphabetic principle/phonics will be defined as an understanding of how written letters are systematically and predictably linked to spoken sounds (phonemes) and an understanding of how to apply that knowledge for the purposes of decoding and reading; and morphology will be defined as an understanding of meaningful word parts (affixes, base words, derivatives) and their role in decoding and reading (NICHD, 2000).

Finally, dyslexia will be defined using the current definition from the International Dyslexia Association (IDA, 2007):

> Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (para. 1)

Specific examples of items will be reported in the "measures" section of this paper.

In summary, the questions posed for research included: What are the perceptions of preservice teachers concerning their ability to teach typically developing readers, struggling readers, teach phonemic awareness, phonics, and vocabulary? What do preservice teachers know about concepts related to phonology, phonemics, alphabetic principle/phonics, morphology, and dyslexia? What, if any, patterns exist in the data? Is preservice teacher knowledge related to perceived ability to teach such concepts? and Does preparation and outside tutoring experience make a difference with regard to preservice teacher knowledge of basic language concepts and dyslexia?

Method

Participants

Ninety-one preservice teachers (PST) from a university based teacher preparation program in the Southwest US participated in this study, all but one of the participants was female and ages ranged from 20-28. Additionally, all participants were in preparation to teach grades Kindergarten through fifth. PSTs' prior preparation was also examined by including an item on the survey which asked participants to list any reading courses taken prior to the course and tutoring experiences. The study was designed to survey PSTs in the last of four required reading courses prior to their methods observations and student teaching, however, due to scheduling differences 32% of the PSTs had less than two reading courses prior to the assessment date, 59% had two reading courses, and the remaining 9% had three or more reading classes. However, 78% of the PSTs had previously or were currently participating in a weekly tutoring program in various local schools.

Instrument

A survey designed to assess knowledge of basic language concepts was used. The survey was based on surveys and questionnaires used by other researchers in the field (Bos et al., 2001; Moats, 1994). The survey in total had 39 items and was constructed to measure teacher knowledge and skill about phonological awareness, phonemic awareness, phonics/alphabetic principle, morphology, dyslexia and comprehension. Because the purpose of the present study is to examine PST knowledge of basic language concepts and dyslexia, not all survey items were used for analysis. A

parsimonious breakdown of the knowledge and skill items and a display of whether or not specific items were used in the present study can be found in Table 5 (see p. 89 for Table 5), and the survey in full can be accessed in the Appendix. Reliability for the survey was found to be 0.903 (Cronbach's α). Additionally, the survey has been used in previous studies (Joshi et al., 2006; Binks et al., in press) in which exploratory factor analysis (EFA) was performed to identify underlying factors. Results from Binks et al. (in press) indicated four factors: phonology, phonemics, phonics, and morphology. Therefore, these factors will be used for sub-grouping of knowledge and skill scores.

In addition to knowledge and skill items, demographic information and perceived teaching ability was identified. Item 1 is used to attain demographic information such as the number of reading classes taken prior to the survey administration and tutoring experience. Items 2-9 were used to ask PSTs to rate their perceived teaching ability of typically developing readers, struggling readers, phonemic awareness, phonics, fluency, vocabulary, comprehension, and children's literature; however, teacher ratings of fluency, comprehension, and children's literature were not used due to the purpose of the present study.

Table 5

Breakdown of Survey Items for PSTs

Target Area Assessed	**Item Number(s)**
Phonological	18a-g, 22
Phonemic	10, 13a-g, 14, 16, 17a-b, 23, 28
Phonics	11, 12, 15, 19, 20, 21, 31, 32, 33
Morphological	18a-g, 24, 25, 34, 35a-g
Dyslexia	37a-e

Items of knowledge were multiple choice and items of skill were both multiple choice and short answer. Item 23 is an example of knowledge: participants were asked to identify the correct definition of phonemic awareness. An example of a multiple choice skill item is item 11 in which the participant was asked to identify the word (out of six choices including "no idea") that has the same "i" sound as the nonsense word "tife". Item 13a–g is an example of a short answer skill item in which participants were asked to indicate the number of phonemes in various words (e.g., ship and fox). To measure PSTs' knowledge and perceptions of the nature of dyslexia, one item divided into five sub-items was chosen from a former 25-item survey used in previous dyslexia knowledge studies (Washburn et al., 2007, 2008). The survey was adapted using the Dyslexia Belief Index (Wadlington & Wadlington, 2005) and the IDA (2007) endorsed

definition of dyslexia (as defined earlier). The five sub-items could be answered using a Likert-scale (1=definitely false, 2=probably false, 3=probably true, 4=definitely false).

Procedure

The researcher asked two instructors in the teacher preparation program responsible for teaching the last reading course (of four required reading courses) if their students could be asked to volunteer and anonymously participant in the present study. Both instructors agreed and proper authorization for the study to be conducted was acquired through the institutional review board for research protocol. Prior to administration of the survey, the researcher approached three different course groupings of students (two from one instructor [$n = 62$] and one from the other instructor [$n = 29$]) and explained the purpose of the study and, without any objection, all students volunteered to anonymously participate in the study. The survey was administered during the first week of courses in the spring semester as an attempt to control for any new learned information in the reading course(s) in which the PSTs were presently enrolled. During administration of the survey, precautions were taken to ensure that answer-sharing did not occur. For all three administrations of the surveys, although there was no time limit, participants completed surveys in approximately 30 minutes.

Each item on the survey was scored either right or wrong and the total number of correct items was used for analysis along with total number of correct items for the four sub-groupings: phonological items, phonemic items, phonics items and morphological items. Responses to dyslexia items were coded one through four starting with “definitely

false" through "definitely true". Both descriptive and inferential statistical tests using SPSS were computer to fully answer all research questions.

Results

Preservice Teacher Perceived Teaching Ability

First, PSTs' perceived teaching ability associated with teaching all kinds of readers (with typically developing readers and struggling readers) as well as various concepts related to research based reading instruction for struggling readers (phonemic awareness, phonics, and vocabulary) were examined. Table 6 displays means and standard deviations for all participants regarding perceived teaching ability in typically developing readers, struggling readers, phonemic awareness, phonics, and vocabulary. The majority of PSTs indicated "moderate" as their perceived teaching ability for four of the five areas: typically developing (71%), struggling readers (66%), phonemic awareness (63%), phonics (62%). However, vocabulary was a perceived area of strength for PSTs because 50% indicated "moderate" and 44% indicated "very good". Vocabulary was also the only area in which one PST designated "expert" as perceived teaching ability.

Table 6

Mean Scores and Standard Deviations of Perceived Teaching Ability for PSTs

Category	**Mean Score (SD in parentheses)**
Teaching Reading to Typically Developing Readers	2.13 (.521)
Teaching Reading to Struggling Readers	1.68 (.492)
Teaching Phonemic Awareness	1.84 (.582)
Teaching Phonics	1.88 (.612)
Teaching Vocabulary	2.42 (.598)

Preservice Teachers' Knowledge of Basic Language Concepts

Before analyzing patterns in the data related to individual basic language concepts, mean scores and corresponding standard deviations were calculated for the total survey score (all items used for assessment minus perception items) as well as the sub-grouping scores (phonological, phonemic, phonics, and morphology). The total mean score for the entire survey was 58.06 (*SD* = 11.26). Table 7 displays the means and standard deviations for all scores. In the following three sections, descriptive data for all remaining scores will further be explained.

Table 7

Mean Scores for All Items Measuring Knowledge and Skill in the Basic Language Concepts: Phonological, Phonemic, Alphabetic Principle/Phonics, Morphology for PSTs

Category	**Item Numbers**	**Mean Score (SD in parentheses)**
Phonological	18a-g, 22	86.19 (16.64)
Phonemics	10, 13a-g, 14, 16, 17a-b, 23, 28	71.66 (19.96)
Alphabetic Principle/Phonics	11, 12, 15, 19, 20, 21, 31, 32, 33	45.05 (20.11)
Morphological	18a-g, 24, 25, 34, 35a-g	49.67 (12.47)

Knowledge of Phonological and Phonemic Concepts

Knowledge and skill scores revealed strengths in the areas of phonology, specifically syllable counting, the *mean percentage correct* for all syllable counting items was 91%. However, only 58% of PSTs were able to identify the correct definition of phonological awareness (e.g., *the understanding of how spoken language is broken down and manipulated*). As syllable counting is one of the more basic phonological

awareness tasks it is possible that PSTs can correctly perform the skill without coherent understanding of phonology. Ninety-two percent of all PSTs were able to correctly identify the definition of a phoneme and the mean percentage correct for all phoneme counting items was 71% with the highest individual items at 87% for "moon" and "ship". However, "box" was the lowest with 47% of participants correctly identifying four sounds. Though phoneme counting skill was somewhat above other mean scores reported in previous studies (Bos et al., 2001; Moats, 1994), only 59% of PSTs were able to identify the correct definition of phonemic awareness, and the overwhelming majority of the remaining 41% indicated that phonemic awareness was the "understanding of how letters and sounds are put together to form words". For a breakdown of all survey items assessing knowledge and skill of phonological and phonemic awareness, please refer to Table 8.

Table 8

Percentage of PSTs Correctly Responding to Survey Items Assessing Phonological and Phonemic Knowledge and Skill

Item Number and correct answer (in italics)	**Percentage Correct**
10. A phoneme refers to:	92%
a. a single letter	
b. *a single speech sound*	

Table 8, continued

Item Number and correct answer (in italics)	**Percentage Correct**
c. a single unit of meaning	
d. a grapheme	
e. no idea	
13. How many speech sounds are in the following words?	
a. ship *(3)*	87%
b. grass *(4)*	70%
c. box *(4)*	47%
d. moon *(3)*	87%
e. brush *(4)*	64%
f. knee *(2)*	81%
g. through *(3)*	62%
14. What type of task would the following be?	82%
"Say the word 'cat'. Now say the word	
without the /k/ sound?"	
a. blending	
b. rhyming	
c. segmentation	
d. *deletion*	
e. no idea	

Table 8, continued

Item Number and correct answer (in italics)	**Percentage Correct**
16. Identify the pair of words that begins with the same sound:	87%
a. joke-goat	
b. *chef-shoe*	
c. quiet-giant	
d. chip-chemist	
e. no idea	
17. The next 2 items involve saying a word and then revering the order of the sounds. For example, the word "back" would be "cab".	
(a). If you say the word and then reverse the order of the sounds, 'ice' would be:	64%
a. easy	
b. sea	
c. size	
d. *sigh*	
e. no idea	

Table 8, continued

Item Number and correct answer (in italics)	**Percentage Correct**
(b) If you say the word and then reverse the order of the sounds, 'enough' would be:	63%
a. fun	
b. phone	
c. *funny*	
d. one	
e. no idea	
18. For each of the words below, determine the number of syllables:	
a. disassemble *(4)*	90%
b. heaven *(2)*	93%
c. observer *(3)*	97%
d. salamander *(4)*	96%
e. bookkeeper *(3)*	92%
f. frogs *(1)*	77%
e. teacher *(2)*	97%

Table 8, continued

Item Number and correct answer (in italics)	**Percentage Correct**
22. Phonological awareness is:	58%
a. the ability to use letter-sound correspondences to decode	
b. *the understanding of how spoken language is broken down and manipulated*	
c. a teaching method for decoding skills	
d. the same as phonics	
e. no idea	

Preservice Teachers' Knowledge of Alphabetic Principle/Phonics

The mean percent correct for all alphabetic principle/phonics knowledge and skill items was 45%. Though the overall phonics score was low, there were areas of particular strength which included: 88% of PSTs were able to identify the correct vowel sound in a nonsense word, 76% correctly identified a word with the "soft C", and 86% correctly identified a word with the closed syllable type. However, open and final stable syllable types proved difficult for PSTs with only 27% and 18% (respectively) correctly identifying words with those syllable types. Additionally, knowledge of two common phonics principles ("c" for /k/ and "k" for /k/) was relatively poor with 53% and 42% (respectively) correctly identifying when to use the rule and only 38% choose the correct definition for a blend. It was not particularly surprising that PSTs performed better on

tasks in which implicit knowledge of letter-sound correspondences could help correctly answer the item (e.g. Item 16: *Identify the pair of words that begins with the same sound*. *Chef-Shoe* is the correct answer.) However, it was surprising that few had explicit knowledge of terminology associated with phonics instruction as well as knowledge of phonics principles that can help guide systematic decoding instruction.

Preservice Teachers' Knowledge of Morphological Concepts

It has been suggested that instruction that directly teaches various aspects of morphology, such as affixes and root words, is essential for learning multisyllabic words and increasing reading vocabulary (Henry, 2005; Keifer & Lesaux, 2007). Thus, it was ironic, that PSTs felt more prepared to teach vocabulary ($M = 2.42$) than any other area of instruction (including typically developing readers), yet their knowledge of word parts such as affixes and roots was low. The items related to morphology on the survey required PSTs to: (1) identify the correct definition for "morphemic analysis" and "etymology", (2) count the number of morphemes in seven words, and (3) identify and list any prefixes, root words, and suffixes in seven different words. Though all mean scores on morphology items are at or fall below 50%, PSTs performed better at listing prefixes (mean percent correct = 52%), root words (mean percent correct = 33%) and suffixes (mean percent correct = 52%) than counting morphemes (mean percent correct = 25.43%). In Table 9 survey items related to morphology are highlighted and percentages correct are displayed.

Table 9

Percentage of PSTs Correctly Responding to Survey Items Assessing Morphology

Item Number and correct answer (in italics)	**Percentage Correct**
18. For each of the words below,	
determine the number of morphemes:	
a. disassemble *(3)*	12%
b. heaven *(1)*	29%
c. observer *(3)*	25%
d. salamander *(1)*	18%
e. bookkeeper *(3)*	37%
f. frogs *(2)*	29%
e. teacher *(2)*	45%
24. Morphemic analysis is:	30%
a. an instructional approach that involves	
evaluation of meaning based on multiple senses	
b. an understanding of the meaning of letters and their sounds	
c. *studying the structure and relations of*	
meaningful linguistic units occurring in language	
d. classifying and recording of individual speech sounds	
e. no idea	

Table 9, continued

Item Number and correct answer (in italics)	**Percentage Correct**
25. Etymology is:	34%
a. not really connected to the development of reading skills	
b. *the study of the history and development*	
of the structures of meaning of words	
c. the study of the causes of disability	
d. he study of human groups through first-hand observation	
e. no idea	

35. For each of the words on the left, please list the prefix, root, and suffix. (You may use a dash to represent "none'. If two fall under one category, please list both):

Word	**Prefix**	**Root**	**Suffix**
a. *undetermined*	*un, de*	*termin*	*ed*
	(2%)	(2%)	(69%)
b. *uniform*	*uni*	*form*	-
	(67%)	(66%)	(75%)
c. *under*	*under*	-	-
	(3%)	(24%)	(58%)

Table 9, continued

Item Number and correct answer (in italics)				**Percentage Correct**
d. *unknowingly*	*un*	*know*	*ing, ly*	
	(91%)	(53%)	(55%)	
e. *conductor*	*con*	*duct*	*or*	
	(37%)	(22%)	(55%)	
f. *disruption*	*dis*	*rupt*	*ion*	
	(71%)	(37%)	(46%)	
g. *immaterial*	*im*	*mater*	*ial*	
	(92%)	(29%)	(4%)	

Preservice Teachers' Knowledge of Dyslexia

Responses to the dyslexia sub-items (37a-e) were similar to findings from pilot studies (Washburn, Binks, & Joshi, 2007, 2008). Mean scores and standard deviations of each dyslexia sub-item can be seen in Table 10. According to Hudson et al. (2007) and Sanders (2001) many teachers have misconceptions about the nature of dyslexia. Only 7 of 91 individuals (~8%) correctly indicated either "probably or definitely false" to "seeing letters and words backwards is a characteristic of dyslexia". This finding is of particular interest because as Moats (1994) stated a decade and a half ago: "the scientific

community has reached consensus that most reading disabilities originate with a specific impairment of language processing, not with general visual-perceptual deficits" (p. 82).

Table 10

Mean Scores and Standard Deviations for Dyslexia Items for PSTs

Question	**Mean Score (SD in parentheses)**
a. Seeing letters and words backwards is a characteristic of dyslexia.	3.37 (.661)
b. Children with dyslexia can be helped by using colored lenses/colored overlays.	2.59 (.830)
c. Children with dyslexia have problems in decoding and spelling but not in listening comprehension.	2.65 (.899)
d. Dyslexics tend to have lower IQ scores than non-dyslexics.	1.78 (.712)
e. Most teachers receive intensive training to work with dyslexia children.	1.88 (.828)

Note. 1 = definitely false, 2 = probably false, 3 = probably true, 4 = definitely true

Interestingly enough, PSTs were split almost exactly down the middle as to whether or not "children with dyslexia can be helped by using colored lenses/colored overlays" with 49% indicating "probably or definitely false" and 51% indicating "probably or definitely true". PSTs' knowledge of dyslexia was more accurate on the remaining three sub-items: 62% indicated "probably or definitely true" concerning dyslexics' experiencing problems with decoding and spelling but not in listening comprehension; 86% indicated "probably or definitely false" to "dyslexics tend to have lower IQ scores than non-dyslexics"; and 80% indicated "probably or definitely false" to "most teachers receive intensive training to work with dyslexic children". The findings from the dyslexia sub-items are likely to indicate that while PSTs do have some accurate knowledge about dyslexia; popular myths about dyslexia prevail and consequently could persist during their years of classroom teaching.

Relationships Between Preservice Teachers' Perceived Teaching Ability and Knowledge

To examine whether or not perceived teaching ability was related to demonstrated knowledge and skill, Canonical Correlation Analysis (CCA) using Structural Equation Modeling (SEM) by way of AMOS statistical software was employed. CCA is designed to analyze the relationship between two sets of variables (Thompson, 1991). Fan (1997) contended that the SEM approach to CCA is beneficial because statistical significance testing of individual canonical function coefficients and structure coefficients is possible, whereas other programs used to compute CCA (e.g., the SPSS CANCOR macro) are unable to give such information. Therefore, a SEM model was hypothesized and built. A MIMIC model, or a Multiple Indicators/Multiple

Causes model, was used for the structural model. A MIMIC model is distinguishable by the latent variable having both casual indicators and effect indicators; however, because CCA is symmetrical, the causal and effect indicators can be switched (Fan, 1997).

The structural model examined two sets of variables, the casual variable set included the mean scores for the five self perception items (teaching typically developing readers, struggling readers, phonemic awareness, phonics, vocabulary) and the effect variable set consisted of three sub-groupings of knowledge/ability mean scores (phonological awareness/phonemic awareness, phonics, morphology). Phonological awareness and phonemic awareness were joined as one sub-grouping instead of two for this analysis because though phonological awareness and phonemic awareness are certainly not the same concepts, phonological awareness is the umbrella of skills in which phonemic awareness exists as often the last and most difficult of phonological skills (Birsh, 2005; Scarborough & Brady, 2002). The MIMIC model, as seen in Figure 1, was constructed for the CCA analysis with one path constrained, PAW or phonological and phonemic awareness to 1. It was hypothesized that PAW would be highly correlated with the latent variable because PAW encompassed syllable counting, which is a fairly easy phonological skill in which teachers and PSTs have, in past studies, done well on such skill related items.

When assessing whether or not a model is good, the *fit* is discussed. The first sign of good fit is a non-significant chi-square value, however, because the chi-square test of goodness of fit is subject to sample size other measures of model fit also need to be analyzed and reported (Tabachnick & Fidell, 2007; Thompson, 2000). Therefore,

though the chi-square test was significant for the model, $\chi^2(8) = 21.395$, $p < .006$, the goodness-of-fit (GFI) index and the comparative fit index (CFI) were high (.949 and .910, respectively) which indicates that the proposed model is an acceptable fit. The RMSEA (.136), was however, higher than the suggested .10 (Byrne, 2001).

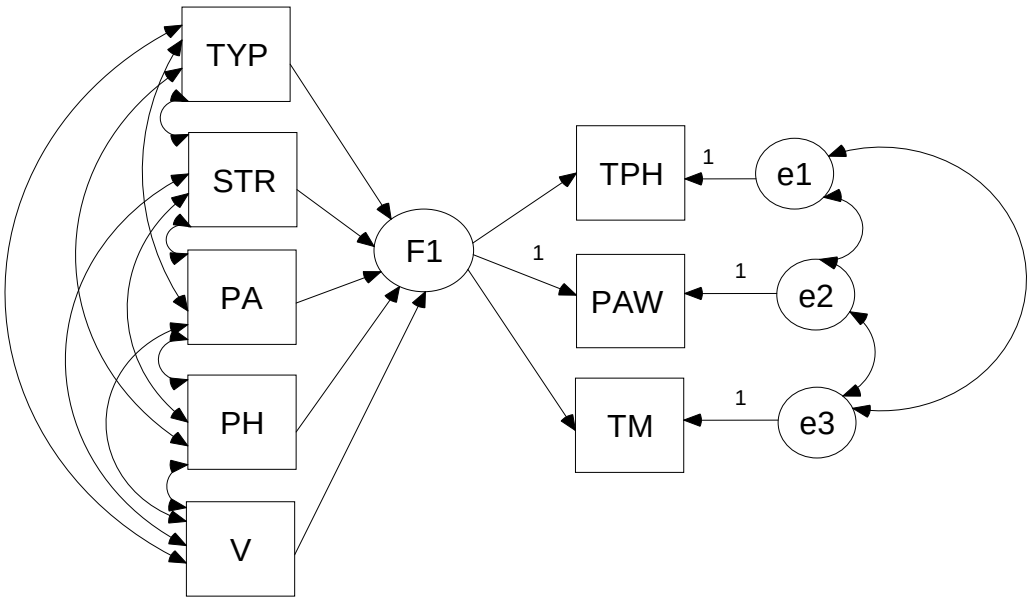

Figure 1

MIMIC Model for PSTs

Note. TYP, STR, PA, PH, and V are the five perception (casual) variables. TPH, PAW, and TM are the three knowledge (effect) variables. TYP = typically developing readers, V = vocabulary, PH = phonics, PA = phonemic awareness, STR = struggling readers, TPH = score for total phonics items, TPAW = score for total phonological and phonemic items, TM = score for total morphological items

One advantage of using SEM for CCA is that measures of standard error and significance are calculated and provided, whereas in traditional CCA such measures are absent (Fan, 1997; Guarino, 2004). According to Thompson (1984) structure coefficients, or standardized regression weights (as reported in AMOS), are "particularly helpful in interpreting canonical results in terms of each variable's contribution to the canonical solution" (p. 24), therefore, all structure coefficients for Function 1 are reported in Table 11 (see p. 109). Only one of the structure coefficients was significant for Canonical Function 1, F1→PH (r = -.504) and all but two of the structure coefficients are negative (F1→TYP, r = .040; F1→PAW, r = .403). Additionally, the overlapping variance (R^2) for Canonical Function 1 was 22%. To evaluate the possibility of a second function, the regression weights for Canonical Function 1 are constrained to their reported values (unstandardized regression weights) and the analysis is repeated (see Figure 2 for model). The chi-square value for Canonical Function 2 was $\chi^2(8) = 11.074$, $p < .198$. According to Johnk (2008): "a change in chi-square values and degrees of freedom is calculated in order to determine significance of fit between the two models…if the change is significant then the second canonical function is useful" (p. 677). The difference between the two chi-square values (Canonical Functions 1 and 2) is 10.321 with 8 degrees of freedom; therefore the difference is not significant at the .05 or .01 levels. Thus, the relationship between preservice teachers' perceptions about teaching ability and actual knowledge was maximized in Function 1, only one of three possible canonical functions.

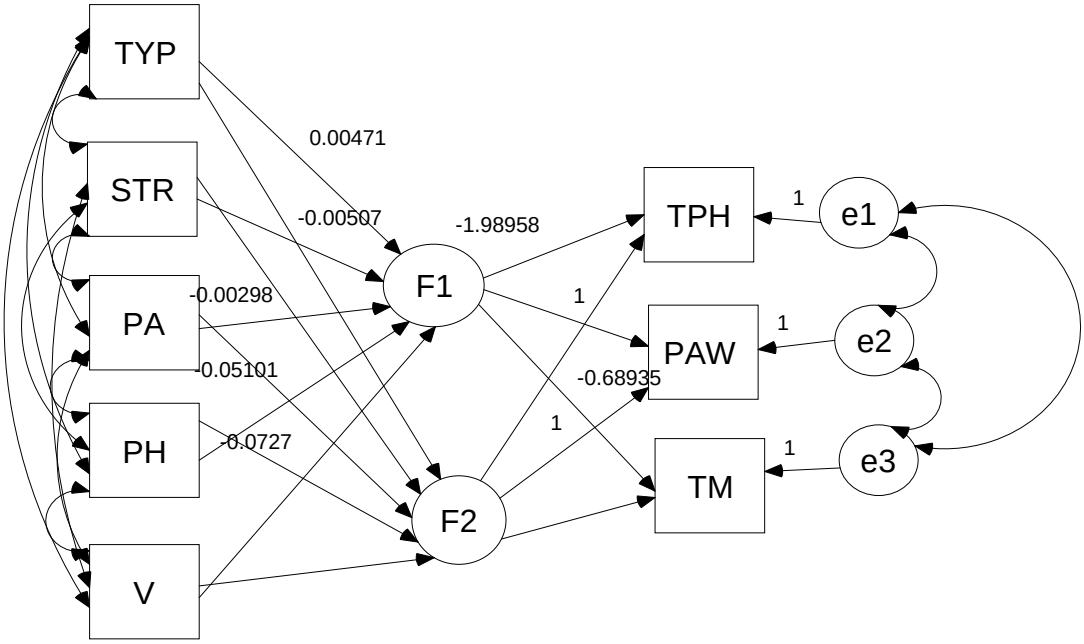

Figure 2

MIMIC Model with Function 1 and Function 2 (unstandardized regression weights) for PSTs

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Note. TYP, STR, PA, PH, and V are the five perception (casual) variables. TPH, PAW, and TM are the three knowledge (effect) variables. Values presented for Function 1 are unstandardized regression weights. TYP = typically developing readers, V = vocabulary, PH = phonics, PA = phonemic awareness, STR = struggling readers, TPH = score for total phonics items, PAW = score for total phonological and phonemic items, TM = score for total morphological items

Table 11

Structure Coefficients (standardized regression weights) for Function 1 for PSTs

	Canonical Function 1
Perceived Teaching Ability	
Typically Developing Readers (TYP)	.040
Struggling Readers (STR)	-.040
Phonemic Awareness (PA)	-.028
Phonics (PH)	-.504*
Vocabulary (V)	-.072
Skill/Knowledge	
Phonology/Phonemics (TPAW)	.403
Phonics (TPH)	-.604
Morphology (TM)	-.337

Note. * p<.05

In this study, the overall fit of the model to the data is acceptable and an underlying relationship appears to exist between teachers' perceived teaching ability and their actual knowledge. Most of the structure coefficients or the standardized regression weights indicate a negative relationship between the latent variable, Canonical Function 1, in two of the eight paths (though only one is statistically significant at the .05 level: F1→PH). Moreover, by examining the canonical correlation matrix for this data (as

depicted in Table 12) some of PSTs' perceptions about their teaching ability are significantly correlated with some areas of knowledge and skill, however, the associations are small to moderate (all *r*'s < .359), some are negative, and yet even others are not significantly related (e.g., all five perceived teaching ability areas to morphology). Thus, PSTs - on average and in most areas (excluding phonics) - perceived their teaching ability to be greater than their actual ability.

Table 12

Canonical Correlation Analysis Matrix for PSTs

	1	2	3	4	5	6	7	8	9
1. TYP	-								
2. STR	.426**	-							
3. PA	.329**	.203	-						
4. PH	.364**	.314**	.630**	-					
5. V	.285**	.269**	.423**	.352**	-				
6. TPAW	-.273**	-.147	-.097	-.261**	.089	-			
7. TPH	-.031	.132	.241*	.287**	.359**	.145	-		
8. TM	-.051	-.048	.187	.176	.119	.399**	.373**	-	
9. Function 1	.040	-.040	-.028	-.504*	-.072	.403	-.604	-.337	-

Note. Correlation significant at * $p < .05$; ** $p < .001$.

Preservice Teachers' Prior Preparation and Experience

Similar to Spear-Swerling and Brucker (2003) and Spear-Swerling (2009) PSTs' prior preparation and experience were examined. The number of reading courses taken was defined as prior preparation and whether or not the PSTs were involved in tutoring was defined as prior experience. Examination of tutoring was preempted by recent research studies (Al Otaiba & Lake, 2007; Spear-Swerling, 2009; Spear-Swerling & Brucker, 2004) which found PSTs who were engaged in tutoring struggling readers during their reading courses made significant gains on measures of knowledge of basic language concepts. Though the present study was not designed specifically to measure the effect of tutoring and instruction as the Al Otaiba and Lake (2007) study, tutoring is required in the PSTs' preparation program and is accessible through local schools, thus, it was hypothesized that the majority of PST participants were either presently tutoring or had tutored in the semester prior to data collection. Therefore, the the question was posed: Do differences of knowledge of basic language concepts exist between PSTs who tutor (have prior experience) and those who do not? A one-way multivariate analysis of variance (MANOVA) was conducted between the variable tutoring (tutoring or no tutoring) and the five dependent variables: total score for knowledge and skill items, total score for phonological items, total score for phonemic awareness items, total score for phonics items, and total score for morphological items. The assumptions of equal dependent variables covariance matrices and normality were supported, but no statistically significant differences existed with any of the scores between the two tutoring groups. Additionally, another one-way MANOVA was calculated to test for

differences between number of reading courses (0, 1-2, 3-6) taken and the five abovementioned dependent variables. However, no statistically significant differences were identified among the six groups of reading classes. Thus, neither tutoring experience nor number of reading courses significantly affected PST scores in any of the five areas.

Discussion

The purpose of this study was to examine the knowledge/skill base of PSTs with regard to basic language concepts and dyslexia as well as perceived teaching ability of related concepts. Knowledge and skill of basic language concepts such as phonology, phonics, and morphology has been identified as essential for teachers working with beginning as well as struggling readers (Brady & Moats, 1997; Moats, 1994; Moats, 2004). However, like previous studies involving PSTs (Bos et al., 2001; Spear-Swerling & Brucker, 2003, 2004) results from the present study indicated that PSTs, on average, lack knowledge about several important concepts needed to teach struggling readers.

On average, PSTs perceived their ability to teach typically developing readers, struggling readers, phonemic awareness, and phonics as "moderate". This finding was not surprising as PSTs often have little classroom teaching experience (Darling-Hammond, 2000; Spear-Swerling & Brucker, 2004). As for scores on the total survey, much like Bos et al. (2001), two-thirds of the sample scored below 60% correct and only 6 participants (roughly 7% of the sample) scored at or above 70% correct.

PST knowledge of the sub-groupings of basic language concepts was, however, varied. PSTs were most successful with items that required basic and implicit

knowledge and skill, such as syllable counting. In fact, at least 90% of all participants got six of the seven syllable counting items correct. This finding is much like Mather et al. (2001) in which PSTs, who scored lower than inservice teachers, were able to produce high and equivalent scores for syllable counting. In the present study, the only word that appeared somewhat problematic was "frogs" in which 77% of participants correctly identified there is only one syllable in the word. It was surprising that 23% of PSTs incorrectly answered this question (all answered "2 syllables"), however, it could be attributed to a possible lack of explicit understanding that a syllable is the "a spoken or written unit that must have a vowel sound" (Birsh, 2005, p. 578). It is also likely that this small group of PSTs relied on implicit skill, or their own ability to read, to count syllables. However, as Moats (1999) contended, teachers cannot rely on their implicit skill/ability alone to teach reading, explicit teaching requires explicit understanding. Though both syllable and phoneme counting tasks involved aspects of phonological awareness - phoneme counting – was a bit more problematic for PSTs. Qualitative error analysis revealed that the majority of PSTs were able to correctly identify some consonant and vowel digraphs. For instance, at least 80% of PSTs correctly identified the number of phonemes in the words "moon", "ship", and "knee". However, only 60% were able to correctly identify the number of phonemes in "brush" and "through". Both "brush" and "through" have more complex grapheme combinations and "brush" has both a blend and a digraph, which identification of both blends and digraphs have proved problematic in previous studies (Bos et al., 2001; Spear-Swerling & Brucker, 2003). Additionally, 70% correctly identified that "grass" has four phonemes with the majority

of the remaining 30% listing 5 phonemes. As in previous studies (Bos et al., 2001; Cunningham et al., 2004; Moats, 1994), the /ks/ sound for the letter "x" proved difficult – only 47% were able to correctly identify four phonemes in the word "box". Interestingly enough, though this percentage is low, PSTs in this study scored better than educators in previous studies in which a word containing the /ks/ sound is used as a phoneme counting item (Cunningham et al., 2004; Moats, 1994). The discrepancy between syllable and phoneme counting scores is likely due to the widely accepted notion that phoneme counting is more difficult than syllable counting (Treiman & Zukowski, 1991). Additionally, errors in phoneme counting could also be attributed to the thought that PSTs are operating on an orthographic level when attempting to dissect words into individual phonemes, as mentioned by Cunningham et al. (2004). Therefore, PSTs could have counted letters in words as opposed to sounds (e.g., 5 phonemes for "grass" and 3 phonemes for "box"). Both explanations as to why PSTs miscount the number of phonemes in a given word point to either a misconception or missing knowledge of what a phoneme is as well as explicit knowledge of the various phonemes that exist in the English language (i.e., digraphs, trigraphs).

Items related to alphabetic principle/phonics knowledge, which required both explicit and implicit knowledge and skill, proved to be more difficult than items related to phonology. PSTs fared better with items in which implicit knowledge could be used to achieve the correct response(s) such as finding the long /i/. However, according to the NRP, effective reading instruction includes teaching phonics systematically, therefore, it seems logical that explicit knowledge of phonics principles is needed to teach decoding

and spelling. Therefore, the fact that approximately half of the PSTs in this study were able to correctly identify when to use certain reliable phonics principles is worrisome.

Items related to various aspects of morphology were the most challenging for PSTs. Morpheme identification was quite low and PSTs had the most difficulty counting the number of morphemes in items 18 a-f. For example, the mean percentage correct score for all morpheme counting items was 25%. As for morpheme identification, PSTs had the most success identifying prefixes and the most difficulty with roots; however, all mean scores fell below 55%. The findings from the present study are similar to those of Moats (1994) in which graduate level teachers had great difficulty with various aspects of morphology.

Terminology and concepts related to reading instruction were also varied. While 92% of PSTs were able to correctly identify the definition of a phoneme, only 59% of PSTs identified the definition of phonemic awareness correctly. This was particularly surprising given the large amount of research made public on the effectiveness of phonemic awareness instruction for beginning and struggling readers. However, as findings from current research studies suggest (Joshi, Binks, Graham, et al., 2009; Joshi, Binks, Hougen, et al., 2009; Walsh et al., 2006) have indicated, preparation programs may not provide sufficient information and education on these basic concepts and their connection to instruction for beginning and struggling readers. On the flip side, findings from research studies that have used interactive and collaborative professional development opportunities as an intervention have indicated that knowledge of basic language concepts can be learned and can benefit student reading achievement (Bos et

al., 1999; McCutchen & Berninger, 1999; McCutchen et al., 2009), particularly if teachers are given opportunities to use learned information. Therefore, it stands to reason that PSTs also need opportunities to learn and practice information in a meaningful and purposeful way (Brady & Moats, 1997; Moats, 1994).

PSTs' knowledge of dyslexia was parallel to myths held by many inservice teachers (Pollack & Waller, 1997; Sanders, 2001) and society in general. The overwhelming majority of PSTs incorrectly specified that "seeing letters and words backwards" is an indicator of dyslexia, though current research and the accepted definition of dyslexia by the NICHD denotes that dyslexia is language-based (Lyon et al., 2003), not visual. Though this finding was not altogether surprising, it was discouraging. However, it seems that PSTs are aware that they are not receiving much preparation with regard to teaching children with dyslexia, as 80% responded "probably or definitely false" to "teachers receive intensive training to work with dyslexic children". With the high incidence of dyslexia, the findings of PST dyslexia knowledge from this study are troubling. Though the findings cannot be generalized, due to the small sample size and demographics, there are still some clear suggestions for teacher education programs. As Moats (1999) suggested, PSTs need to know what dyslexia is and what it is not, it is likely that misinformation can lead already frustrated students and parents down a difficult path and as Sanders (2001) contended: "once there is greater understanding of what dyslexia is and how it affects one's aptitude for learning to read, we can look forward to increased awareness that dyslexia is an eminently treatable condition" (p. 5).

An additional purpose was to examine if PST knowledge/skill and perceived teaching ability are related. Because two sets of multiple variables were involved, CCA using SEM analyses was employed. The MIMIC model, though the chi-square value was significant, showed to be an acceptable fit according to its CFI and GFI values. Though it was possible to have three canonical functions, only the first canonical function was statistically significant with the canonical function accounting for 22% of the shared variance. Thus, an underlying relationship exists between this group of PSTs' perceptions of their teaching ability and their actual knowledge scores. However, the majority of contributions from structure coefficients (standardized regression weights) to Canonical Function 1 in the MIMIC model were negative (see Table 8 for the canonical correlation matrix) and only one was statistically significant (PH→F1: r = -.504). Negative contributions likely indicate that PSTs' perceived teaching ability(s) may not match actual knowledge. As Cunningham et al. (2004) contended such a mismatch between perceptions and actual knowledge may cause problems later on - in the classroom - with regard to teachers seeking additional education for and/or assistance in teaching struggling readers.

Finally, prior preparation and tutoring experience were used to test for differences on the total knowledge and skill score as well as among the various scores on sub-groupings of items. Unlike previous studies (Al Otaiba & Lake, 2007; Spear-Swerling & Brucker, 2004) no statistically significant differences existed among any of the scores between the two tutoring groups and among the six preparation groups. This is likely because previous studies were designed with pre/post-test measures and

incorporated instruction as a treatment variable, whereas the present study is descriptive in nature and sought only to observe if prior preparation and tutoring experience had an effect on present scores. In future research, qualitative measures such as observation of tutoring time could be helpful in interpreting and understanding results. Even more appropriate would be the incorporation of student/tutees' reading achievement scores.

Limitations and Conclusions

In educational research there are always limitations, the present study is no different. One particular limitation was the sampling technique, due to limited resources, sampling was of convenience and not done systematically as to represent a full range of all PSTs in university-based preparation programs in the United States. Therefore, interpretation of the results must be done carefully and within the context of the study. However, future research could be done to obtain a more representative sample of university based teacher preparation programs in the United States, so that findings could be generalized. Also, all of the data examined was based on a self-report measure and data collection was in a face-to-face manner, which, consequently, is subject to "social desirability bias" (Dillman, 1978). Social desirability bias is a phenomenon in which survey participants (or interview) report different answers in different contexts. For the current study, this could be problematic in that participants were asked to complete the survey within the context of their preparation (as opposed to a more neutral site), therefore answers, particularly to perceptions items, may be influenced by how well they feel they should be prepared. Though the course instructors were removed during survey administration, answers could still be subject to the context

in which data was collected. Additionally, the sample size was fairly small for purposes of data analysis, specifically for using structural equation modeling. According to Anderson and Gerbing (1988), sample sizes of at least 150 are desirable for SEM analyses and the present study only had 91 participants. However, as two sets of variables clearly emerged from the survey (perceptions and knowledge scores), CCA appeared to be the most appropriate statistical analysis to employ as the purpose of CCA is to maximize the relationship between two sets of multiple variables. Nevertheless, interpretation of results must be done with caution.

Though the present study presents only one small snapshot of teacher knowledge, when summarized with previous findings using similar instruments, it is clear that PSTs likely lack knowledge of basic language concepts needed to teach struggling readers. One important way in which the findings from this study add to the existing body of literature concerning preservice teacher knowledge of basic language concepts is that knowledge of perceptions and dyslexia was also examined. It is clear that the preservice teachers in this sample did not receive information (or accurate information) about the nature of dyslexia. However, given the prevalence of dyslexia and reading related difficulties, the findings from this study have strong implications for preparing future teachers for teaching children who have reading difficulties. Thus, it is important for educators involved in the preparation of PSTs to understand that the content knowledge (i.e., knowledge of concepts related to reading and reading difficulties) learned in preservice preparation programs can play a supportive role in later inservice planning and implementing curriculum and assessments, particularly if PSTs' knowledge base and

teaching repertoire is expanded by continuing inservice professional development (Darling-Hammond, 2000).

CHAPTER IV

INSERVICE TEACHER KNOWLEDGE

In recent decades, a good deal of attention has been given to increase reading proficiency in elementary-aged children. Thus, efforts have been made to understand how children learn best to read and why some children struggle to acquire basic reading skills. In their research report, the National Research Council (Snow, Griffin, & Burns, 1998) contended that children typically learn to read fairly well when the following conditions are in place:

- have normal or above average language skills;
- have had experiences in childhood that fostered motivation and provided exposure to literacy in use;
- are given information about the nature of print via opportunities to learn letters and to recognize the sublexical structure of spoken words, as well as about the contrasting nature of spoken and written language; and
- attend schools that provide coherent reading instruction and opportunities to practice. (p. 315)

However, not every child is privy to the abovementioned conditions; in fact the National Center for Education Statistics (NCES) reported that roughly 13% of all school aged children are placed in special education (NCES, 2006). Nearly 50% of these children are identified as learning disabled (LD) with 80% receiving special services for reading. Moreover, 52% of students with LD spend 80% or more of their instruction time in the general education classroom. The International Dyslexia Association (IDA) estimated

that 15-20% of the general population experiences one or more symptoms of dyslexia (IDA, 2007). Consequently, many of these students will struggle with reading though not all will receive needed instruction and/or intervention. Therefore, the purpose of the present study is to examine the knowledge base of both first year teachers and teachers with teaching experience with regard to basic language concepts related to reading instruction. What differentiates this study from other teacher knowledge studies (Moats, 1994; Bos et al., 2001) is that in addition to measuring knowledge of basic language concepts, knowledge about dyslexia is measured.

Struggling Readers in the Early Grades

According to Snow et al. (1998), there are three obstacles to reading success: (1) difficulty understanding and mastering the alphabetic principle, or "the failure to grasp that written spellings systematically represent sounds of spoken words" (p. 315), (2) "failure to acquire and use comprehension skills and strategies" (p. 316), and (3) "motivation to read" (p. 316). For many children who experience reading difficulty in the early grades (K-3), problems exist at the word level (Scarborough, 2003; Siegal, 2004). Difficulty with word recognition is thought to be a result of difficulty with the alphabetic principle (Liberman et al., 1989; Liberman & Liberman, 1990; Snow et al., 1998). Children who do not posses good word recognition skills will read slowly and/or inaccurately which is likely to result in poor comprehension (Lyon, Shaywitz, & Shaywitz, 2003; Torgesen et al., 1997). As children move beyond the early grades (K-3) reading is ideally used as a means of acquiring new learning (Chall, 1983). However,

without solid initial decoding instruction, children are likely to fall behind their typically-developing peers and the consequences are grim (Juel, 1988; Lyon, 2001).

For some children, reading difficulty is neurobiological in origin (Velluntino et al., 1996). These children are referred to as having a specific learning disability called dyslexia. Dyslexia is often misunderstood and educators may have attributed the cause of dyslexia to a visual deficit (Hudson, High, & Al Otaiba, 2007; Wadlington & Wadlington, 2005). However, dyslexia is language based and characterized by poor phonological processing (Lyon et al., 2003; IDA, 2007). Children with dyslexia generally have good listening comprehension, but tend to struggle with accurate and fluent single word reading (Adams, 1990; IDA 2000; Lyon, 1998; Lyon et al., 2003). Because these struggling readers have difficulty with phonological awareness tasks (Adams, 1990; Moats, 1994) or tasks that require them to detect the sound structure of words, they tend to have a weak foundation for learning an alphabetic writing system (Liberman & Liberman, 1990).

However, findings from early intervention studies indicate that children at-risk for reading difficulty as well as those who struggle with dyslexia or dyslexia-like tendencies benefit from instruction that is explicit, direct, systematic, and intensive (Torgesen, 2002; Vellutino et al., 1996). The following section will further explain the content of research-based reading instruction for at-risk and struggling readers.

Reading Instruction and Intervention for Struggling Readers

Adams (1990), after synthesizing reading literature, contended that explicit instruction in phonemic awareness is “invaluable” (p. 331), particularly for children who

display weak phonemic skills. Additionally, Brady and Moats (1997) purported that students with reading difficulties, such as dyslexia, need explicit instruction in the structure of the English language (i.e., phonetics, phonology, sound-symbol correspondences and their relationship to orthography, syntax, and text structure). Additionally, the National Reading Panel (NRP), building upon the previous work of the National Research Council (Snow et al., 1998) - concluded, after a two-year long meta-analysis of reading research, that *all* (emphasis added) children can benefit from explicit, systematic and sequential instruction in the areas of (1) phonemic awareness, (2) phonics, (3) fluency, (4) vocabulary, and (5) text comprehension strategies. The executive summary stated the following:

> …effective reading instruction includes teaching children to break apart and manipulate the sounds in words (phonemic awareness), teaching them that these sounds are represented by letters of the alphabet which can then be blended together to form words (phonics), having them practice what they have learned by reading aloud with guidance and feedback (guided oral reading), and applying reading comprehension strategies to guide and improve reading comprehension
>
> (p. 1)

Several researchers (Bos et al., 2001; Moats & Foorman, 2003; Spear-Swerling, 2007) have asserted that the findings of the NRP, along with other mentioned research reports (Adams, 1990; Snow et al., 1998; Taylor, Pearson, Clark, & Walpole; 1999; Taylor &

Pearson, 2001), have substantial implications for teacher knowledge and teacher professional development.

The Role of Teacher Knowledge

Moats (2004) proposed that teachers who teach reading need to understand the phonological structure of words and how to direct students' attention to the contrasts in speech-sound sequences. This is extremely important because one major problem of students who experience reading difficulty is insufficient phoneme awareness (Brady & Moats, 1997). Moats' (2004) added that teachers who know and understand phonemes and their distinction from letters (graphemes) and letter names are more capable of demonstrating this knowledge in their classrooms than teachers who do not have such understanding. More recently, Brady et al. (2009) provided a comprehensive list of needed teacher knowledge related to the concepts of phoneme awareness:

> (a) What the speech sounds of English are; (b) how phonological awareness develops and the characteristics of advanced levels of phoneme awareness; (c) what kinds of activities foster development; (d) what speech sounds are easier for children to segment and identify, as well as which are harder and why; (e) what constitutes an adequate level of phoneme awareness for literacy purposes; and (f) how weaknesses in phoneme awareness are evident in reading and spelling errors (p. 427).

Additionally, Moats (2009) purported that if systematic phonics instruction is a necessary component (not the only component) of early reading instruction, it is vital that teachers have an understanding of phoneme/grapheme (sound/symbol)

correspondences; particularly because English does not share the one-to-one phoneme/grapheme correspondence that other languages do (e.g., Finnish). Snow, Griffin, and Burns (2005) further supported teacher knowledge of orthography and morphology by stating: "to move beyond the basic limitations of phonics instruction, teachers must be able to appreciate and explain the morphemic structure of words" (p. 81). Wong-Fillmore and Snow (2000) also contended that teachers must know that spoken language is made up of units of different sizes, including the phoneme (smallest unit of sound), the morpheme (smallest unit of distinct meaning), words, sentences, and discourses. Additionally, Wong-Fillmore and Snow stated: "Understanding the basics of how one's own language works contributes to skillful reading and writing" (p. 10). The National Research Council (Snow et al., 1998) supported all of the above arguments by acknowledging excellent reading instruction in the primary grades to be that which is administered by highly knowledgeable and well prepared teachers.

Teacher Knowledge Research

Clearly, an argument can be made that teachers need to possess knowledge of basic language concepts related to phonology, letter-sound correspondences, orthography, and morphology, and a small but growing body of research has explored actual teacher knowledge of such concepts.

In one of the first and well-noted studies, Moats (1994) created a survey instrument titled *The Informal Survey of Linguistic Knowledge* (variations of the survey have been used in subsequent studies) which consisted of items that asked participants to define terms, locate or give examples of phonic, syllabic, and morphemic units, and

analyze words into speech sounds. Eighty-nine inservice teachers of varying backgrounds (speech pathologists, graduate students, general education, and special education teachers) were surveyed. Results indicated a lack of teacher knowledge, specifically highlighting weaknesses in the areas of terminology, phonic knowledge, and phoneme and morpheme awareness, all of which are needed to effectively instruct struggling readers. Teachers were unaware of morphological terminology such as *inflection*, and *derivational.* They were also unable to distinguish between a *compound* and *affixed* word form. The terms *phonetics*, *phonology*, and *phonics* were indistinguishable and though most had heard of *phonological awareness* they were unable to identify the number of phonemes in a word. Phonic knowledge was also weak with only 10 to 20 % of all subjects able to consistently identify consonant blends in written words. Even more surprising was that no one was able to consistently identify a consonant digraph. Only 30 % were able to explain when *ck* was used in spelling. Measures of phoneme and morpheme awareness revealed that only 27 % of subjects were able to identify the number of morphemes in a word. Only 25 % knew that the word *ox* has 3 speech sounds. Moats also noted other areas of misconception during course time and discussion. Some of the most common misconceptions are the following: (1) that the letters *ng* represent an amalgam of /n/ and /g/; (2) that the letter *x* corresponds to /z/; (3) that the silent letters in the words *comb* and *balk* should be pronounced; and (4) digraphs such as *th* represent a melting of two individuals phonemes rather than one unique phoneme.

In the past fifteen years, several studies (Bos et al., 2001; Cunningham et al., 2004; Spear-Swerling, Brucker, & Alfano, 2005) have been conducted aimed at measuring teacher knowledge of basic language concepts related to reading instruction as well as teachers' perceptions of teaching ability. Though not each study has been conducted in the same manner or even used the same tool of measurement, knowledge findings have been similar to the Moats' 1994 study. Bos et al. (2001) found that both preservice and inservice teachers who felt more comfortable with the language structure perceived themselves as more prepared to teach all children to read (including struggling readers). Additionally, both groups strongly agreed that K-2 teachers should know how to teach phonics, but their scores on phonics items indicated that they lacked basic knowledge. Another interesting finding from Bos et al. (2001) was that two-thirds of participants scored below 60% correct on the teacher knowledge measure. Cunningham et al. (2004) found that almost 20% of K-3 teachers were not able to correctly identify the number of phonemes in any of the eleven words on the phonological awareness task and only 60% were able to identify common irregular words. Cunningham et al. also measured teachers' perceived teaching abilities in the areas of phonological awareness, phonics, and children's literature. Ironically, in the domains of phonological awareness and phonics the researchers found that teachers were poorly calibrated, in fact the group that thought they had greater knowledge in phonological awareness actually scored lower than the group who perceived themselves as having less knowledge. The authors note the serious implications of teachers overestimating their knowledge by stating:

> Reading experts agree by consensus that if teachers are poorly calibrated and significantly overestimate their knowledge of important reading related information, they will not seek to acquire or be open to new constructs presented in the context of professional development. (p. 162)

Professional development that is meaningful, collaborative, and on-going has been said to be the most successful in terms of teacher growth and change (Joyce & Showers, 1988). To expose inservice and preservice teachers to knowledge needed to teach struggling readers and provide opportunities for guided practice, several studies (Bos, Mather, Friedman Narr, & Babur, 1999; McCutchen, Green, & Abbott, 2009; McCutchen & Berninger, 1999; McCutchen, Abbot et al., 2002; Moats & Foorman, 2003; Podhajski et al., 2009) have been designed to incorporate professional development (PD) programs as a means to increase teacher knowledge of basic language concepts related to reading.

Bos et al. (1999) studied the knowledge base of 11 K-3 general and special education teachers involved in an interactive, collaborative, a year-long PD and compared their performance to a group of 17 K-3 teachers who did not participate in the PD. The goals of the PD were to provide teachers with opportunities to "gain knowledge and understanding of how the English language is constructed and how speech sounds relate to print" (p. 228), to expose teachers to a greater understanding of the nature of reading and spelling difficulties and to offer research-driven suggestions for instruction and assessment. Bos and colleagues found that teachers involved in the PD benefited from the program with a statistically significant difference in teacher

knowledge and attitude (toward explicit instruction) scores from pre-PD to post-PD compared to the group that did not participate in the PD. Teachers involved in the PD rated the PD course (on average) to be "very valuable to extremely valuable" (p. 233) and excerpts from reflection journals revealed teacher connection with the material and student success. Student performance was also impressive with students of PD teachers making statistically significant gains in letter –sound identification (kindergarteners), reading fluency (second graders), spelling (kindergarteners and first graders) and dictation (kindergarteners, first graders, and second graders). The study provided a positive platform for PD to increase teachers' knowledge and attitudes about explicit instruction for children with reading difficulties.

Additionally, in a series of publications, McCutchen and colleagues (McCutchen & Berninger, 1999; McCutchen, Abbot et al., 2002; McCutchen, Harry et al., 2002) found that "those who know teach well" (McCutchen & Berninger, 1999, p. 215) when they implemented an extended (year-long) and collaborative PD focused on the core curriculum components mentioned by Brady and Moats (1997) (e.g., phonological awareness [PA], morphological awareness, reading and writing systems, motivation, and teaching children with reading difficulties) and provided teachers with research-based reading instructional techniques. The *Informal Linguistic Survey* by Moats (1994; Moats & Lyon, 1996) was used to measure teacher knowledge (pre-/post-PD). Extensive field notes were taken during 15 minute observations of reading instruction and students' learning was assessed on one or more measures (depending on grade level) of PA, word reading, comprehension, spelling, and composition fluency.

Pre-PD tests revealed that teachers' knowledge of linguistic constructs was relatively low compared to their knowledge of children's literature, yet scores on the post-PD tests were statistically significantly different. From observation data, PD teachers were engaged in more instruction directed toward the alphabetic principle than non-PD teachers. Students who had PD teachers showed more growth than their peers in non-PD classrooms in the following: Kindergarten - PA and orthographic fluency; first grade –PA, word reading, comprehension, spelling, composition fluency; second grade – composition fluency. The findings reported by McCutchen and colleagues revealed that a highly collaborative PD which allows teachers to build on areas of weakness and provides opportunities for practice and feedback has the potential to change teachers' instructional habits as well as increase student reading achievement.

Findings from the teacher knowledge studies above suggest that teachers do not necessarily have the sufficient knowledge needed to teach struggling readers, but that professional development can increase teacher knowledge which can in turn positively impact student reading achievement. However, none of these studies have measured knowledge of dyslexia. Therefore, because of the high incidence of dyslexia and dyslexia-related reading problems (NCES, 2007; IDA, 2007), it can be argued that teacher knowledge of dyslexia needs to be explored in conjunction with knowledge of basic language concepts.

Method

The purpose of the present study was to identify what teachers, teaching Kindergarten through 5th grade, know about various basic language concepts and

dyslexia and to examine teachers' perceived teaching ability in certain areas of reading instruction. The present study differs from previous studies (as mentioned earlier) in that knowledge of dyslexia was examined, therefore it is important to first define dyslexia as it was measured. The following definition, adopted by IDA, was chosen to reflect a more inclusive definition of dyslexia that incorporates spelling and other language processing difficulties, whereas more narrow definitions only encompass word recognition as the distinguishing characteristic (for a discussion on the definitions of dyslexia see Sanders, 2001).

> Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (para. 1, IDA, 2007)

In addition to dyslexia, the umbrella term "basic language concepts" includes phonology, phonemics, alphabetic principle/phonics, and morphology (affixes, roots, base words, and derivatives) is defined. For the present study definitions from the NRP (NICHD, 2000) are used to explicitly define each of the concepts: Lastly, "basic language concepts" is an umbrella term which includes the following elements of the English language: phonology, phonemics, alphabetic principle/phonics, and morphology

(affixes, roots, base words, and derivatives). Phonology is defined as a set of skills and explicit understanding of the different ways in which spoken language can be broken down and manipulated; phonemics is defined as the skills and knowledge related to the ability to notice, think about, or manipulate the individual sounds in words (phonemes); alphabetic principle/phonics will be defined as an understanding of how written letters are systematically and predictably linked to spoken sounds (phonemes) and an understanding of how to apply that knowledge for the purposes of decoding and reading; and morphology will be defined as an understanding of meaningful word parts (affixes, base words, derivatives) and their role in decoding and reading.

Lastly, the term "struggling reader" is defined as elementary-aged readers (in grades K-5) who experience unexpected reading difficulty resulting chiefly in inaccurate and/or slow word reading. The term "struggling reader(s)" has been specifically chosen, as opposed to more current phasing such as "striving reader" (Brozo & Simpson, 2007), not to reflect fixed ability but rather to parallel literature used to support the proposed studies.

In summary, the following research questions were constructed to guide investigation in the present study: What are the perceptions of teachers concerning their ability to teach typically developing readers, struggling readers, phonemic awareness, alphabetic principle/phonics and vocabulary? What do teachers know about phonology, phonemics, alphabetic principle/phonics, morphology, and dyslexia? What, if any, patterns exist in the data? Does experience in the classroom affect teachers' scores on

knowledge and skill portions of the survey? Is teacher knowledge related to perceived ability to teach such concepts?

Participants

Participants for the present study came from two data collections. The first group consisted of 99 K-5 teachers from 10 different school districts in a Midwestern state in the United States. The second group of participants included 86 K-5 teachers from a large urban school district in the Southwest United States. However, the researcher wanted to combine both groups of participants for analysis purposes to boost statistical power, therefore, the distribution of scores on the overall survey were analyzed. Before combining groups, descriptive statistics for the total knowledge and skill score for both groups was examined and used as the deciding factor for combination. First means, standard deviations, and 95% confidence intervals were examined, next an independent samples t-test was calculated. No statistical significant difference was found between the two groups' total survey scores, (t [185] = .275, $p <$ .784), therefore the groups were combined for a total of 185 teacher participants.

Forty-eight percent of the teachers were first year teachers, having zero years of formal teaching experience. Because almost half of the sample were first year teachers (n = 90), the mean number years of teaching experience was somewhat low (M = 6.30, SD = 8.85) though the range was large (0-38). The remaining 52% of teachers were systematically placed into groups by constructing a frequency distribution. The frequency distribution results are as follows: 28 (15%) teachers with 1-5 years of experience, 21 (13%) with 6-10 years, 26 (14%) with 11-19 years, and 20 (10%) with 20

plus years of teaching experience. With regard to educational background, 83% of teachers had only their bachelors and 17% had a Masters degree. The overwhelming majority of the sample were K-5 reading teachers (n = 174), however, there were 5 special education teachers, and 6 reading specialists.

Instrument

A survey designed to assess knowledge of basic language concepts was used. The survey was based on surveys and questionnaires used by other researchers in the field (Bos et al., 2001; Moats, 1994). Reliability for the survey scores from a previous study (Joshi et al., 2009) was found to be 0.903 (Cronbach's α). The survey included thirty-eight items total, however for the scope of the present study only those items which were related to basic language concepts were used for analysis, therefore the total number of items scored was 28. The remaining 10 items were related to comprehension instruction, which is beyond the scope of the present study. The 28 items used included: 5 items assessing perceived teaching ability of typically developing readers, struggling readers, phonemic awareness, phonics, and vocabulary (with regard to morphology); and 23 items assessing knowledge of and skills in the different basic language concepts of phonological awareness, phonemic awareness, phonics, and morphology. In a different research study, Binks et al. (in review) performed exploratory factor analysis on the survey used in the present study, and the following factors emerged: knowledge and skill each for phonological awareness, phonemic awareness, phonics, and morphology. Items of knowledge were multiple choice and items of skill were both multiple choice and short answer. An example of a multiple choice skill item is item 11: The participant is

asked to identify the word (out of six choices including "no idea") that has the same /i/ sound as the nonsense word "tife". Item 13a–g is an example of a skill item in which participants are asked to indicate the number of phonemes in various words (e.g., ship and fox). To measure teachers' knowledge and perceptions of the nature of dyslexia the remaining one item was divided into five sub-items chosen from a former 25-item survey used in previous dyslexia knowledge studies (Washburn et al., 2007, 2008). The survey was adapted using the Dyslexia Belief Index (Wadlington & Wadlington, 2005) and the IDA (2007) endorsed definition of dyslexia. The five sub-items were answered using a Likert-scale (1=definitely false, 2=probably false, 3=probably true, 4=definitely false). Table 13 displays a breakdown of all survey items used for analysis.

Table 13

Breakdown of Survey Items for Inservice Teachers

Target Area Assessed	**Item Number(s)**	**Used in Present Study (*Yes or No*)**
Phonology	18a-f, 22	*Yes*
Phonemics	10, 13a-g, 14, 16, 17a-b, 23, 28	*Yes*
Phonics	11, 12, 15, 19, 20, 21, 31, 32, 33	*Yes*
Morphology	18a-f, 24, 25, 34, 35a-g	*Yes*
Dyslexia	37a-e	*Yes*

Procedure

The first group was given the survey in ten different locations as there were ten different school districts who participated in the study. For the administration for group 1, the surveys were administered in a quiet environment in which the participants were not talking and answer-sharing was discouraged. The second group of participants was given the survey prior to a professional development session by an independent non-profit organization in the same large urban city in which the participants taught. Again the survey was administered in a quiet environment and answer-sharing was discouraged. For the administration of the surveys (in both groups), although there was no time limit, participants completed surveys in approximately 30 minutes.

Each item on the survey was scored either right or wrong and the total number of correct items was used for analysis along with total number of correct items for the following grouping categories: phonological awareness items, phonemic awareness items, phonics items and morphology items. Responses to dyselxia items were coded one through four starting with "definitely false" through "definitely true". Both descriptive and inferential statistical tests using SPSS and AMOS software were used to fully answer all research questions.

Results

Teacher Perceived Teaching Ability

First, teachers' perceived teaching ability to teach all kinds of readers (typically developing readers and struggling readers) as well as various concepts related to research based reading instruction for struggling readers (phonemic awareness, phonics,

and vocabulary) were examined. Means and standard deviations for all participants regarding perceived teaching ability for typically developing readers, struggling readers, phonemic awareness, phonics, and vocabulary are presented in Table 14. In all five categories more than 50% of teachers rated their perceived teaching ability as "very good": typically developing (66%), struggling readers (56%), phonemic awareness (58%), phonics (53%) and vocabulary (70%). In all five categories 5-16% of teachers rated themselves as "experts" whereas only 2-7% rated their teaching ability as "minimal". Because 48% of the sample was first year teachers, Pearson correlation analyses were computed to investigate if teachers' perceptions were associated with actual number of years teaching. It was hypothesized that first year teachers would rate their teaching ability lower than teachers with teaching experience. Small to moderate but significant positive correlations (with p-values < .001) were found for four of the five areas: (typically developing readers, r = .351; struggling readers, r = .325; phonemic awareness, r = .301; and phonics, r = .294). It can be suggested by examining the above correlational data that the degree to which teachers rated their teaching ability was associated with the number of years of teaching (i.e., teachers who had more experience rated their ability higher). However, a significant relationship did not exist between number of years teaching and vocabulary, in which 70% of teachers rated themselves as "very good". With further examination of descriptive data, ratings for all five sub-groups of teaching experience (i.e., 0, 1-5, 6-10, 11-19 and 20+) ranged from 2.78 to 3.00 (respectively) were found.

Table 14

Mean Scores and Standard Deviations of Perceived Teaching Ability for Inservice Teachers

Category	**Mean Score (SD in parentheses)**
Teaching Reading to Typically Developing Readers	2.79 (.626)
Teaching Reading to Struggling Readers	2.64 (.620)
Teaching Phonemic Awareness	2.63 (.688)
Teaching Phonics	2.63(.696)
Teaching Vocabulary	2.84 (.554)

Note. 1 = minimal, 2 = moderate, 3 = very good, 4 = expert

Teachers' Knowledge of Basic Language Concepts

Before analyzing patterns in the data related to individual basic language concepts, mean scores and corresponding standard deviations were calculated for the total survey score (on all items used for assessment minus perception items) as well as

the sub-grouping scores (phonological awareness, phonemic awareness, phonics, and morphology). Table 15 displays the means and standard deviations for all scores. Next, descriptive data were examined by individual concept beginning with phonological and phonemic awareness.

Table 15

Mean Scores for All Items Measuring Knowledge and Skill in Phonological, Phonemic, Phonics, and Morphological Concepts for Inservice Teachers

Category	**Item Numbers**	**Mean Percent Correct on all Items**
Phonology	18a-g, 22	86%
Phonemics	10, 13a-g, 14, 16, 17a-b, 23, 28	68%
Phonics	11, 12, 15, 19, 20, 21, 31, 32, 33	52%
Morphology	18a-g, 24, 25, 34, 35a-g	53%

Knowledge of Phonology and Phonemics

Syllable counting was an area of particular strength for teachers, with a mean percentage correct score for all syllable counting items at 93.24%. Ironically, only 45% of teachers were able to identify the correct definition of phonological awareness (e.g., *the understanding of how spoken language is broken down and manipulated*). Eighty-two percent of all teachers were able to correctly identify the definition of a phoneme and the mean percentage correct for all phoneme counting items was 68% with the

highest individual items at 93% for ship and 90% for "moon" and with "box" being the lowest at 24%. Despite the majority of teachers correctly defining "phoneme", only 29% of teachers were able to identify the correct definition of phonemic awareness. For a breakdown of all survey items assessing knowledge and skill of phonological and phonemic concepts, please refer to Table 16.

Table 16

Percentage of Teachers Correctly Responding to Survey Items Assessing Phonological and Phonemic Concepts

Item Number and correct answer (in italics)	**Mean**
10. A phoneme refers to:	82%
a. a single letter	
b. *a single speech sound*	
c. a single unit of meaning	
d. a grapheme	
e. no idea	
13. How many speech sounds are in the following words?	
a. ship *(3)*	93%
b. grass *(4)*	57%
c. box *(4)*	24%
d. moon *(3)*	90%

Table 16, continued

Item Number and correct answer (in italics)	**Percentage Correct**
e. brush *(4)*	58%
f. knee *(2)*	87%
g. through *(3)*	63%
14. What type of task would the following be?	63%
"Say the word 'cat'. Now say the word without the /k/ sound?"	
a. blending	
b. rhyming	
c. segmentation	
d. *deletion*	
e. no idea	
16. Identify the pair of words that begins with the same sound:	91%
a. joke-goat	
b. *chef-shoe*	
c. quiet-giant	
d. chip-chemist	
e. no idea	

Table 16, continued

Item Number and correct answer (in italics)	**Percentage Correct**
17. The next 2 items involve saying a word and then revering the order of the sounds. For example, the word "back" would be "cab".	
(a). If you say the word and then reverse the order of the sounds, 'ice' would be:	68%
a. easy	
b. sea	
c. size	
d. *sigh*	
e. no idea	
(b) If you say the word and then reverse the order of the sounds, 'enough' would be:	73%
a. fun	
b. phone	
c. *funny*	
d. one	
e. no idea	

Table 16, continued

Item Number and correct answer (in italics)	**Percentage Correct**
18. For each of the words below, determine the number of syllables:	
a. disassemble *(4)*	96%
b. heaven *(2)*	95%
c. observer *(3)*	97%
d. salamander *(4)*	97%
e. bookkeeper *(3)*	94%
f. frogs *(1)*	82%
22. Phonological awareness is:	45%
a. the ability to use letter-sound correspondences to decode	
b. *the understanding of how spoken language is broken down and manipulated*	
c. a teaching method for decoding skills	
d. the same as phonics	
e. no idea	
23. Phonemic awareness is:	29%
a. the same as phonological awareness	
b. the understanding of how letters and sounds are put together to form words	
c. *the ability to break down and manipulate the individual sounds in spoken language*	

Table 16, continued

Item Number and correct answer (in italics)	**Percentage Correct**
d. the ability to use sound-symbol correspondences to spell new words	
e. no idea	
23. Phonemic awareness is:	29%
a. the same as phonological awareness	
b. the understanding of how letters and sounds are put together to form words	
c. *the ability to break down and manipulate the individual sounds in spoken language*	

Teachers' Knowledge of Alphabetic Principle/Phonics

The mean percent correct for all alphabetic principle/phonics knowledge and skill items was 52%. Once again areas of strength required implicit skill, for example: 90% of teachers were able to identify the correct vowel sound in a nonsense word and 82% correctly identified a word with the "soft C" sound. However, syllable types proved to be difficult for teachers with only 45% correctly identifying words that had closed and final stable syllables and 26% an open syllable. Additionally, knowledge of two common phonics generalizations ("c" for /k/ and "k" for /k/) was relatively poor with 43% and 53% respectively. And as Moats' (1994) found, teachers in this study had difficulty correctly defining the term blend (only 52% choose the correct definition). Though teachers clearly did better at implicit skill phonics items, it was surprising that

few had explicit knowledge of terminology associated with phonics instruction, particularly since systematic phonics instruction has been supported by reading research (e.g., NRP).

Teachers' Knowledge of Morphology

Some researchers (Henry, 2005; Keifer & Lesaux, 2007) have made clear arguments for the inclusion of direct instruction that teaches various aspects of morphology, such as affixes and roots, for learning multisyllabic words and increasing reading vocabulary. Thus it was ironic, that teachers felt most prepared to teach vocabulary (M = 2.83) than any other area of instruction (including typically developing readers), yet their knowledge of word parts such as affixes and roots was low with the mean percentage correct for morpheme identification at approximately 54%. In Table 17 survey items related to morphology and percentages correct are displayed.

Table 17

Percentage of Teachers Correctly Responding to Survey Items Assessing Morphology

Item Number and correct answer (in italics)	**Mean**
a. disassemble *(3)*	5%
b. heaven *(1)*	20%
c. observer *(3)*	8%
d. salamander *(1)*	13%

Table 17, continued

Item Number and correct answer (in italics)	**Mean**
e. bookkeeper *(3)*	32%
f. frogs *(2)*	19%
24. Morphemic analysis is:	40%
a. an instructional approach that involves evaluation of meaning based on multiple senses	
b. an understanding of the meaning of letters and their sounds	
c. *studying the structure and relations of meaningful linguistic units occurring in language*	
d. classifying and recording of individual speech sounds	
e. no idea	
25. Etymology is:	49%
a. not really connected to the development of reading skills	
b. *the study of the history and development of the structures of meaning of words*	
c. the study of the causes of disability	
d. he study of human groups through first-hand observation	
e. no idea	

Teachers' Knowledge of Dyslexia

It has been suggested that teachers often have misconceptions about the nature of dyslexia (Hudson, High, & Al Otaiba, 2007; Sanders, 2001). Responses to the dyslexia sub-items (37a-e) confirmed such suggestions and were similar to findings from previous studies (Wadlington & Wadlington, 2005; Washburn, Binks, & Joshi, 2007, 2008). Mean scores and standard deviations of each dyslexia sub-item can be seen in Table 18.

Table 18

Mean Scores and Standard Deviations for Dyslexia Items for Inservice Teachers

Question	**Mean Score (SD in parentheses)**
a. Seeing letters and words backwards is a characteristic of dyslexia.	3.42 (.711)
b. Children with dyslexia can be helped by using colored lenses/colored overlays.	2.88 (.723)
c. Children with dyslexia have problems in decoding and spelling but not in listening comprehension.	2.86 (.877)

Table 18, continued

Question	**Mean Score (SD in parentheses)**
d. Dyslexics tend to have lower IQ scores than non-dyslexics.	1.74 (.885)
e. Most teachers receive intensive training to work with dyslexia children.	1.56 (.786)

Note. 1 = definitely false, 2 = probably false, 3 = probably true, 4 = definitely true

Ninety-one percent of teachers indicated either "probably or definitely true" to "seeing letters and words backwards is a characteristic of dyslexia". This finding is of particular interest because as Moats (1994) has stated "the scientific community has reached consensus that most reading disabilities originate with a specific impairment of language processing, not with general visual-perceptual deficits" (p. 82). Also, 71% reported that "children with dyslexia can be helped by using colored lenses/colored overlays". However, teachers' knowledge of dyslexia was more accurate on the remaining three sub-items: 74% indicated "probably or definitely true" concerning dyslexics problems with decoding and spelling but not listening comprehension; 82% indicated "probably or

definitely false" to "dyslexics tend to have lower IQ scores than non-dyslexics"; and 87% indicated "probably or definitely false" to "most teachers receive intensive training to work with dyslexic children". The findings from the dyslexia sub-items supported the notion that dyslexia is still misperceived despite current research.

Teaching Experience and Knowledge

As mentioned earlier, teacher experience, in this study, is defined as the number of years a teacher has spent teaching in grades K-5. As nearly half of the sample consisted of first year teachers (48%), the remaining 52% was grouped systematically by constructing a frequency distribution (Howell, 2007). Four other groups resulted from the frequency distribution: 28 = 1-5 years of experience, 21 = 6-10 years, 26 = 11-19 years, and 20 = 20 plus years of teaching experience. A one-way analysis of variance (ANOVA) was computed for the total score with experience as the fixed factor. The F value was not statistically significant, $F(4, 180) = 1.44$, $p < .222$ which indicated no significant differences existed among the group means for the total survey score. Additionally, one important assumption of ANOVA is that homogeneity of variance exists across group mean scores. A non-significant *p* value for Levene's test indicates homogeneity of variance across groups, whereas a significant *p* value ($p < .05$) indicates non-homogeneity of variance. The Levene's test for the current analysis was not significant at the .05 level ($p < .676$), thus homogeneity of variance can be assumed. To investigate an effect of experience on the four sub-groupings of scores (phonological, phonemic, phonics, morphological), a between-subjects MANOVA was performed. Using Wilk's Lambda, a statistically significant effect for teaching experience was

found: Wilks' $\lambda = .741$, $F(4, 180) = 3.492$, $p < .000$, $\eta^2 = .072$. Similar to ANOVA, one important assumption of MANOVA is homogeneity of variance. Box's M Test of Equality of Covariance Matrices test is used to evaluate the assumption. In this analysis, a non-statistically significant F-value indicates homogeneity of variance, whereas a significant *p* value ($p < .05$) indicates non-homogeneity of variance. For this analysis, the assumption of homogeneity of variance was met at the .05 level ($p < .180$). Follow-up univariate tests revealed statistically significant differences for three of the four knowledge and skill group scores: phonemic awareness ($F = 6.387$, $p < .000$, $\eta^2 = .124$), phonics ($F = 6.840$, $p < .000$, $\eta^2 = .132$), and morphology ($F = 3.390$, $p < .011$, $\eta^2 = .070$). Tukey's Honesty Significant Differences (HSD) post hoc analyses indicated that first year teachers had significantly lower group mean scores for phonemic awareness than teachers who had 6-10 and 11-19 years of teaching experience ($p < .000$). Additionally, first year teachers had significantly lower group scores for phonics than all other groups of teachers except teachers with 1-5 years of experience (6-10 [$p < .000$], 11-19 [$p < .000$], and 20+ [$p < .000$]). The last area of difference was the group scores for morphology in which first year teachers had significantly higher scores than teachers with 20+ years of experience ($p < .000$) only.

Relationships Between Teachers' Perceived Teaching Ability and Knowledge

To examine whether or not perceived teaching ability was related to demonstrated knowledge and skill, Canonical Correlation Analysis (CCA) using Structural Equation Modeling (SEM) by way of AMOS statistical software was employed. CCA is designed to analyze the relation between two sets of variables

(Tabachnick & Fidell, 2007). Fan (1997) contended that the SEM approach to CCA is beneficial because it provides the researcher with statistical significance testing of individual canonical function coefficients and structure coefficients, whereas other programs used to compute CCA (e.g., the SPSS CANCOR macro) are unable to give such information. Therefore, a SEM model was hypothesized and constructed using a Multiple Indicators/Multiple Causes (MIMIC) model. A MIMIC model is distinguishable by the fact that the latent variable has causal indicators and effect indicators; however, because CCA is symmetrical, the causal and effect variables can be switched (Fan, 1997). The structural model examined two sets of variables, the causal variable set included the five self perception items for typically developing readers, struggling readers, phonemic awareness, phonics, and vocabulary, and the effect variable set consisted of three sub-groupings of knowledge/ability scores – phonological /phonemics, phonics, and morphology. Phonological and phonemic scores were joined as one sub-grouping instead of two for this analysis because though phonological and phonemic knowledge and skills are not exactly the same concepts, phonological skills encompass a group of skills in which phonemic skills exists as often the last and most difficult of phonological skills (Birsh, 2005). The first model, when assessed using AMOS, was unable to produce a chi-square or another other relevant measures of fit. Therefore, the model was revised by constraining one of the three effect variables: phonological/phonemics (TPAW). It was hypothesized that this variable would be highly correlated with the causal variables because teachers often encounter terminology associated with phonological and phonemic awareness through various assessments and

curricula materials. However, as findings from previous studies (Bos et al., 2001; Cunningham et al., 2004; Spear-Swerling & Brucker, 2003) suggest, teachers' perceptions of how well they teach a concept is not always associated with their actual knowledge of that concept. Figure 3 on page 153 shows the model used for CCA.

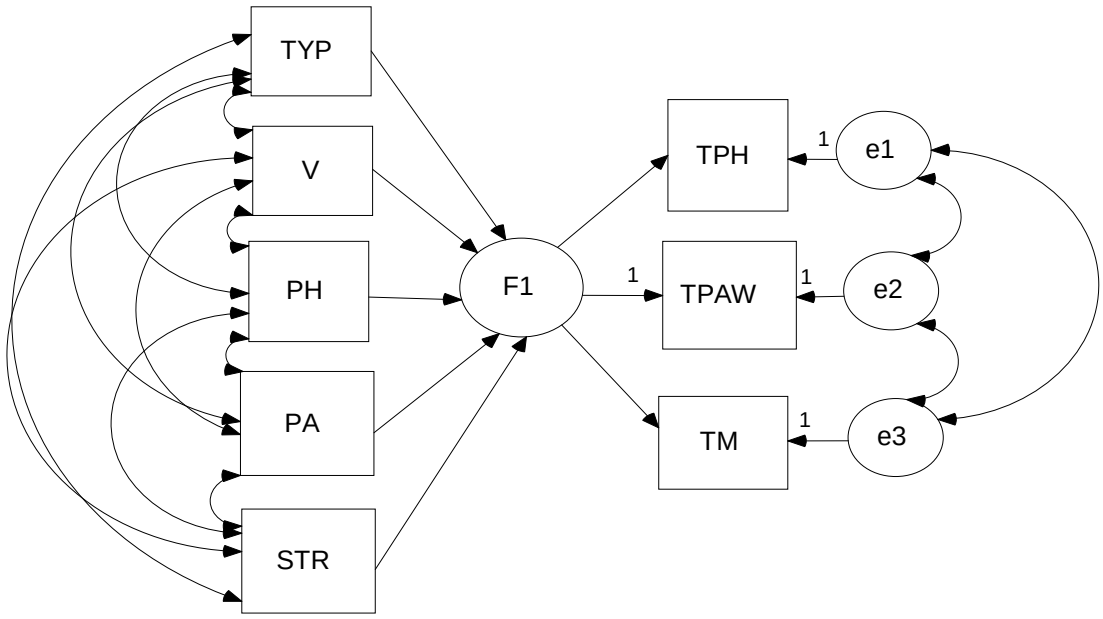

Figure 3

MIMIC Model for Inservice Teachers

Note. TYP, STR, PA, PH, and V are the five perception (casual) variables. TPH, PAW, and TM are the three knowledge (effect) variables. TYP = typically developing readers, V = vocabulary, PH = phonics, PA = phonemic awareness, STR = struggling readers, TPH = score for total phonics items, TPAW = score for total phonological and phonemic items, TM = score for total morphological items

When assessing whether or not a model is good, the *fit* is discussed. The first sign of good fit is a non-significant chi-square value, however, because the chi-square test of goodness of fit is subject to sample size other measures of model fit also need to be analyzed and reported (Thompson, 2000). The chi-square test was significant, $\chi^2(8) = 4.148$, $p < .844$, and the goodness-of-fit (GFI) index and the comparative fit index (CFI) were high (.994 and 1.00) respectively which indicates that the proposed model is a good fit for the actual data. One advantage of using SEM is that measures of standard error and significance are calculated and provided, whereas in traditional CCA such measures are absent. According to Thompson (1984), structure coefficients in CCA, are "particularly helpful in interpreting canonical results in terms of each variable's contribution to the canonical solution" (p. 24). Referring to Table 19 only two structure coefficients or standardized regression weights are significant for Canonical Function 1, PA → F1 and F1→M, and the variance explained (R^2) was 21%. To evaluate a second function, the regression weights for Canonical Function 1 are constrained to their reported values and the analysis is repeated (See Figure 4 on page 155 for the model). The chi-square value for Canonical Function 2 was $\chi^2(8) = .956$, $p < .999$. According to Johnk (2008): "a change in chi-square values and degrees of freedom is calculated in order to determine significance of fit between the two models…if the change is significant then the second canonical function is useful" (p. 677). The difference between the two chi-square values (Canonical Functions 1 and 2) is 3.192 with $df = 8$, therefore, using a Chi-Square table of Critical Values, the difference between Functions 1 and 2 is not statistically significant.

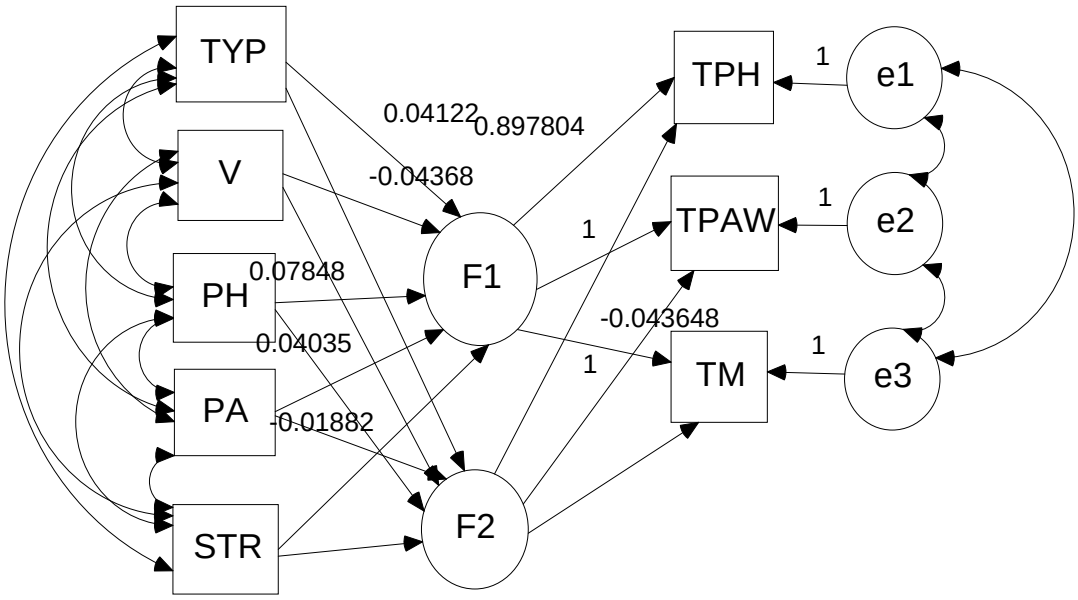

Figure 4

MIMIC Model with Function 1 and Function 2 for Inservice Teachers

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Note. TYP, STR, PA, PH, and V are the five perception (casual) variables. TPH, PAW, and TM are the three knowledge (effect) variables. TYP = typically developing readers, V = vocabulary, PH = phonics, PA = phonemic awareness, STR = struggling readers, TPH = score for total phonics items, TPAW = score for total phonological and phonemic awareness items, TM = score for total morphology items. Values presented for Function 1 are unstandardized regression weights.

Table 19

Structure Coefficients (standardized regression weights) for Function 1 for Inservice Teachers

	Canonical Function 1
Perceived Teaching Ability	
Typically Developing Readers (TYP)	.309
Struggling Readers (STR)	-.138
Phonemic Awareness (PA)	.329
Phonics (PH)	.642*
Vocabulary (V)	-.286
Skill/Knowledge	
Phonology/Phonemics (TPAW)	.412
Phonics (TPH)	.398**
Morphology	-.026

Note. * p<.05, **p< .01

In this study, the relationship between teachers' perceptions and knowledge was maximized in only one of three possible Canonical functions. However, only two of the eight paths were significant contributors for Canonical function 1. It seems that an underlying relationship may exist between teachers' perceived teaching ability and their actual knowledge, however, the variance explained is small (R^2 = .212). The SEM

analysis seems to be supported by the correlation matrix for this data (as depicted in Table 20), some of the teachers' perceptions about their teaching ability are significantly correlated with some areas of knowledge and skill, however, the associations are small (all *r*'s < .374) and yet even others are not significantly related (e.g., all five perceived teaching ability areas to morphology).

Table 20

Canonical Correlation Analysis Matrix for Inservice Teachers

	1	2	3	4	5	6	7	8	9
1. TYP	-								
2. STR	.717**	-							
3. PA	.606**	.578**	-						
4. PH	.599**	.547**	.784**	-					
5. V	.361**	.324**	.233**	.315**	-				
6. TPAW	.278**	.192**	.364**	.374**	.027	-			
7. TPH	.272**	.235**	.350**	.369**	.019	.563**	-		
8. TM	-.069	-.057	.022	-.038	.-016	.060	.003	-	
9. Function 1	.309	-.138	.329	.642*	-.286	.412	.398**	-.026	-

Note. Correlation is significant at * $p < .05$,** $p < .001$

Discussion

The purpose of this study was to examine the knowledge/skill base of teachers - both first year teachers and teachers with experience - with regard to basic language concepts and dyslexia as well as perceived teaching ability of related concepts. Knowledge and skill of basic language concepts such as phonology, phonics, and morphology have been identified as essential for teachers working with beginning as well as struggling readers (Brady & Moats, 1997; Moats, 1994; Moats, 2004). However, like previous studies involving inservice teachers (Bos et al., 2001; Moats, 1994; Moats & Foorman, 2003) results from the present study indicated that teachers, on average, lack explicit knowledge about several important concepts needed to teach struggling readers.

On average, teachers perceived their ability to teach typically developing readers, struggling readers, phonemic awareness, and phonics as "moderate". This finding was not particularly surprising as it does correspond to other literature. Cunningham et al. (2004) found that teachers had difficulty calibrating their knowledge, as teachers' perceptions about their skill and knowledge level with regard to children's literature and phonological awareness, on average, were different than their scores of knowledge in the perspective areas. Additionally, teaching experience, as described by number of years teaching was found to yield positive correlations for four of the five areas indicating that as the number of years a teacher taught increased so did the rating of perceived teaching ability. However, the majority of teachers, regardless of classroom experience, rated their ability to teach vocabulary high.

Teacher knowledge of basic language concepts was, however, varied. Teachers were most successful with items that required basic and implicit knowledge and skill, such as syllable counting. In fact, at least 90% of all participants got six of the seven syllable counting items correct. The only word that appeared somewhat problematic was "frogs" in which 80% of participants correctly identified there is only one syllable in the word. It was surprising that 20% of teachers incorrectly answered this question (all answered "2 syllables"), however, it could be attributed to possible lack of explicit understanding that a syllable is the "a spoken or written unit that must have a vowel sound" (Birsh, 2005, p. 578) or perhaps confusing concepts of spoken language with that of written language (i.e., the inflectional ending "s"). It is likely, though, that this group of teachers relied on implicit skill to count syllables. This finding is comparable to findings from Bos et al. (2001), Mather et al. (2001), and Joshi, Binks, Hougen, et al. (2009). However, as Moats (1999) contended, teachers cannot rely on their implicit skill/ability alone to teach reading, explicit teaching required explicit understanding. Though both syllable and phoneme counting tasks involved aspects of phonological awareness - phoneme counting – was a bit more problematic for teachers. Qualitative error analysis revealed that the majority of teachers were able to correctly identify some consonant and vowel digraphs. For instance, teachers correctly identified the number of phonemes in the words "ship" (92%), "moon" (89%), and "knee" (86%). However, words with more complex structure such as "through" and "brush" were more difficult, with only 62% and 57% (respectively) of teachers able to correctly identify the number of phonemes. And much like the results found in Moats (1994), the /ks/ sound for the

letter “x” proved to be difficult for teachers with only 24% able to correctly identify four phonemes in the word “box”. The discrepancy between syllable and phoneme counting scores is likely due to the widely accepted notion that phoneme counting is more difficult than syllable counting (Treiman & Zukowski, 1991). Additionally, errors in phoneme counting could also be attributed to the thought that teachers are operating on an orthographic level when attempting to dissect words into individual phonemes, as mentioned by Cunningham et al. (2004), in which teachers are counting letters in words as opposed to sounds (e.g., 5 phonemes for “grass” and 3 phonemes for “box”).

Items related to phonics knowledge, which required both explicit and implicit knowledge and skill, proved to be more difficult than items related to phonology. Teachers fared better with items in which implicit knowledge could be used to achieve the correct response(s). Lack of explicit phonics knowledge could be hypothetically attributed to several reasons: (1) teachers may have a different philosophical disposition to reading instruction (i.e., whole language or meaning-centered) (Bos et al., 1999, 2001); (2) teachers may use curricular materials that do not support explicit and systematic phonics instruction (Moats, 2007), therefore daily and repeated exposure to phonics principles is limited; and (3) professional development has either been limited or ineffective in helping teachers gain working knowledge of common phonics principles (McCutchen et al., 2009).

Items related to various aspects of morphology were the most challenging for teachers. In this study, teachers were asked to identify the number of morphemes in a set of words (13a-f) and identify any affixes or root words in another set of words. Teachers

did better identifying prefixes and suffixes than counting the number of morphemes in a given word. It is likely that the wording in the first set of words could have given teachers difficulty that did not have explicit knowledge of the definition of a morpheme, as the directions stated: "write the number of morphemes". This notion was reinforced by only 40% of teachers correctly identifying the definition of "morphemic awareness". The findings from the present study are similar to those of Moats (1994) in which graduate level teachers had great difficulty with various aspects of morphology, particularly identifying suffixes or endings.

Terminology and concepts related to reading instruction were also varied. While 82% of teachers were able to correctly identify the definition of a phoneme, only 29% of teachers identified the definition of phonemic awareness correctly. This was particularly surprising given the large amount of research made public on the effectiveness of phonemic awareness instruction for beginning and struggling readers.

The effect of teacher experience, as defined in the present study as number of years teaching, was also examined. Interestingly, no differences were found for teacher experience for the total knowledge and skill scores or for the phonological group scores. The mean scores for total knowledge and skill, on average for each teacher experience group, fell below two-thirds correct. On the flip side, phonological group mean scores were high (all above 85%) for all experience groups. This is likely due to lower level of implicit skill involved in correctly answering the phonological items (e.g., syllable counting). Statistical differences were, however, found for the phonemic awareness group scores, phonics group scores, and morphology group scores. First year teachers

displayed significantly lower phonemic awareness group scores (M = 61.75, SD = 19.43) than teachers who had 6-10 years experience (M = 75.17, SD = 18.57) and teachers who had 11-19 years experience (M = 79.67, SD = 14.24). It should be noted that teachers who had more than 5 years of teaching experience scored, on average, above 70% on the phonemic awareness group of items. Thus, it can be argued that teacher knowledge about a certain reading concept or skill may deepen with authentic classroom experience as well as reflection and analysis time, which is not always afforded in teacher preparation programs or in the early years of teaching (Putnam & Borko, 2000). Similarly, first year teachers scored significantly lower than teachers who had 6+ years of teaching experience on the phonics group of items. However, first year teachers had significantly higher scores than teachers of 20+ years on items of morphology. Nevertheless, all groups had mean scores that were at or below 61% for phonics and at or below 56% morphology, indicating that knowledge in both areas is weak regardless of experience. Thus, based on the findings from the present study, it could be argued that teachers' experience may strengthen knowledge of certain basic language concepts. However, as it is generally accepted in educational and social science research, many variables may exist outside the effect variable in measurement. As a hypothetical example, variables such as teacher efficacy, attitude, and exposure to professional development (in such concepts as measured above) may explain more variance than length of teaching experience.

An additional purpose was to investigate if teacher knowledge/skill and perceived teaching ability are related. Examination of relationships was done using

CCA via SEM. However, only two of eight paths for the first canonical function were statistically significant and none for the second canonical function were statistically significant. The paths which were significant for Function 1 pertained to teachers' perceived ability to teach phonics ($r = .642$, *critical ratio (CR)* = 2.616, $p < .009$) and their actual score on the phonics group of items ($r = .398$, *critical ratio (CR)* = 5.868, $p < .000$). Other variables, that were not statistically significant, but made moderate contributions to Function 1 were knowledge scores for phonics ($r = .398$) and phonological/phonemic awareness ($r = .412$). It appears that Function 1 maximized the relationship between the perception set of variables and the knowledge scores set of variables, with 20% of the variance is explained.

Finally, teacher knowledge about dyslexia was examined. This piece of the investigation differed from previous studies of teacher knowledge of basic language concepts. As findings from several research studies have indicated (Torgesen, 2001; Velluntio et al., 1996), children with dyslexia or dyslexia-like reading problems fare better when identified early and given appropriate intervention. However, the findings from the present study clearly support the common misconception that the core deficit in dyslexia is visual rather than phonological. This misconception alone, if not rectified, could lessen the chances that children with dyslexia or dyslexia-like symptoms receive the needed and appropriate instruction and intervention (High et al., 2007), particularly if teachers' are trying to intervene with techniques that have little or no research basis. Additionally, the overwhelming majority of teachers acknowledged that teachers receive little training in working with children with dyslexia. Therefore, teachers know that they

do not receive training, yet with the likelihood of 15-20% of individuals having dyslexia (IDA, 2007), it seems imperative that teachers, particularly those in the earlier grades (K-5) receive such education.

Limitations and Conclusions

The present study, however, does have several limitations. For example, the sampling technique, which due to limited resources was of convenience and not done systematically. Therefore, interpretation of the results must be done carefully and within the context of the study. Also, all of the data examined was based on a self-report measure. According to Cunningham, Zibulsky, Stanovich, and Stanovich (2009), measures of self-report for teachers where teachers indicate perceptions are not always an accurate picture of their actual teaching ability. Additionally, self-report measures are subject to "social desirability bias" (Dillman, 1978). Social desirability bias is attributed to individuals giving answers that are deemed more socially acceptable. For example, a teacher with five years of experience may rate her ability to teach phonemic awareness as "very good", because she feels that she should be "very good" at teaching by her 5th year of teaching.

Though the sample for present study is not large and the design is not flawless, the findings are similar to other studies of teacher knowledge. Thus, a trend appears to exist, in that teachers - on average - are able to perform implicit skills-related tasks but are unable to demonstrate explicit knowledge which is needed to interpret tests and assessments which can help inform instruction as well as direct struggling readers' attention to areas of improvement (Moats, 2009). Understanding this trend can help

inform educators and administrators involved in making decisions about continuing education endeavors such as professional development. Clearly teacher knowledge needs to be linked student reading achievement and a few studies have recently published positive findings (Brady et al., 2009; McCutchen et al., 2009; Piasta, Connor, Fishman, & Morrison, 2009) that indicated increased teacher knowledge through collaborative and on-going professional development have significantly impacted reading achievement, particularly for at-risk and struggling readers. However, at the present time, the picture of teacher knowledge and student achievement is piece-meal at best. A large, nation-wide study of teacher knowledge and student achievement could give researchers, educators, and administrators a better picture of the importance and impact of teacher knowledge.

CHAPTER V

CONCLUSIONS

Summary

A common theme has emerged from the results of the three conducted studies: teachers, preserivce and inservice as well as teacher educators, seem to lack knowledge, particularly explicit knowledge, concerning certain basic language concepts related to reading instruction needed to teach struggling readers. In study one, a systematic literature review of teacher knowledge of basic language concepts, both methodological quality and findings of 25 studies were reviewed, analyzed, and synthesized. Unfortunately, because the majority of reviewed studies had some methodological flaws that made generalizability difficult, a conclusive finding was not achieved. However, a trend among the descriptive findings concerning teachers' knowledge of basic language concepts (as reported specifically in 16 of the 25 reviewed studies) appeared to exist. Teachers had more success on survey/questionnaire items that required basic and implicit skill, such as syllable counting, but had less success responding correctly to items that required explicit knowledge and skill of alphabetic and morphological concepts – such as knowledge of phonics principles and morpheme identification.

In studies two and three teacher knowledge of basic language concepts and dyslexia was examined using the survey: *Survey of Language Constructs Related to Literacy Acquisition* (Binks et al., in press). Findings from both studies, though study one examined preservice teacher knowledge and study two examined inservice teacher knowledge, corroborate with findings from study one. For example in study two,

preservice teachers demonstrated success with syllable counting and even some phoneme counting items, but struggled to correctly identify reliable phonics generalizations and count and list morphemes. However, prior experience working with struggling readers and number of reading classes were not found to be significantly associated with their performance on the survey or any of the subtests of the survey (e.g., items related to phonics). Thus, it could be suspected that preservice teachers may not be receiving instruction and/or learning in their preparation courses knowledge that is necessary to teach struggling readers.

Additionally, in study three, inservice teachers also demonstrated some implicit phonological skill by accurately counting syllables, however, syllable counting has been found to be a very basic phonological skill (Liberman et al., 1974). On the other hand, teachers had more difficulty with advanced phonological skills like counting phonemes in words which were less transparent (e.g., *box, grass ,brush, through*). Inservice teachers also struggled to identify the correct definition for both "phonological awareness" and "phonemic awareness". And much like the preservice teachers in study two, morpheme counting and identification proved to be complicated.

Of additional interest was a predominantly negative relationship between preservice teachers' perceived ability to teach certain basic language concepts and their demonstrated knowledge. Such relationship information for inservice teachers, however, differed slightly with more positive relationships. Thus, by examining the data from studies two and three, it could be argued that preservice teachers are less accurate in their perceptions about teaching certain basic language concepts than inservice

teachers. Lastly, it appears that both preservice and inservice teachers hold the common misconception that dyslexia is visual perception deficit as opposed to a phonological processing difficulty. This misconception is worrisome because as High et al. (2007) and Sanders (2001) have argued, a misunderstanding of the nature of dyslexia can lead to delayed intervention of research-based methods.

Recommendations

One's ability to read is not only a necessary skill for success in life, but also a skill for survival in an increasing literacy diverse society (Braunger & Lewis, 2005; Leu et al., 2004; Neuman, 2001; Snow et al., 1998). Unfortunately, the consequences of reading failure are grim (Lyon, 2001) and the need for research-based reading instruction is crucial for all readers, but particularly for struggling readers. However, it appears, through the research conducted in studies one, two, and three in this dissertation that preservice and inservice teachers have not demonstrated, on average, the explicit knowledge and skills of phonemic awareness, phonics, or morphology, research-based reading concepts, that are needed to teach struggling readers. Though this is troubling, it can also be noted that findings from study one indicated that highly collaborative and on-going professional development and university curriculum focused on teaching teachers explicit knowledge and skills related to the structure of the English language can significantly increase teachers' knowledge. Therefore, it is suggested that teacher preparation and professional development not only include the teaching of research-based reading concepts, but preservice and inservice teachers are given meaningful and extended opportunities to practice and implement such concepts. Additionally,

education for all involved in the teaching of beginning and struggling readers on the truths of the nature of dyslexia is key. Such knowledge will not only help students receive intervention earlier, but will also help teachers make effective instructional decisions.

In conclusion, teachers in the early reading classroom need to be prepared to teach struggling readers. Therefore, I am in agreement with McCutchen and Berninger (1999) in that teachers ought to be able to use their knowledge of reading and research based instruction (and I would add reading difficulties such as dyslexia) to "develop their own effective lessons" (p. 216). However, it is not enough for teachers to be skilled readers themselves (Moats, 1994), and as stated earlier, teachers need a strong knowledge base in phonology, orthography, morphology and text structure and an understanding of the nature of dyslexia (Brady & Moats, 1997; Sanders, 2001).

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APPENDIX

Survey of Language Constructs Related to Literacy Acquisition

1. Please provide: a. highest degree you have obtained (e.g., B.S., B.A., M.S., etc.):_____
   b. Year obtained: _____
   c. Name of the Institution (e.g., University of Indiana): _____
   d. Please list the courses in teaching reading and language arts you have taken:

2. How would you rate your ability to teach reading to typically developing readers?

   a. minimal b. moderate c. very good d. expert

3. How would you rate your ability to teach reading to struggling readers?

   a. minimal b. moderate c. very good d. expert

4. How would you rate your ability to teach phonemic awareness?

   a. minimal b. moderate c. very good d. expert

5. How would you rate your ability to teach phonics?

   a. minimal b. moderate c. very good d. expert

6. How would you rate your ability to teach fluency?

   a. minimal b. moderate c. very good d. expert

7. How would you rate your ability to teach vocabulary?

   a. minimal b. moderate c. very good d. expert

8. How would you rate your ability to teach comprehension?

   a. minimal b. moderate c. very good d. expert

9. How would you rate your ability to teach children's literature?

   a. minimal b. moderate c. very good d. expert

10. A phoneme refers to:

a. a single letter b. a single speech sound c. a single unit of meaning d. a grapheme e. no idea

11. If tife is a word, the letter "i" would probably sound like the "i" in:

a. if b. beautiful c. find d. ceiling e. sing f. no idea

12. A combination of two or three consonants pronounced so that each letter keeps its own identity is called:

a. silent consonant b. consonant digraph c. diphthong d. consonant blend f. no idea

13. How many speech sounds are in the following words? For example, the word "cat" has 3 speech sounds 'k'-'a'-'t'. (Speech sounds do not necessarily equal the number of letters).

a. ship
b. grass
c. box
d. moon
e. brush
f. knee
g. through

14. What type of task would the following be? "Say the word 'cat.' Now say the word without the /k/ sound."
a. blending b. rhyming c. segmentation d. deletion
e. no idea

15. A soft c is in the word:
a. Chicago b. cat c. chair d. city e. none of the above f. no idea

16. Identify the pair of words that begins with the same sound:
a. joke-goat b. chef-shoe c. quiet-giant d. chip-chemist e. no idea

17. (The next 2 items involve saying a word and then reversing the order of the sounds. For example, the word "back" would be "cab.")

a. If you say the word, and then reverse the order of the sounds, ice would be:
a. easy b. sea c. size d. sigh e. no idea

b. If you say the word, and then reverse the order of the sounds, enough would be:
a. fun b. phone c. funny d. one e. no idea

18. For each of the words on the left, determine the number of syllables and the number of morphemes. (Please be sure to give both the number of syllables and the number of morphemes, even though it may be the same number.)

	# of syllables	# of morphemes
a. disassemble		
b. heaven		
c. observer		
d. salamander		
e. bookkeeper		
f. frogs		
g. teacher		

19. Which of the following words has an example of a final stable syllable?
a. wave b. bacon c. paddle d. napkin e. none of the above
f. no idea

20. Which of the following words has 2 closed syllables?
a. wave b. bacon c. paddle d. napkin e. none of the above
f. no idea

21. Which of the following words contains an open syllable?
a. wave b. bacon c. paddle d. napkin e. none of the above
f. no idea

22. Phonological awareness is:
a. the ability to use letter-sound correspondences to decode.
b. the understanding of how spoken language is broken down and manipulated.
c. a teaching method for decoding skills.
d. the same as phonics.
e. no idea

23. Phonemic awareness is:

a. the same as phonological awareness.
b. the understanding of how letters and sounds are put together to form words.
c. the ability to break down and manipulate the individual sounds in spoken language.
d. the ability to use sound-symbol correspondences to spell new words.
e. no idea

24. Morphemic analysis is:
a. an instructional approach that involves evaluation of meaning based on multiple senses
b. an understanding of the meaning of letters and their sounds
c. studying the structure and relations of meaningful linguistic units occurring in language
d. classifying and recording of individual speech sounds
e. no idea

25. Etymology is:
a. not really connected to the development of reading skills
b. the study of the history and development of the structures and meaning of words
c. the study of the causes of disabilities
d. the study of human groups through first-hand observation
e. no idea

26. Reading a text and answering questions based on explicit information found within the text describes:
a. inferential comprehension
b. literal comprehension
c. summarization
d. question generating
e. no idea

27. Questions that combine background knowledge and text information to create a response describes which of the following:
a. inferential comprehension
b. literal comprehension
c. morphemic analysis
d. reciprocal teaching
e. no idea

28. Which of the following is a phonemic awareness activity?
a. having a student segment the sounds in the word cat orally
b. having a student spell the word cat aloud
c. having a student sound out the word cat

d. having a student recite all the words that they can think of that rhyme with cat
e. no idea

29. Which of the following is **not** a reciprocal teaching activity?
    a. summarization
    b. question-generating
    c. using graphic organizers
    d. clarifying
    e. no idea

30. Which of the following is a semantic mapping activity?
    a. concept of definition word web
    b. hinks pinks
    c. writing a brief definition of different terms
    d. predicting
    e. no idea

31. What is the rule that governs the use of 'c' in the initial position for /k/?
    a. ‘c’ is used for /k/ in the initial position before e, i, or y
    b. the use of ‘c’ for /k/ in the initial position is random and must be memorized
    c. ‘c’ is used for /k/ in the initial position before a, o, u, or any consonant
    d. none of the above
    e. no idea

32. What is the rule that governs the use of 'k' in the initial position for /k/?
    a. ‘k’ is used for /k/ in the initial position before e, i, or y
    b. the use of ‘k’ for /k/ in the initial position is random and must be memorized
    c. ‘k’ is used for /k/ in the initial position before a, o, u, or any consonant
    d. none of the above
    e. no idea

33. Which answer **best** describes the reason for an older student’s misspelling of the following words? hav (for have) and luv (for love)
    a. the student spelled the word phonetically
    b. the student has not been taught that English words do not end in v
    c. the student is using invented spelling
    d. the student must memorize the spellings of these irregular words
    e. no idea

34. A morpheme refers to:
    a. a single letter
    b. a single speech sound
    c. a single unit of meaning
    d. a grapheme.

e. no idea

35. For each of the words on the left, please list the prefix, root, and suffix. (You may use a dash to represent "none." If two fall under one category, please list both.)

	prefix	root	suffix
a. undetermined			
b. uniform			
c. under			
d. unknowingly			
e. conductor			
f. disruption			
g. immaterial			

36. Comprehension monitoring would be considered similar to or the same as:

a. metacognitive awareness
b. examples and comparisons used to develop an understanding of an abstract idea
c. relating two or more sets of ideas
d. schema theory
e. no idea

37. The following questions relate to 'dyslexia' Please circle the extent to which you agree with the following statements:

1 = definitely false 2 = probably false 3 = probably true 4 = definitely true

a. Seeing letters and words backwards is a characteristic of dyslexia:
1 2 3 4

b. Children with Dyslexia can be helped by using colored lenses/colored overlays
1 2 3 4

c. Children with dyslexia have problems in decoding and spelling but not in listening comprehension
1 2 3 4

d. Dyslexics tend to have lower IQ scores than non-dyslexics
1 2 3 4

e. Most teachers receive intensive training to work with dyslexic children
1 2 3 4

38. What **percentage** of school-age children may have difficulty in learning to read?

39. What are the components of reading recommended by the National Reading Panel (NRP)

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Instructor, Dept. of Teaching, Learning & Culture, Texas A&M University, 2006-2010

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SELECTED PUBLICATIONS

Mc Tigue, E. M., Washburn, E. K., & Liew, J. (2009). Resiliency and reading: The role of self-efficacy in learning to read. *The Reading Teacher*, *62*(5), 422-432.

Binks, E. S., Washburn, E. K., & Joshi, R. M. (in review). Peter effect validated in reading teacher education. *Scientific Studies of Reading.*

SELECTED PRESENTATIONS

Washburn, E. K., Binks, E. S., & Joshi, R. M. (June, 2009). *Preservice teachers' knowledge of and beliefs about dyslexia.* Poster presented at the annual meeting of the Society for the Scientific Study of Reading, Boston, MA.