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Relationship of Students' Spelling Gains to Teacher Knowledge and Teacher Practice

Alison Puliatte

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Relationship of Students’ Spelling Gains to Teacher Knowledge and Teacher Practice

by

Alison Puliatte

A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

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This manuscript has been read and accepted for the
Graduate Faculty in Educational Psychology in satisfaction of the
dissertation requirement for the degree of Doctor of Philosophy.

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THE CITY UNIVERSITY OF NEW YORK
Abstract

Relationship of Students’ Spelling Gains
to Teacher Knowledge and Teacher Practice

by

Alison Puliatte

Advisor: Professor Linnea C. Ehri

This study examined the impact of classroom teachers’ linguistic knowledge and spelling instructional practices on Grade 2 and 3 students’ spelling gains over the course of one school year. The purpose of this study was to identify teacher level variables that impact student spelling gains. This study employed a correlational research design aimed at finding relationships between two independent variables and one dependent variable. The two independent variables were teacher instructional practices and teacher linguistic knowledge. Teacher level variables were identified through two measures, an Instructional Practices Questionnaire and a Linguistic Knowledge Survey. The dependent variable was the student spelling gain score which was measured by calculating gains made from a beginning of the year spelling pretest to an end of the year spelling posttest. Gains were measured in terms of the number of words spelled correctly. In addition, relationships between teacher knowledge and practices were examined. The participants included 32 classroom teachers (16 Grade 2 and 16 Grade 3), and 636 students (331 Grade 2 and 305 Grade 3).

Correlational analyses revealed a significant positive relationship between teacher total knowledge and classroom practices. In addition, significant and positive relationships were found between student gain scores and teacher phoneme knowledge, time spent in weekly spelling instruction, and teaching of spelling strategies. These results were found on a subsample
of students who scored less than 20 words correct on the pretest for Grade 2. HLM analyses revealed similar significant findings with the Grade 2 data. Correlational analyses revealed a significant relationship between gain scores and teacher phoneme knowledge for Grade 3 students. In addition, teachers did not perform well on measures of phoneme knowledge.

Results of this study show a relationship between teacher knowledge and practice and student spelling gains. There is a need for additional research to demonstrate a causal relationship between teacher variables and student gains.
Acknowledgements

Completing my dissertation has been a long time goal as well as an exciting and challenging journey. I have a deep sense of gratitude for my advisor, Dr. Linnea Ehri, whose expertise and guidance allowed me to complete this project. Her courses on literacy inspired this dissertation and I feel honored to have been given the opportunity to learn from her. She has supported me throughout this process and she has provided me with valuable feedback. Special thanks are given to my committee members Alpana Bhattacharya and Mark Lauterbach, and outside readers David Rindskopf and Joanna Uhry whose time and commitment have helped me improve my research.

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Chapter I Introduction

The Common Core Learning Standards for English Language Arts and Literacy adopted by New York State for implementation in the 2012-13 school year, place emphasis on reading, writing, speaking and listening. Within the writing standards, goals are set for spelling achievement on each grade level. According to the New York State Education Department’s Early Literacy Guidance document, by the end of second, students who are making adequate progress in writing should be able to correctly spell previously studied words (e.g., grade-level multisyllabic, decodable words; irregularly spelled content and high-frequency words), use spelling patterns (e.g., word families), and represent all the sounds in a word when spelling independently. By the end of third grade, students who are making adequate progress in writing should be able to correctly spell previously studied decodable and irregularly spelled words and spelling patterns.

The inclusion of spelling competencies in the Common Core Standards was not a surprise to educators. Elementary school teachers have included spelling instruction as part of their regular teaching practices for decades. Yet, the question many of these educators still ask is “What is the best method for teaching spelling?” In reviewing the research, it appears that many teachers continue to teach spelling following a traditional approach that involves memorizing lists of words. One purpose of the current study was to explore spelling instructional practices and compare different practices to student spelling gains to determine if some instructional practices produce greater gains than others.

The ability to spell words requires the ability to apply specific linguistic knowledge including: phonemic awareness, phoneme-grapheme correspondences (ability to connect phonemes to graphemes within the spellings of specific words), orthographic knowledge,
morphographic knowledge (understanding that particular letter clusters carry meaning), memory for specific words by applying knowledge of the spelling system, and analogy to known words (Ehri, 2000). This study looked at teachers’ levels of linguistic knowledge to determine if teacher knowledge impacted student spelling gains.

Theoretical models of the development of spelling are similar to theoretical models of reading development. Henderson’s (1990) developmental spelling theory is based on children progressing through stages, at different rates, from a reliance on sound to more pattern-based strategies. This model is divided into five stages: preliterate, letter name, within word pattern, syllable juncture, and derivational constancy. Henderson’s stages of spelling development are similar to Ehri’s (2005) phases of development for sight word reading. According to Ehri, children learn to form connections between the spellings of written words and their pronunciations and meaning in memory. There is a relationship between reading and spelling because sight word learning is enhanced by drawing attention to the spelling of written words. Ehri’s four phases of development identify advances that occur as children learn to read words by sight. The phases are pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic. According to Henderson and Ehri, spelling is a developmental process that occurs in stages or phases and the rate of progression from one phase to the next varies for each individual. Spelling ability develops over time with appropriate instruction and exposure to the language system.

Relationships between the ability to spell and read words have been found in a variety of studies. Both skills require knowledge of phonological, orthographic and morphological information (Berninger et al., 1998; Dreyer et al., 1995; Ehri, 2000; Foorman & Petscher, 2010; Morris, Bloodgood & Perney, 2003; Morris & Perney, 1984). In addition, students need to be
exposed to the spellings of words in order to spell them correctly, particularly in English whose spellings are variable and sometimes irregular. It is during their reading that much exposure occurs. The relationship that exists between reading and spelling achievement supports the comparisons made in the current study between theoretical models of spelling development and theoretical models of reading development.

Instructional practices impact spelling growth and greater gains have been found in students’ spelling achievement when spelling instruction follows research based practices (Berninger et al., 1998; Brown & Morris, 2005; Christine & Hollingsworth, 1966; Drake & Ehri, 1984; Ehri, Satlow & Gaskins, 2009; Foorman & Petscher, 2010; Graham, 1983; Horn, 1960; Joshi et. al, 2008-09; Morris et. al., 1995a; Morris et. al., 1995b; Schlagal, 2002; Templeton & Morris, 2001; Wallace 2006; Yee, 1969). The current study examined the spelling instructional practices of classroom teachers to see how instructional practices impacted students’ spelling gains. The study expanded on the existing research by examining the link between teacher knowledge, teacher practice and spelling achievement as suggested by Graham et al., (2008).

Past research has indicated that teachers need to have knowledge of English orthography to be able to teach reading and spelling effectively and to plan appropriate instruction (Carreker et al., 2010; Moats, 2009b; Moats & Foorman, 2003). Positive relationships have been found between teacher knowledge and instructional practices on students’ literacy gains (McCutchen et al., 2002; Moats & Foorman 2003; Piasta et al., 2009). The current study examined teachers’ levels of linguistic knowledge and its impact on student spelling gains. The majority of the teacher knowledge studies in the area of language arts have looked at reading development. Fewer have looked at spelling development. Therefore, the current study expanded on past
research findings by investigating the relationship between teacher knowledge and instructional practices to see how they impacted student gains in spelling.

The current study examined the impact of classroom teachers’ linguistic knowledge and instructional practices on Grades 2 and 3 students’ spelling gains over the course of one school year. The purpose of this study was to explore the relationship of teacher level characteristics on spelling gains of their students. The results of this study will help to inform teacher professional development training programs by determining the level and types of linguistic knowledge and instructional practices that lead to gains in student spelling.

Participants for this research study were solicited from suburban elementary schools in middle class neighborhoods. The sample size was 32 classroom teachers: 16 Grade 2 teachers and 16 Grade 3 three teachers. The student participants consisted of 636 students, 331 Grade 2 students and 305 Grade 3 students.

Classroom teachers administered two spelling tests to their students. A pretest was administered in the fall and a posttest was administered in the late spring. The words and example sentences for the tests were taken from the Words Their Way program and the Boder Test of Reading-Spelling Patterns (Bear, Invernizzi, et al., 1996; Boder & Jarrico, 1982).

Classroom teachers completed two measures. The Classroom Practices Questionnaire consisted of short-answer questions to gain an understanding of their instructional practices in spelling. Items for the questionnaire were developed by this researcher and are based on research findings on spelling instructional practices. The Linguistic Knowledge Survey consisted of multiple choice and short answer items that measured the teachers’ linguistic knowledge. Items for the survey were borrowed from various teacher knowledge surveys (Carlisle et al., 2009; Crim et al., 2008; Moats, 1994; Moats & Foorman, 2003; Moats, 2009b)
and combined to measure teachers’ knowledge of oral and written language including phonology, morphology, phonics, and orthography.

The research questions of this study are:

1. How much gain do students make in spelling in Grades 2 and 3?
2. What are teachers’ levels of linguistic knowledge?
3. What is the impact of teacher linguistic knowledge on student spelling gain?
4. What types of spelling instructional practices do teachers implement?
5. What is the impact of teachers’ instructional practices on student spelling gain?
6. Are aspects of teacher knowledge and instructional practices positively related?

The results of this study were used to test several hypotheses about the relationships between teacher knowledge and practice and student spelling gains. First, it was hypothesized that students will show growth in their spelling performance from the fall to the spring. Second, the level of teacher linguistic knowledge was expected to be low. Third, positive relationships between teacher knowledge and student spelling gains were expected. Fourth, the types of spelling instructional practices were expected to be varied, from no spelling instruction to daily instruction. Fifth, it was expected that positive relationships would be found between teacher practice and student spelling gains. Finally, positive relationships between teacher knowledge and instructional practices were expected.
Chapter II Literature Review

Development of Spelling

Prerequisite knowledge for spelling.

The ability to spell words requires knowledge of specific linguistic information and the ability to apply that knowledge. The information that is needed to spell words includes: phonemic awareness, phoneme-grapheme correspondences (sound-letter matching), orthographic knowledge, morphographic knowledge (understanding that particular letter clusters carry meaning), memory for specific words, and analogy to known words (Ehri, 2000). Orthographic knowledge refers to “knowledge of the legitimate letter sequences or spelling patterns in a written language” and phonemic awareness refers to the “conscious awareness of the phonemic segments within spoken words” (Morris & Perney 1984, p. 452-453).

According to Wasowicz (2010), phonological awareness skills of segmenting, sequencing, discriminating, and identifying phonemes play a critical role in spelling development. Students need to have knowledge of the sound-symbol relationship to be able to represent spoken language in written form. They need to be able to break down words into phonemes and then link the phoneme to their written form to be able to spell a word. Therefore, orthographic knowledge is also a critical skill in spelling development. The current study measured teachers’ knowledge of phonological awareness and orthographic knowledge through the Linguistic Knowledge Survey to determine the relationship between teachers’ knowledge and student spelling gains.

Berninger and Fayol (2008) classified spelling as a code that uses letters to represent words that are tied to a specific pronunciation and meaning. They identified three kinds of codes that contribute to spelling: a phonological code that is related to the sounds in spoken words, an
orthographic code that is related to the letters in written words, and a morphological code that is related to word parts at the beginning and end of words that impact meaning, tense, number or part of speech. Additional sources of knowledge that contribute to spelling include vocabulary knowledge (semantic features or meaning clues), phonotactics (permissible and probable sound sequences, patterns, and positions in spoken words), orthotactics (permissible and probable letter sequences, patterns and positions in written words), and syntax (part of speech for a word and the permissible word order of the language).

Stages of spelling development.

Henderson’s (1990) developmental spelling theory is based on children progressing through stages from a reliance on sound to more pattern based strategies. His model is divided into five stages—preliterate, letter name, within word pattern, syllable juncture, and derivational constancy. Since children progress at different rates through the stages, children in the same grade have the potential to be at different stages of development, therefore instruction needs to be individualized to meet the stage of development for each learner.

Henderson’s first stage of spelling development, the preliterate stage, occurs before children understand the alphabetic principle, that is, before they grasp the concept that letters are associated with sounds. Their writing is characterized by squiggles, random marks and copied letters. The typical grade range for this stage is pre-K to mid first grade. Treiman and Kessler (2013) argue that children’s prephonological writings are not as random as Henderson suggests. Rather, they found that children’s early writings tend to follow patterns of written words that children have been exposed to. For example, their writing, while not phonologically sound, does follow the patterns of their native language. They suggest that children develop a graphic memory for words and letters before phoneme-grapheme correspondences are made.
The second stage, letter-name, is the beginning of alphabetic writing. Children possess some understanding of phoneme-grapheme correspondence. It begins after a child has developed a stable concept of word. High frequency pre-primer sight words may be spelled correctly and children’s invented spelling at this stage typically involves a single letter representing a sound. Errors at this stage may include BIK for BIKE, CRT for CHART and JREZL for DRIZZLE. The typical grade range for the letter-name stage is Grade 1 to Grade 2.

In the third stage, within-word pattern, letter clusters are used to represent sounds and the learner shows a deeper understanding of English orthography. Most sight words are spelled correctly at this stage and invented spellings use short vowels and long vowel markers. Errors at this stage may include BIEK for BIKE, CHRAT for CHART, DOTID for DOTTED, and MUJORTEA for MAJORITY. The typical grade range for the within-word pattern stage is Grade 2 to Grade 4.

The fourth stage, syllable juncture, focuses on the place in words where syllables meet resulting in spelling changes that occur when inflectional endings are added to root words, possessive forms, and contractions (i.e., sit-sitting, body-bodies, can-can’t). Invented spelling errors occur at juncture points. Sight words may or may not be applied to spelling performance. Errors at this stage may include DOTED for DOTTED, DRIZZEL for DRIZZLE, and MEJORATY for MAJORITY. The typical grade range for the syllable juncture stage is Grade 3 to Grade 8.

The fifth stage, derivational constancy, concentrates on the morphological connections in English orthography where students learn that spellings are related to word meanings. For example, condemn/condemnation, discuss/discussion and music/musician. Errors at this stage may include HASEN for HASTEN due to the silent t, CONFESION for CONFESSION due to
the consonant sound change of ss from CONFESS to CONFESSION, and IMERSE for IMMERSE due to the lack of doubling (Ganske, 2000). The typical grade range for the derivational constancy stage is Grade 5 and above. Due to the overlap in ages for Henderson’s stages, it was expected that the developmental level of the students in the current study would vary from stage one to stage five depending on the development of the individual student.

The current study asked the question: What influences students’ progression through the stages of spelling development? The purpose of the current study was to investigate the impact of teacher knowledge and practice on students’ progression through the stages of spelling development. The study aimed to address the following question: Will students’ progress in spelling be related to their teachers’ linguistic knowledge and/or their teachers’ instructional practices?

*Strategy Approach.*

According to the strategy approach perspective to spelling development, stage theories for spelling development may oversimplify the actual process of spelling acquisition. The strategy approach perspective is a linguistically-based approach to spelling development that contrasts with stage theories by explaining that “rather than using certain types of information at some points in time and other types of information at later points in time, children use a variety of strategies from the beginning” (Treiman, 1998, p. 292). For example, children’s spellings reflect characteristics of writing that follow linguistic patterns (statistical frequencies). Exposure to these patterns influence children’s spelling development (Pollo, Treiman, & Kessler, 2008). According to stage theories, children in the preliterate stage of spelling development produce random sequences of letters to represent words. However, according to the strategy approach, this sequence of letters may not be random. Instead, they may actually be
representations of pairs of letters that they have been previously exposed to in written text such as in their name and environmental print. Children’s productions of letter pairs are related to the frequency of the pairs in print they are exposed to (Read & Treiman, 2013).

The strategy approach perspective argues that while phonological, orthographic, and morphological knowledge are necessary for spelling development, these types of knowledge may not be gained in discreet stages. Rather, this knowledge continually develops over time. Therefore, children who are purported to be in the beginning phonological stages of spelling development may actually have an orthographical and morphological knowledge base that assists them in spelling. Instruction that supports a strategy approach to spelling development would focus on a spelling curriculum that presents letter-sound relations, orthographic patterns and morphological patterns in a sequence that is age appropriate based on typical acquisition of patterns as well as spending more time on developing an understanding of sounds that are difficult to encode and less time on easier sounds (Bourassa & Treiman, 2009).

Although Treiman views the strategy approach as contrasting to stage theories, both views can be seen as being complementary to each other. While stage theories and the strategy approach vary on their beliefs of spelling development and acquisition, they support similar approaches to instruction. For example, both theories support explicit instruction in spelling patterns. In addition, both theories place an emphasis on teacher knowledge whereas teachers need to understand why children make specific spelling errors and how to correct the errors (Read & Treiman, 2013).

*Relationships between Reading and Spelling Words*

Both spelling and reading rely on multiple processes including phonological awareness and knowledge of orthography. As students progress through the stages/phases of reading and
spelling development, they become more automatic in both reading and spelling and this enables them to read and spell words quickly from memory. In order to develop automaticity, students need to have clear mental representations of previously read words to be able to automatically read and spell words. Spelling and reading rely on the same underlying linguistic processes. However, spelling places a greater demand on these processes because there is more attention to the individual letters of words than is needed for reading (Wasowicz, 2010).

Henderson’s stages of spelling development are similar to Ehri’s phases of development for sight word reading. According to Ehri (2005), sight word learning is a connection forming process. Children learn to make connections between the spelling of written words and their pronunciations and meaning in memory. “The connections are formed out of readers’ knowledge of the alphabetic system. This includes knowledge of grapheme–phoneme relations and phonemic awareness, that is, knowing how to distinguish the separate phonemes in pronunciations of words. This also includes knowledge of spelling patterns that recur in different words” (p.170). There is a relationship between reading and spelling because sight word learning is enhanced by drawing attention to the spelling of written words.

Ehri identified four phases of development to identify advances that occur as children learn to read words by sight. The phases are pre-alphabetic (similar to Henderson’s preliterate stage), partial alphabetic, full alphabetic (similar to Henderson’s letter-name stage), and consolidated alphabetic (similar to Henderson’s within word stage). During the pre-alphabetic phase, children know little about the alphabetic system, they do not form letter-sound connections to read words and they use visual features to remember words (i.e. environmental print). Children in the partial alphabetic phase learn the names or sounds of alphabet letters and use these to remember how to read words, they form connections between some of the letters and
sounds in words, but they lack full knowledge of the alphabetic system. Children in the full alphabetic phase learn sight words by forming complete connections between letters in spellings and phonemes in pronunciations, they know the major grapheme-phoneme correspondences and they can segment pronunciations into phonemes that match the graphemes. Children in the consolidated phase retain more sight words in memory, and grapheme-phoneme connections become consolidated into larger units including rimes, syllables, morphemes (the smallest meaningful units in words) and whole words. In order for children to reach the consolidated phase, they must have complete knowledge of the alphabetic system in order to form connections that bond spellings to pronunciations in memory which in turn will enhance their sight word learning and memory for vocabulary words (Ehri, 2005).

Relationships between the ability to spell and read words have been found in a variety of studies. Students’ ability to spell words has been found to be related to their ability to read words accurately (Ehri, 2000; Foorman & Petscher, 2010). Morris and Perney (1984) identified a relationship between spelling and word reading in first grade students. They found that a child’s ability to identify and write the sounds in spoken words predicted how well they could read words. Conrad (2008) compared the effects of practicing spelling and reading specific words on the orthographic representations in memory in typically developing readers in second grade. The results indicated that transfer from spelling to reading was greater than transfer from reading to spelling. The results of the study showed that spelling ability impacts reading ability whereas reading ability does not necessarily impact spelling ability. Berninger et al. (1998) examined the effects of spelling training on second grade poor spellers. The results of the study indicated that spelling training improved not only spelling but word reading as well. In a study comparing good and poor spellers, Dreyer et al. (1995) found that poor spellers have lower rates
of word-level reading skills, phonological awareness and initial knowledge of words. Morris and Perney (1984) showed that beginning of the year spelling ability was a good predictor of end of the year word reading \( (r = .68) \) and total reading \( (r = .61) \). They attributed this relationship to the children’s phonemic awareness and orthographic awareness because they are both underlying abilities needed to read and spell words.

As noted in the studies discussed above, a relationship exists between reading and spelling achievement. This relationship supports the current study’s comparison between theoretical models of spelling development (e.g. Henderson, 1990) and theoretical models of reading development (e.g. Ehri, 2005). In addition, the relationship between spelling and reading supports the need to investigate spelling instruction to see how to best meet students’ spelling needs to help them improve both their spelling and reading abilities.

*Spelling Instructional Practices*

*Paradigms of spelling instruction.*

Heald-Taylor (1998) discussed three paradigms of spelling instruction: traditional, transitional, and student-orientated. In the traditional approach, spelling words are presented to students in lists for students to study. The lists are typically derived from commercially produced spelling textbooks with a focus on phonics and spelling rules. It involves formal direct instruction, drills, memorization, imitation, rote learning and an emphasis on correctness. The transitional approach has two main features: an integration of spelling strategies (phonetic, graphic/visual, syntactic/word patterns, semantic/meaning) and the importance of reading in learning to spell. The transitional approach links spelling, reading and writing. Students learn to spell by integrating phonetic, graphic and syntactic letter patterns with semantics. With this approach, spelling is integrated with the students’ reading and writing across all subject areas.
and spelling words are selected from the students’ reading and writing material. For both the traditional and transitional approaches, words are presented in lists and are taught through direct instruction, spelling rules, study techniques and weekly tests. The transitional approach adds the component of word study techniques and interactive instruction. During word study activities, students sort and classify words according to phonetic, visual, meaning and derivational principles. In addition, with the transitional approach, students are pretested on the list of words at the beginning of the week and are required to study the words they spelled incorrectly on the pretest. The third approach, student-oriented, is modeled after a developmental view of spelling and uses reading and writing as the contexts for learning spelling. Spelling lists are generated individually based on the students’ level of spelling ability and from their reading and writing. Instruction in the student-oriented approach takes into account the needs and developmental stages of the students as well as the contexts of reading and writing processes. Like the transitional approach, word study is a common activity in the student-oriented approach.

A review of historic and contemporary literature on spelling instruction identified three views of spelling instruction: incidental, developmental word study and basal speller (Schlagal, 2002). Advocates of the incidental view argue that a spelling curriculum is not necessary because students learn to spell through reading and writing. Advocates of the developmental word study view believe that spelling should be taught “systematically in relation to individual development” (p.42). The basal speller view “argues that English spelling can be learned developmentally through the progressive study of some 3,000 words across grades two through eight” (p.45). Both the developmental word study and basal views support the developmental stage theories of spelling development. Schlagal supports the modified basal speller approach which utilizes the basal speller in a developmentally supportive approach by having the spelling
instruction match the students’ instructional level. In summarizing the historic research on spelling instruction, Schlagal identified 14 effective principles and practices for teaching spelling: learning spelling from word lists is more effective than learning words from content; spelling word lists should be created from frequency lists rather than content vocabulary; list should be differentiated by controlling the difficulty of lists by frequency and word length; lists should be organized according to linguistic principles of English spellings; the organization of the lists should have generalizability; orthographic patterns taught should be introduced in relation to documented developmental trends; the words and patterns that are taught should be periodically reviewed; the study of spelling words should be distributed in small amounts across the week; pretests should be used where students self-correct their errors and copy the words no more than three times each; a study method should be taught and practiced; students should have many opportunities for writing which will help to practice and apply their skills; in addition to regular spelling instruction, incidental spelling instruction should be used to meet individual needs, broaden understanding, and to assist students in applying what they learned; students should be able to read the words they are required to spell; and students should be guided in understanding words by their spoken and written patterns. In the current study, teachers were asked to complete a questionnaire about their instructional practices in spelling. The items from the questionnaire referred to several of Schlagal’s effective principles and practices for teaching spelling and to Heald-Taylor’s (1998) paradigms of spelling instruction.

*Instructional practices.*

According to Henderson (1990) and Ehri (2005), spelling is a developmental process that occurs in stages or phases and the rate of progression from one phase to the next varies for each individual. Spelling ability develops over time with appropriate instruction and exposure to the
language system. Because of the variation in the rate of acquisition of spelling skills, a variety of levels of spelling ability will exist in children in one classroom. This makes the job of the classroom teacher quite difficult because not only do they have to determine what is the best approach to teaching spelling, but they also have to decide how to address the varying levels of spelling ability present in their classroom. Approaches to spelling instruction vary from no formal instruction to rote memorization of words to interactive word sorts. Templeton and Morris (2001) view spelling as a process of conceptual learning rather than a process of rote memorization. “Spelling is a linguistic task that requires knowledge of sounds and letter patterns...” therefore, “explicit instruction in language structure, and specifically sound structure, is essential to learning to spell” (Joshi et al, 2008-09, p. 7). Because of spelling’s linguistic demands, spelling instruction should include instruction on speech sounds, sound-letter correspondences, word origins, and meaningful parts of words.

Classroom instruction in spelling varies depending on beliefs in spelling acquisition. Some approaches focus on rote memorization of spellings and rules while other approaches are more constructivist by incorporating hands on exploration of patterns and generalizations. In a survey looking at the spelling instructional practices of 355 grades 1-5 teachers, it was found that most teachers follow a traditional approach to spelling instruction (Fresch, 2003). The majority of the teachers responding to the survey (98%) spent time in spelling instruction and 73% believed in formal spelling instruction. The formal instruction included basal spellers and common word lists for the entire class. Although many teachers believed in differentiating word lists and using words from their students’ writing, they did not follow these practices due to lack of time and lack of teacher control in selecting instructional programs. The current study expanded Fresch’s (2003) study by investigating the instructional practices of classroom teachers...
to see if different practices yield different gains in spelling achievement. The study also looked at teacher knowledge to see if knowledge impacted instructional practices and student spelling gains.

Treiman and Kessler (2013) argue that in learning to spell, children first learn the salient graphic characteristics of written text. Next, children apply this graphic learning to phonemes and spellings. Explicit instruction plays an important role in spelling development. Since research supports that spelling is more of a linguistic skill than a visual skill, instruction should not focus on rote memorization of word lists. Instead, instruction should focus on explicit instruction in systematic phonics with an emphasis on both the correspondences between sounds and spelling and between spelling and sounds. Traditionally, phonics instruction emphasizes spelling to sounds correspondences, but does not emphasize sounds to spelling correspondences. Children should also be taught about using context to assist with spelling as this will help to address alternative spellings. Teachers should have a knowledge base of phonology to effectively teach spelling.

In a national survey of 405 elementary school teachers in New Zealand, McNeill and Kirk (2014) examined if teachers implemented research based spelling instructional practices in their classrooms. The results indicated that 70% of teachers used a published spelling program, 67% of teachers grouped their students based on spelling assessment results, 60% of teachers utilized individual spelling lists, 74% delivered explicit instruction in underlying spelling skills at least weekly, 74% taught phonics, 73% taught phonological awareness, 89% taught spelling rules and 98% taught proofreading.

Research in spelling instruction has found greater gains in students’ spelling achievement when spelling instruction follows research based practices. Templeton and Morris (2001)
recommend the following instructional practices to increase students’ orthographic knowledge which helps improve spelling and word recognition: instruction should be focused on word study, significant time needs to be spent on reading and writing tasks, invented spelling should be encouraged in young students, students should be encouraged to look for patterns to stress the importance of the visual comparison of words, an inductive or exploratory approach is effective for average students, struggling students require a deductive, systematic and direct approach, there should be instruction on the interrelatedness of spelling and phonics, morphology, and vocabulary as students get older, instruction should be differentiated and students should be assessed to determine their level of spelling knowledge, and teachers need to have an understanding and strong knowledge base of the English spelling system.

Examples of research based spelling instructional practices include direct instruction; teaching orthographic patterns; differentiated weekly spelling lists where the words are adjusted to the instructional level of the speller and organized according to linguistic principles of English spellings; presenting words in a pretest-teach-posttest format allowing students to self-correct their tests; words students misspell on the pretest should be included in their weekly spelling list; obtaining spelling words from a variety of sources including subject area content, students’ own reading and writing and spelling textbooks; keeping a log of students’ misspelled words for the students to practice; teaching study methods; the study methods should concentrate on the whole word, careful pronunciation, visual imagery, auditory and/or kinesthetic reinforcement, and over learning; presenting words in a list or column is more effective than presenting them in a sentence or paragraph; spending approximately 60-75 minutes on spelling instruction each week; games should be used to promote student interest; explicitly teach sound-spelling patterns to students; and teaching strategies and procedures to help students learn new words. Such
strategies and procedures include looking for visual patterns; creating analogies; incorporating word meaning; examining word structure for prefixes, suffixes, and roots; and looking for word families in words. (Christine & Hollingsworth, 1966; Ehri, Satlow & Gaskins, 2009; Graham, 1983; Horn, 1960; Horn, 1969; Invernizzi & Hayes, 2004; Joshi et al. 2008-09; Schlagal, 2002; Wallace 2006; Yee, 1969). In sum, spelling instruction should consist of explicit instruction in phoneme-grapheme correspondences, phonemic patterns, rules, elements of morpheme preservation and strategies for encoding irregular words. Words to learn need to be carefully selected based on the students’ stage of spelling development. Practice needs to be repeated consistently with immediate error correction (Reed, 2012). In learning the spellings of specific words, students need to be helped to fully analyze the systematic mappings between phonemes or syllables in pronunciations and graphemes or letter patterns in written words so that the spellings are amalgamated with pronunciations and retained in memory (Ehri et al., 2009). The current study identified the presence or absence of the above mentioned research based spelling instructional practices in classrooms. The relationship between the type of instructional practices implemented and student spelling growth was then compared to see if different approaches to instruction yielded different rates of spelling growth.

*Differentiated spelling instruction.*

Following a developmental spelling theory model of instruction, researchers have found success in differentiating spelling instruction by providing students with individualized instruction based on their level of spelling development. Spelling instruction should begin with a qualitative spelling assessment to determine the students’ instructional levels. After the instructional levels are determined, differentiated instruction through small group instruction and consistent, daily instructional routines should be provided (Invernizzi & Hayes, 2004). The
utilization of differentiated spelling instruction in a second grade classroom showed growth in student spelling achievement (Brown & Morris, 2005). Additional support for the use of differentiated spelling lists was found by Morris et al. (1995a). This year-long study analyzed spelling instruction and achievement in Grades 3 and 5. The results of the study indicated that low performing spellers did not make as much progress as higher performing students. They concluded that the results support the need for differentiated spelling instruction based on individual spelling achievement. Support for the utilization of differentiated spelling instruction based on the students’ spelling achievement level was also found by Morris et al.’s (1995b) examination of spelling instruction and achievement with third grade students.

Bear and Templeton (1998) identified three instructional practices which support spelling acquisition in a developmental spelling framework. First, students should be grouped by their level of word knowledge and then given instruction and words based on their stage of spelling development. Second, students should be given opportunities to examine known words. Third, students should be encouraged to find patterns and make generalizations among the words they examine.

In the current study, student spelling growth was compared to the presence or absence of differentiated spelling instruction to see if there was a relationship between spelling gains and differentiated spelling instruction.

*Impact of instruction on spelling gains.*

Spelling is a skill that should be taught because classroom instructional practices in spelling impact student spelling growth. In a meta-analysis of spelling instruction, Graham and Santangelo (2014) found that formal spelling instruction was superior to incidental/informal methods for learning to spell. In addition, increasing the amount of spelling instruction had a
positive impact on spelling performance. Formal spelling instruction enhanced students’ skills in phonological awareness, reading performance, word reading, correct spelling while writing and reading comprehension. Gains from explicit spelling instruction were maintained over time. In contrast, formal spelling instruction did not have a significant effect on reading fluency or students’ writing performance.

Foorman and Petscher (2010) showed that variations in improvements in student spelling were stronger at the classroom rather than the student level which suggests that instructional practices impact spelling growth. In addition, classrooms were significantly differentiated in the amount of average monthly spelling growth suggesting that classroom spelling instruction affects spelling growth. Explicit instruction in the alphabetic principal and alternations (alternate ways of representing the same phoneme) in third grade students resulted in improved spelling and transfer of spelling to written essays (Berninger et al., 2002). Graham et al. (2002) looked at the impact of teaching spelling to second grade poor spellers. They taught the students to spell words that frequently occur in the writing of second grade students. The teaching practices focused on two sources of information for spelling words: lexical knowledge (memory for the spelling of specific words) and knowledge of the spelling system. The activities used to teach spelling included word sorts, word building and peer practice activities. They found that the students receiving the spelling treatment made greater gains than the control group on spelling measures, writing fluency and word-attack. Therefore, both studies support the importance of spelling instruction by showing that spelling can be successfully taught, learned and transferred to novel reading and writing situations. The current study expanded on this idea by investigating which types of instructional practices contributed more to student spelling growth.
Studies have been conducted to examine the effectiveness of different approaches to spelling instruction. Drake and Ehri (1984) investigated the effects of pronunciation on spelling in fourth grade students. The results indicated that when special spelling pronunciations were taught so that correspondences between phonemes and graphemes were optimized (e.g., pronouncing chocolate as “choc-o-late”), the students remembered the spelling better than when the pronunciations of words were written in their phonetic (dictionary) form. These results support the theory that “children use their general knowledge of spelling-sound relations to store the spellings of specific words in memory” (p. 300). The current study explored this idea by investigating the relationship between phonics instruction and student spelling gains.

Shippen, Reilly and Dunn (2008) examined the effects of increasing the intensity of an explicit and systematic spelling program by comparing the spelling growth of 36 students ages 6-11 who received one lesson a day to students who received two lessons a day. The lessons followed a direct instruction format and focused on three main strategies: phonemic awareness, morphemic awareness (e.g., root words and affixes), and whole words. The same spelling program was used for both groups, the group that received one lesson a day completed 15% of the spelling program and the group that received two lessons a day completed 30% of the spelling program. The outcome measure used was the Test of Written Spelling 4th edition. The results of the study showed that while all students showed growth in their spelling ability with the teacher directed spelling instruction, there was not a significant difference found between the two groups. Therefore, the intensity as measured in time spent in instruction did not impact spelling growth. The current study explored these results by comparing the amount of time teachers spent in spelling instruction to their students’ spelling gains to see if increased time in instruction impacted student gains.
Abbott (2004) examined the effects of traditional and developmental spelling instruction on spelling achievement of average third-grade within-word stage spellers over the course of the year. Developmental spelling instruction is assessment-driven, differentiated small group instruction that seeks to develop knowledge of specific words and to generalize that knowledge to other words that share similar spelling patterns. Rather than traditional whole group instruction, word study is taught in small groups based on students’ developmental spelling levels and common instructional needs, as identified through assessment. During these lessons, the students have the opportunity to analyze spelling patterns, discuss vocabulary, and apply studied features to new words through reading and writing. The results of the study supported a developmental approach to spelling instruction. The results found that extended word-study spelling instruction better advanced students’ overall orthographic development than did traditional spelling instruction. The extended word-study group performed significantly better in transferring spelling knowledge to low-frequency words with similar orthographic structures. However, there was no significant difference between the two groups on spelling achievement. The lack of significant finding for spelling achievement was attributed to flaws in the assessment tools. It was noted that the gains in orthographic development should support spelling achievement for the developmental spelling group.

Foorman et al. (2006) investigated how instructional practices impact reading and spelling development for students in grades 1 and 2 in high poverty schools. The results showed significant effects of initial reading ability and teaching effectiveness on reading and spelling posttests. A high amount of time spent in structural analysis and vocabulary instruction in first grade resulted in high spelling achievement. However, in second grade the results were different. In this case, a high amount of time spent in structural analysis and vocabulary
instruction resulted in lower spelling achievement. Overall, they found that initial reading status was the strongest predictor of spelling achievement. Teachers were not found to have much of an impact on increasing student spelling outcomes. For highly rated teachers, the amount of time spent teaching grammar, mechanics and spelling did not impact spelling outcomes. However, for less effective teachers, the more time they spent teaching grammar, mechanics and spelling, the lower the spelling outcomes for high ability students. This may be as a result of poor instruction in which the less effective teachers generally had the students complete workbook activities and did not instruct the students on spelling patterns. The current study explored this claim by comparing different teachers’ approaches to instruction and their linguistic knowledge to see if these two factors impacted students spelling gains.

Since spelling and reading share similar linguistic processes through development, spelling instruction should involve a multiple-linguistic approach that incorporates phonological awareness, knowledge of orthography, vocabulary, morphological and semantic relationships, and mental images of words (Wasowicz, 2010). This current study examined the instructional practices of teachers to determine if they utilized a multiple-linguistic approach to their spelling instruction and how their practices impacted student gains.

Spelling instruction will improve spelling performance if the instruction is based on research based practices that have proven to be successful. “To strengthen the spelling skills of struggling readers, it [instruction] needs to include direct instruction and practice in spelling specific words and in analyzing regularities of the spelling system” (Ehri, Satlow & Gaskins, 2009, p. 187). According to Graham (1983), unsatisfactory spelling progress may be attributed to three factors. First, teachers rely on commercial materials whose practices are not based on educationally sound research. Second, instruction is not differentiated to meet the wide range of
spelling abilities and achievement. Third, instruction tends to be based on tradition rather than research based practices. When teachers select words for weekly spelling lists they need to consider what words to teach. “…spelling programs should concentrate primarily on a basic spelling vocabulary supplemented by instruction in essential phonic skills and spelling rules” (p. 562). Spelling instruction needs to be individualized; instruction needs to be planned, monitored and modified based on assessment; and students’ and teachers’ motivation and attitudes need to be considered when planning activities. The current study examined these claims by comparing different instructional practices to see how instructional practices varied between classrooms and how instructional practices impacted students’ spelling gains.

Assessment of Spelling

Calhoon et al. (2010) examined five spelling assessments to determine the orthographic qualities of the words on spelling tests to see if different tests measure the same orthographic knowledge. They found that the tests varied in their measurement of orthographic knowledge. Specifically, there was variability between the tests for the number of words represented in each syllable type, the types of syllables covered, consonant grapheme knowledge and vowel knowledge. They concluded that a single standardized spelling test is not sufficient for understanding the strengths and weaknesses of a student and diagnostic or research decisions should not be made based on a singular test. The current study examined the gains of student spelling performance over time. The purpose is not diagnostic. A single spelling test was used for a different purpose than what Calhoon investigated.
Teacher Knowledge

Types of knowledge needed to teach spelling.

Spelling ability depends on an awareness and knowledge of the rules and patterns of the English orthographic system. To be able to teach spelling to students, teachers need to instill this awareness and knowledge into their students. Teachers need to decide not only how to teach spelling, but what elements of spelling they need to teach their students. According to Moats (2009b), teachers need to have knowledge of English orthography to be able to teach reading and spelling effectively. “English orthography represents sounds, syllable patterns, and meaningful word parts (morphemes), as well as the language from which the word originated. Clear instruction is possible when the teacher can describe why almost any word is spelled the way it is (p. 385).” Effective spelling instruction involves teaching spelling as a linguistic skill (Bourassa & Treiman, 2009). The three main linguistic skills that contribute to spelling acquisition are phonemic awareness, orthographic awareness and morphological awareness. Instruction in these three linguistic skills supports spelling development. Therefore, teachers need to have sufficient knowledge in these linguistic skills in order to effectively teach spelling to their students.

In a meta-analysis exploring phonemic awareness and phonics, Ehri (2004) concluded that students need to develop alphabetic knowledge to be able to read and write new words. Alphabetic knowledge should be taught in a systematic phonics program to teach children to read and spell words. Students use their alphabetic knowledge to spell words by first writing the sounds they hear, then by remembering correct spellings of words. More advanced spellers learn and apply patterns that recur in words. As students learn to decode new words, they begin to form connections between the letters and sounds and they store these connections in their memory. The connections they form between spelling, meaning and pronunciation helps them to
read and spell words (Ehri, 2004). Since teachers need to teach these specific linguistic elements, they need to have a working knowledge of these elements. In the current study, teachers completed a Linguistic Knowledge Survey to determine their level of linguistic knowledge. Their level of knowledge was then compared to their students’ spelling gains.

Past research has indicated that teachers need to have knowledge of English orthography to be able to teach reading and spelling effectively and to plan appropriate instruction (Carreker et al., 2010; Moats, 2009b; Moats & Foorman, 2003). Spelling instruction encompasses instruction in phonological awareness (the ability to differentiate syllables from onsets and rimes and count, produce, blend, segment and manipulate the individual speech sounds in words), phonemic awareness (ability to differentiate letters from phonemes to assist with transfer from speech to print) and phonics (to learn spelling correspondences at sound, syllable and morpheme levels). According to Joshi et al. (2008-2009), “spelling instruction underpins reading success by creating an awareness of the sounds that make up words and the letters that spell those sounds” (p.6).

Teachers’ levels of linguistic knowledge.

However, teachers have demonstrated low levels of orthographic knowledge (Crim et al., 2008; Moats & Foorman, 2003). Crim et al. assessed teacher knowledge of early literacy development including phonological awareness and language structure. Specifically, they assessed the level of teachers’ knowledge in the areas of syllable identification, morpheme identification (morphemes are the smallest units of meaning in a word), and phoneme identification (phonemes are the smallest sound units in speech) using a modified version of the Moats Informal Survey of Linguistic Knowledge (Moats, 1994) for early childhood teachers of students aged 3-5. The results indicated that teachers had difficulty with counting syllables in
words (accuracy rate ranged between 67.5% and 95%) and with identifying the number of morphemes (accuracy rate ranged between 5% and 32.5% with 56% of the teachers leaving this section incomplete) and phonemes in words (accuracy rate ranged between 15% and 60% with 11% of the teachers leaving this section incomplete). The teachers were the most successful at identifying syllables and the least successful with morpheme identification.

Spencer et al. (2008) evaluated the phonemic awareness skills of speech-language pathologists (SLPs), kindergarten teachers, first grade teachers, reading teachers and special education teachers. The results showed that SLPs outperformed all other educators on the measure of phonemic awareness. In addition, the performance of reading and special education teachers was comparable to the kindergarten and first grade teachers which suggests that special educators did not bring greater phonemic awareness proficiency to their instruction. The findings suggested that the phonemic awareness skills of all educators must be improved and that SLPs could provide valuable information to other educators in the area of phonemic awareness. In addition, the training that SLPs receive provided them with a stronger knowledge base of phonemic awareness than the training that elementary and special education teachers receive.

Mather et al. (2001) examined the perceptions and knowledge of early literacy instruction of pre-service and in-service general educators to see whether inexperienced and experienced teachers differed in their perceptions about the role of explicit, code-based instruction in early reading, as well as their knowledge of language elements. They found that in-service teachers were more knowledgeable about the structure of language than pre-service teachers yet; both groups had insufficient knowledge about concepts of language structure. The pre-service group averaged 50% correct while the in-service group average 68% correct. Both groups of teachers did poorly on phoneme counting tasks yet they did well on syllable counting tasks. In summary,
they found that both groups of teachers did not have sufficient levels of knowledge of spoken and written language structure to be able to successfully teach children who have difficulties in learning to read.

In a study examining elementary school teachers’ linguistic knowledge and knowledge of dyslexia, Washburn et al. (2011) found that teachers’ results varied based on the type of skill being assessed. For example, syllable counting was an area of strength for teachers, with a mean percentage correct score at 93.24%. However, only 45% of teachers were able to identify the correct definition of phonological awareness while 82% were able to correctly identify the definition of a phoneme. The mean percentage correct for all phoneme counting items was 68%. The majority of teachers were able to correctly define ‘phoneme’, yet only 29% were able to identify the correct definition of phonemic awareness. The mean percent correct for all alphabetic principle/phonics knowledge and skill items was 52% while 90% of teachers were able to identify the correct vowel sound in a nonsense word. Teacher knowledge of word parts such as affixes and roots was low with the mean percentage correct for morpheme identification at approximately 54%.

Carreker et al. (2010) conducted two studies investigating teacher’s literacy-related content knowledge of phonemes, syllables and morphemes. The ability to identify appropriate instructional activities was assessed by the Spelling Instruction Assessment. Teachers were presented with student spelling errors and the teachers were asked to match appropriate spelling activities to address the errors. The results indicated that in-service teachers were better able to identify appropriate spelling activities and they had higher levels of content knowledge compared to pre-service teachers. The results showed that higher levels of content knowledge resulted in a better ability to select appropriate instructional activities. However, both groups did
not demonstrate a thorough knowledge of phonemes or morphemes. The second study measured
the effects of professional development on literacy related content knowledge and the ability to
identify appropriate spelling activities. The results indicated that professional development
increased teacher knowledge. Both studies showed that teacher literacy-related content
knowledge influenced teachers’ ability to identify the most appropriate spelling instructional
activities. The study was limited because it did not look at student gains in relationship to
teacher knowledge and practice. The current study expanded on the findings of this study by
investigating the relationship between teacher knowledge and instructional practice in spelling to
see how they impacted student gains in spelling.

Impact of teacher knowledge on student gains.

Past research has found mixed results of teacher knowledge on student literacy gains. Positive
relationships have been found between teacher knowledge and instructional practices on
student reading gains (Piasta et al, 2009; McCutchen et al., 2002). However, some research
found no significant effects of teacher knowledge on student reading gains (Carlisle et al., 2009).
According to Moats (2009a), “Teachers often have minimal understanding of how students learn
to read and write or why many of their students experience difficulty with this most fundamental
task of schooling (p. 387).” Teachers need to have strong linguistic knowledge to be able to
analyze student spelling errors to make determinations for remediation of those errors. “To
analyze students’ spellings, the teacher must be aware of the constituent sounds within words. In
order to assess the spellings of longer words and derivatives, the teacher must also understand
the structures within words, such as syllables, prefixes, and suffixes (Carreker et al.,2010, p.
149).” Therefore, teachers need to have adequate linguistic knowledge to appropriately plan
effective instruction.
The majority of the teacher knowledge studies in the area of language arts have looked at reading development, whereas fewer have looked at spelling development. The current study expanded past research by measuring teachers’ linguistic knowledge and its impact on student spelling gains. In addition, the current study investigated teachers’ application of instructional spelling practices. Because of the relationship between reading and spelling discussed earlier and due to the limited number of studies on teacher knowledge as related to spelling, past research on teacher knowledge related to reading will be discussed.

In a longitudinal study of reading instruction in high poverty schools serving minority students, Moats and Foorman (2003) examined the relationship between teachers’ knowledge and student achievement in 3rd and 4th grade students. They developed a teacher knowledge survey to assess levels of teacher content knowledge of language. The results indicated that teachers who were rated as more effective in their teaching techniques had students with higher reading outcomes. In addition, scores on the Teacher Knowledge Survey were related to student reading achievement. The Teacher Knowledge Survey scores predicted reading achievement in one of the two schools studied. The school that did not show a predictive relationship between teacher knowledge and reading achievement was most likely affected by a restricted range of scores on the teacher test due to many teachers scoring close to the ceiling on the test. The results from the Teacher Knowledge Survey indicated that teachers have significant misconceptions about sounds, words, sentences and principles of reading instruction. The teachers displayed difficulty with: the differentiation of speech sounds from letters; the ability to detect the identity of phonemes in words, especially when the spelling of those sounds is not transparent; knowledge of the letters and letter combinations (graphemes) that represent many phonemes; conceptualization of functional spelling units such as digraphs, blends and silent
letter spellings; the conventions of syllable division and syllable spelling; the linguistic constituents of a sentence; the recognition of children’s difficulties with phonological, orthographic, and syntactic learning; and comprehension of the ways in which the components of reading instruction are causally related to one another. They also found that teachers with high attendance at professional development sessions performed better on the teacher knowledge survey than those who attended some or none of the sessions. This shows that teachers’ content knowledge can increase with the professional development. In sum, they found a modest relationship between teacher knowledge, teaching effectiveness, and student outcomes. A shortcoming of this study was that they only examined student outcomes and did not consider prior student achievement in order to study student gains in reading. Looking at gains would have allowed them to determine whether teachers’ knowledge was the factor contributing to improved reading achievement. The current study examined student gains in an effort to control for prior spelling ability.

McCutchen et al. (2002b) studied the relationship between teachers’ reading content knowledge (literature and phonology), their philosophical orientation toward reading, their classroom practice, and their students’ learning. They studied kindergarten, first and second grade teachers’ knowledge of literature, which involved having to correctly identify real from fictitious titles of children’s literature, general knowledge, theoretical orientation to reading instruction, classroom practice, student learning and knowledge of phonology, which measured the ability to identify sounds within words, and other structural aspects of language. The results demonstrated that overall, teachers have little knowledge of language structure and phonology. The results indicated a relationship between teachers’ content knowledge and the instructional practices they used for sounds and letter-sound relationships. A relationship was also found
between kindergarten teachers’ phonological knowledge and explicit instruction in the alphabetic principal and their students’ end of year reading achievement. However, a relationship between teacher knowledge and student performance was not found in the first and second grade sample.

Spear-Swerling and Brucker (2004) examined the word-structure knowledge (graphophonemic segmentation, syllable types, and irregular words) of novice teachers and the effects of teacher training on student performance. The results of the study demonstrated that instruction for teachers on word-structure resulted in greater gains in both the teachers’ knowledge and their students’ reading performance. The results showed that the knowledge the teachers acquired as part of the teacher training provided in the study influenced the teachers’ ability to teach word decoding effectively. The results supported the view that teachers must demonstrate knowledge of word structure in order to effectively instruct their students.

Spear-Swerling and Zibulsky (2014) compared elementary school teachers’ knowledge base for reading instruction to how they would chose to allocate time in a two hour language arts block. Teacher knowledge was assessed through the Teacher Knowledge Survey which assessed teachers’ knowledge for assessing and teaching phonemic awareness and phonics as well as their knowledge for assessing and teaching fluency, vocabulary and comprehension. Teachers’ time allocation for the language arts block was assessed through the Language Arts Activity Grid which required teachers to report what kinds of activities they would teach and how long they would devote to each activity. Results indicated that many teachers did not allocate time in a manner that supports research-based recommendations. For example, they allocated little to no time to phonemic awareness, phonics, vocabulary and reading comprehension. In addition, teachers’ level of knowledge of phonemic awareness and phonics correlated with the amount of time they allocated for phonemic awareness and phonics instruction. Therefore, the higher the
teacher levels of phonemic awareness and phonics the more time they would spend in instruction in these areas.

Piasta et al. (2009) examined first grade teachers’ knowledge about language and literacy concepts to see if this knowledge related to instructional practice and to their first grade students’ word reading gains. The teachers averaged only 52% correct on the Teacher Knowledge Assessment which measured teachers’ understanding of English phonology, orthography, morphology, concepts of literacy acquisition and instruction. Results did not show that teacher knowledge alone affected students’ reading gains. Instead, results showed that student gains were predicted by the interaction between teacher knowledge and the amount of time the teacher spent providing explicit decoding instruction. Specifically, when teachers provided the same amount of time in explicit instruction, the students of teachers with the higher level of language and literacy knowledge showed greater gains in word reading than students of teachers with lower levels of language and literacy knowledge. In addition, “the more time teachers with low knowledge scores spent in explicit decoding instruction, the weaker were their students’ spring word reading scores” (p. 242). Also, teachers with high knowledge scores who spent less time in explicit instruction did not result in greater student gains. Therefore, teacher knowledge combined with instructional practices were found to have an impact on students’ word reading gains; “the quality of decoding instruction is the mechanism by which teacher knowledge influences student word reading gains” (p. 243). The results of this study showed that not only teacher knowledge, but how teachers apply that knowledge influence student gains. The current study addressed this finding in the area of spelling by examining the influence of teacher knowledge and instructional practices on student gains.
Carlisle et al. (2009) examined the effect of teacher knowledge of early reading on grade 1-3 students’ reading achievement gains in the areas of word analysis and reading comprehension. The results showed no significant effects of teacher knowledge on student reading gains. Only third grade students’ improvement on reading comprehension was marginally significant. The authors inferred that the lack of effect of teachers’ reading knowledge may have resulted from the teacher and student measures utilized in the study. They proposed that the content of the tests might not have captured the knowledge teachers need to teach reading. The study was limited because it did not measure classroom teaching practice and how teachers applied the knowledge they possessed. The current study addressed this limitation by examining the relationship between teacher knowledge and practice on student spelling gains.

Graham et al. (2008) surveyed 169 teachers in grades 1, 2 and 3 on instructional practices they employed for spelling and the types of adaptations they made for struggling spellers. The results showed that almost all of the teachers reported teaching spelling. They reported spending an average of 90 minutes per week teaching spelling. Only 2% of teachers reported not teaching spelling at all. Ninety percent of teachers reported that they expected their students to master a set of spelling words each week; 66% of the teachers used commercial spelling textbooks to select the spelling words; 37% of teachers selected their words from basal readers, 30% from the material students read, 26% from student writing, and 14% from student self-selection. The teachers reported utilizing a variety of approaches to teach spelling including: praise, phonics, phonological awareness, mini-lessons, teacher feedback on misspellings, spelling games to teach skills and strategies, spelling rules, encouraging invented spelling, teaching strategies for unknown words, student conferences, spell checkers, peer assistance, proofreading, word sorts, re-teaching, and reinforcement and motivational strategies. The teachers reported that 27% of
their students have difficulty with spelling. However, 42% of teachers made virtually no adaptations for weak spellers. The authors questioned whether the limited amount of teacher adaptations was due to the teachers’ lack of knowledge of spelling development and spelling instructional strategies as well as their lack of knowledge of English orthography. They suggested future research examining the link between teacher knowledge, teacher practice and spelling achievement which the current study will address. The current study utilized several of the same questions used by Graham et al. Therefore, the teachers’ reports of their instructional practices from the current study can be compared to Graham et al.’s results.

McCutchen et al. (2002) examined the relationship between teacher knowledge of phonological and orthographic awareness, literacy instruction and kindergarten and first grade students’ literacy development. Teachers’ knowledge of the structure of language was assessed with the Informal Survey of Linguistic Knowledge developed by Moats (1994). Teachers’ literacy practice was assessed through observations of teachers’ teaching literacy in their classrooms. Students’ literacy development was assessed throughout the school year in the areas of phonological awareness, listening comprehension, orthographic fluency, reading comprehension, spelling, composition and word reading. The results indicated that the greater the teacher knowledge and the stronger the teacher practice, the greater the student gains. This study provided professional development for the teachers focusing on phonology, phonological awareness and balanced reading instruction. The results showed that improving teacher knowledge resulted in increased gains for the students. Specifically, teacher time spent in explicit instruction and increased teacher knowledge was significantly related to student growth in phonological awareness, orthographic fluency, word reading, reading comprehension, reading vocabulary, spelling, and composition fluency. Another promising finding of the study was that
teacher knowledge of language improved over the course of a two week professional
development workshop, thus indicating that professional development can be effective in
improving student gains.

The current study examined teacher’s linguistic knowledge. According to Moats (2009b,
pp. 385-386), “recognition of prefixes, suffixes, roots, and parts of compounds, and recognition
of the morphological structure of words to which inflections have been added, facilitates word
recognition, access to word meaning, recall for spelling, and ultimately, comprehension.” Since
“English is a morphophonemic or “deep” alphabetic orthography, its spellings map onto speech
sounds quite predictably, although correspondences are complex and variable” (p. 381).
Therefore, the teacher needs to have adequate linguistic knowledge and be able to relay this
knowledge to their students.

Teacher knowledge impacts instructional decision making. However, teachers may have
some misunderstandings about appropriate methods of spelling instruction. Vallecorsa et al.
(1985) found that teachers were able to identify research supported spelling practices, but they
had difficulty identifying non-research supported practices. Therefore, the teachers employed
both research supported and non-supported methods of spelling instruction. The current study
explored this idea by examining the relationship between teacher knowledge and instructional
practice.
Chapter III Pilot Study, Hypotheses and Rationale

Pilot Study

The pilot study examined the influence of teacher linguistic knowledge and instructional practices on student spelling gains. The sample for the study consisted of 10 elementary school teachers and 177 students from two elementary schools in one town. The students were in Grades 3, 4 and 5. The students were administered a spelling pretest and four months later, a posttest by their classroom teacher. Each test consisted of 40 words. The words and example sentences for the tests were taken from the Morrison-McCall Spelling Scale (Morrison & McCall, 1923). This scale consists of eight lists of 50 words intended to measure the spelling ability of students in Grades 2 to 8. Each list is of equivalent difficulty and the words are arranged in order of ascending difficulty. The grade norms, in terms of the average number of words spelled correctly, are: Grade 3- 18 words, Grade 4- 24 words, and Grade 5- 30 words. Two lists were randomly selected from the 8 lists. One list was used as the pretest and the second list was used as the posttest. To address the different grade levels participating in the study, students in Grade 3 were administered words 1-40 and students in Grades 4 and 5 were administered words 11-50 because the words were ordered by difficulty.

Students’ spelling skills were assessed in the fall (pretest) and four months later (posttest) during the 2011-12 school year. The first test was administered during the first week of September; the second test was administered during the last week of December. The classroom teachers administered each test to their entire class in one sitting. The teacher pronounced each word, used it in a sentence and pronounced it a second time before the students recorded the word. All teachers used the same sentences for each word. Students received one point for each whole word spelled correctly. To maintain the anonymity of the students, the teachers assigned a
code to each student and recorded the code on the student tests. Student names were not recorded on the tests.

Each teacher completed a Classroom Practices Questionnaire consisting of 22 short answer questions to gain an understanding of their instructional practices in spelling. The questions focused on the teachers’ general assessment of their students’ spelling abilities, how the teachers select spelling words for their students, how they deliver and plan spelling instruction, and how they apply their content knowledge in an instructional setting.

A Linguistic Knowledge Survey consisting of 23 multiple choice items was administered to the teacher participants as a measure of their linguistic knowledge. Items for the survey were borrowed from various teacher knowledge surveys (Carlisle et al., 2009; Crim et al., 2008; Moats, 1994; Moats, 2009b; Moats & Foorman, 2003) and combined to measure the teachers’ knowledge of oral and written language including phonology, morphology, phonics, and orthography.

The results of the pilot supported past research demonstrating that instructional practices impact spelling growth (Berninger et al., 1998; Foorman & Petscher, 2010; Joshi et. al, 2008-09). The pilot study yielded a positive, though not significant, correlation ($r = .281$) between classroom instructional practices and 4 month spelling gains. The effects of teacher instructional variables on student spelling gains indicated that teachers who followed the research based practices of using spelling lists, using differentiated lists according to students’ spelling levels, using a posttest, using phonics instruction, and spending time in spelling instruction exhibited higher gain scores than teachers who did not follow these practices. Although the results were not statistically significant, the correlations were positive. It is possible that the results were not
significant due to the low number of participants and short amount of time between the pre and post-tests.

Regarding the effects of teacher knowledge on student spelling gains, the pilot study results demonstrated low teacher scores on the Linguistic Knowledge Survey. On average teachers scored only 60% correct on the total survey. They scored 90% on syllable counting, 37% on phoneme counting, 64% on phoneme matching, 70% on spelling conventions, 63% on prefix/suffix identification, and 38% on morpheme counting. The pilot study found a very low correlation, close to zero, \( r = .037 \) between teacher’s total linguistic knowledge and student spelling gains. It is possible that the correlation would have been stronger if there were more participants in the study and if the posttest was administered more than four months after the pretest to allow for additional student growth. The small number of teachers participating in the study also limited the power of the analyses in the study. The current study sought to expand the pilot study by increasing the number of participants to strengthen its power. In addition, the focus for the current study was on fewer grades, the pilot study included Grades 3, 4 and 5 and the current study included Grades 2 and 3, the grades in which spelling is more commonly taught. The current study used different words to assess the students’ spelling skills. Twenty two of the new words were decodable and were from the Words Their Way program which is a more current word list (Bear, Invernizzi, et al., 1996). Eighteen of the new words were irregular and were from the Boder Test of Reading-Spelling Patterns (Boder & Jarrico, 1982).

In summary, the results of the pilot study found some positive relationships between student spelling gains and teacher knowledge and instructional practices. The results suggest the need for enhancing teacher education in the areas of linguistic knowledge and research based spelling practices to produce an increase in student spelling gains.
Rationale

The current study expanded upon and improved the pilot study by examining the impact of classroom teachers’ linguistic knowledge and instructional practices on Grades 2 and 3 students’ spelling gains over the course of 8 months. Based on both Henderson’s (1990) and Ehri’s (2005) theories of spelling and reading acquisition, spelling is a developmental process that occurs in stages or phases and the rate of progression from one phase to the next varies for each individual. Spelling ability develops over time with appropriate instruction and exposure to the language system. Teachers’ varying levels of linguistic knowledge (Moats, 2009b) and their instructional practices (Morris et al., 1995b; Templeton & Morris, 2001) impact their students’ spelling achievement. It was hypothesized that strong positive relationships between teacher knowledge, instructional practices, and student spelling gains would be found in the current study.

The current study addressed the shortcomings of the pilot study by changing the participants to Grades 2 and 3 when spelling is more commonly taught, extending the length of time between the pre and post-test from 4 months to 8 months, increasing the number of participants, utilizing more current spelling measure, adding decodable and non-decodable words to the spelling measure, and adding additional questions to the teacher practices questionnaire.

The purpose of the current study was to explore the teacher influences on student spelling gains for students in Grades 2 and 3. The research questions of this study were:

1. How much gain do students make in spelling in Grades 2 and 3?
2. What are teachers’ levels of linguistic knowledge?
3. What is the impact of teacher linguistic knowledge on student spelling gain?
4. What types of spelling instructional practices do teachers implement?
5. What is the impact of teachers’ instructional practices on student spelling gain?

6. Are aspects of teacher knowledge and instructional practices positively related?

**Hypotheses**

The results of this study were used to test several hypotheses about the relationships between teacher knowledge and practice and student spelling gains. First, it was hypothesized that students will show growth in their spelling performance from the fall to the spring. Second, the level of teacher linguistic knowledge was expected to be low. Third, positive relationships between teacher knowledge and student spelling gains were expected to be found. Fourth, the types of spelling instructional practices were expected to be varied, from no spelling instruction to daily instruction. Fifth, it was expected that positive relationships would be found between teacher practice and student spelling gains. Finally, aspects of teacher knowledge were expected to be positively related to instructional practices.

**Anticipated Results**

This study focused on the influence of teachers’ linguistic knowledge and their spelling instructional practices on student spelling gains. To answer the research question concerning the contribution of teachers’ knowledge and practice to students’ spelling achievement, Hierarchical Linear Models (Rindskopf, 2010) were used to control for the nested nature of the data because students were nested within their teacher’s classroom. The outcome variable in each analysis was the students’ spelling gain score from pre to post-test.

*Effects of spelling instruction on student spelling gains.*

Research on spelling instruction has found greater gains in students’ spelling achievement when spelling instruction follows research based practices. Examples of research based spelling instructional practices include direct instruction; teaching orthographic patterns;
differentiated weekly spelling lists and tests where the words are adjusted to the instructional level of the speller and organized according to linguistic principles of English spellings; presenting words in a pretest-teach-posttest format allowing students to self-correct their tests; words should be obtained from a variety of sources including subject area content, students’ own reading and writing and spelling textbooks; keeping a log of students’ misspelled words for the students to practice; teaching study methods; approximately 60-75 minutes should be spent on spelling instruction each week; and strategies and procedures need to be taught to help students learn new words (Christine & Hollingsworth, 1966; Ehri, Satlow & Gaskins, 2009; Graham, 1983; Horn, 1960; Schlagal, 2002; Wallace 2006; Yee, 1969).

It was expected that a positive correlation would be found between the classroom instructional practices and spelling gains. It was expected that teachers who follow more of the research based instructional practices will show higher gain scores than teachers who follow fewer of these practices. This type of result would support past research findings that has shown that instructional practices impact spelling growth (Berninger et al., 1998; Foorman & Petscher, 2010; Joshi et al., 2008-09).

*Effects of teacher knowledge on student spelling gains.*

Past research has indicated that teachers need to have strong linguistic knowledge to be able to teach reading and spelling effectively and to plan appropriate instruction (Carreker et al., 2010; Moats, 2009b; Moats & Foorman, 2003). However, teachers have demonstrated low levels of linguistic knowledge (Crim et al., 2008; Moats & Foorman, 2003). It was expected that the results of this study would support these research findings. Therefore, it was expected that a positive relationship would be found between teacher knowledge and student spelling gains.
The current study extended the results of several previous studies. Past studies have found that a variety of explicit spelling instructional practices and activities impact spelling growth (Berninger et al., 2002; Christine & Hollingsworth, 1966; Drake & Ehri, 1984; Ehri et al., 2009; Ehri, Satlow & Gaskins, 2009; Foorman & Petscher, 2010; Graham, 1983; Graham et al., 2002; Horn, 1960; Horn, 1969; Invernizzi & Hayes, 2004; Joshi et al., 2008-09; Morris et al., 1995b; Reed, 2012; Schlagal, 2002; Shippen, Reilly & Dunn, 2008; Wallace 2006; Yee, 1969).

The current study extended the results of this past research by analyzing the instructional practices identified in these studies to examine which practices produced the greatest gains in spelling performance. The relationship between the type of instructional practices implemented and student spelling growth was compared to see if different approaches to instruction yielded different rates of spelling growth.

The current study extended past research findings where teachers have demonstrated low levels of linguistic knowledge (Carreker et al. 2010; Crim et al., 2008; Moats & Foorman, 2003) by measuring teachers’ level of linguistic knowledge and comparing their level of knowledge to their instructional practices and student spelling gains. Past research has found mixed results of teacher knowledge on student literacy gains. Positive, negative and no relationships have been found between teacher knowledge and instructional practices on student literacy gains (Carlisle et al., 2009; Carreker et al., 2010; McCutchen et al., 2002; Moats, 2009b; Moats & Foorman, 2003; Piasta et al., 2009). The majority of the teacher knowledge studies in the area of language arts have looked at reading development, whereas fewer have looked at spelling development. The current study extended this past research by measuring teachers’ linguistic knowledge and its impact on student spelling gains.
In summary, it was expected that the results of this study would show a positive relationship between teacher knowledge and student spelling gains. In addition, it was expected that a positive relationship would be found between teacher practice and student spelling gains. The results of this study will help to develop teacher professional development training programs to determine the level of knowledge and types instructional practices that lead to greater gains in student spelling.
Chapter IV Methods

Participants

Elementary school principals were contacted via telephone to request their participation in this study (see Appendix A). Permission was obtained from the principals of six public elementary schools in three suburban communities in Long Island, New York to conduct this study (see Appendix B). According to the 2012-13 New York State Education Department School Report Card Data, the percentage of students identified as economically disadvantaged ranged from 3%- 61% (see Table 1). The majority of students in all schools were white with a range of 67%- 97%. The second most common ethnicity in all schools was Hispanic or Latino with a range of 1%-25%.

Table 1

School Demographics

<table>
<thead>
<tr>
<th>School</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Economically Disadvantaged</td>
<td>12</td>
<td>7</td>
<td>3</td>
<td>26</td>
<td>5</td>
<td>61</td>
</tr>
<tr>
<td>Percent White</td>
<td>67</td>
<td>80</td>
<td>97</td>
<td>70</td>
<td>87</td>
<td>69</td>
</tr>
<tr>
<td>Percent Black or African American</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Percent Hispanic or Latino</td>
<td>22</td>
<td>10</td>
<td>1</td>
<td>21</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>Percent Asian or Native Hawaiian/other Pacific Islander</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Percent Multiracial</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Percent American Indian or Alaska Native</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
After the principals granted their permission, the teachers were contacted via e-mail to invite them to participate in the study (see Appendix A). A total of 34 teachers were contacted to participate in the study; 17 Grade 2 and 17 Grade 3 teachers. After the initial contact was made, thirty two teachers volunteered to participate in the study; 16 Grade 2 and 16 Grade 3 teachers. Signed consent was obtained from all teachers who agreed to participate in the study and the teachers were informed that they would receive $100 for their participation upon completion of the data collection (see Appendix C). There was no teacher attrition throughout the study; therefore, the original 32 teachers completed all parts of the study. All teachers were New York State Elementary Education certified teachers and they all had a Master’s Degree. All of the teachers were white. Thirty teachers were female and two of the third grade teachers were male. The class enrollment size ranged from 17-26 with a mean class size of 22 for Grade 2 and 21 for Grade 3. The range of years of teaching experience was 3-36 years with a mean of 18.44 years for Grade 2 and 20.5 years for Grade 3 (see Table 2).

Table 2

*Grade Level Comparisons*

<table>
<thead>
<tr>
<th></th>
<th>Grade 2</th>
<th>Grade 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total teachers</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Total Female</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Total Male</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Average years Teaching</td>
<td>18.44</td>
<td>20.50</td>
</tr>
<tr>
<td>Average Class Size</td>
<td>22</td>
<td>21</td>
</tr>
</tbody>
</table>
The student participants consisted of 636 students, 331 Grade 2 students and 305 Grade 3 students. Forty eight of the students who were enrolled in the participating teachers’ classes did not participate due to their absence on testing days. Student consent was not required for this study because the researcher did not have contact with the students and the spelling tests completed by the students were considered part of their regular instructional routine. Therefore, all students in each participating teacher’s class participated in the study if they were present on the days the tests were administered.

**Measures**

**Student measures.**

The same spelling test was used for this study for both for the pretest and the posttest; the test consisted of 40 words (see Appendix D). Since the pre and post tests were administered eight months apart, it was unlikely that the students remembered the words on the pretest when they took the posttest.

In selecting the words for the spelling tests, the goal was to include both decodable and non-decodable words. In addition, the test was developed to measure a wide range of spelling ability because, as was seen in the pilot study, students’ spelling ability typically varies from below to above grade level. Therefore, the list was developed to include words appropriate for Grades 1-5. Twenty two of the words were decodable words from the spelling inventories in the *Words Their Way* program (Bear, et al., 1996). All of the even numbered words from the Primary Spelling Inventory were used in addition to the first nine even numbered words from the Elementary Spelling Inventory. The program recommends using the Primary Spelling Inventory for students up to grade 3 and the Elementary Spelling Inventory for students up to Grade 5.
The remaining 18 words were non-decodable words taken from the Boder Test of Reading-Spelling Patterns (Boder & Jarrico, 1982). The Grades 2, 3, and 4 lists were used and 6 words from each list were selected. The words in each list were arranged in order of difficulty. In order to select words that represented a range of grade levels, words 4, 6, 8, 10, 12, and 14 were selected from each list. After the 40 words were selected, the words were rearranged so that they were not presented in order of difficulty. This was done to address the observations made in the pilot study. The spelling words in the pilot study were arranged in order from least to most difficult. As observed by the teachers administering the spelling test during the pilot study, the students became frustrated with the more difficult words and began to give up. In addition, the students’ test papers showed that their handwriting became messier as the words became more difficult. Rearranging the order of the words aimed to address these concerns. A five minute break was also included between words 20 and 21; the break was added to help prevent student fatigue.

Students’ spelling skills were assessed in the fall (pretest) and eight months later (posttest) during the 2013-14 school year. The teachers were given a two week window to administer the tests to their students. All materials were hand delivered to each teacher along with a deadline for administration; September 26, 2013 for the pretest and May 29, 2014 for the posttest. For both testing periods, each teacher was given directions for administering the tests, a word list with accompanying sentences and a class set of student recording sheets. The classroom teacher administered each test to their entire class in one sitting. The teacher pronounced each word, used it in a sentence and pronounced it a second time before the students recorded the word. All teachers used the same sentences for each word. Both the pretest and
posttest were scored in the same manner. Students received one point for each whole word spelled correctly for a maximum of 40 points.

To maintain the anonymity of the students, the teachers assigned a code to each student and the students recorded their code on their answer sheet. Student names were not recorded on the tests. The teachers assigned each student a code following the format: first letter of first name, first letter of last name and a number. For the number, they began with one and ended with the total number of students in their class. For example, if the first student’s name was John Smith, his code was JS1. The students wrote their code on the test and they did not write their name on the test. Teachers kept a record of the codes they assigned to the students because the students used the same code for the post test at the end of the year.

*Teacher Measures.*

Teachers completed two measures in the spring of 2014; the Instructional Practices Questionnaire (see Appendix E) and the Linguistic Knowledge Survey (see Appendices F and G). Both measures were distributed to the teachers on the same day that the spelling posttest was delivered. The teachers were given two weeks to complete both measures; the deadline for completion was May 29, 2014.

*Instructional practices questionnaire.*

Each teacher completed a questionnaire consisting of 44 short-answer questions to gain an understanding of their instructional practices in spelling. Teachers were asked to self-report spelling instruction practices that they implemented during the 2013-14 school year. Twenty three of the questions required the teachers to rate their responses on a seven point scale. A rating of zero indicated “Never” and a rating of six indicated “Always.” The questionnaire was created based on past research of spelling instructional practices that identified best practices in
spelling instruction. Information gathered during the pilot was also used to create additional questions. During the pilot study, the teachers shared how they plan and deliver spelling instruction on the Classroom Practices Questionnaire. The similarities in the teachers’ answers were used to create additional questions. In addition, during the pilot study, some teachers had unique answers for some of the questions. These answers were incorporated to see if nontraditional instructional practices impact spelling gains. Overall, the questions focused on how the teachers select spelling words for their students, how they deliver and plan spelling instruction, and how they apply their content knowledge in an instructional setting.

The Instructional Practices Questionnaire was scored based on the teacher’s response to the questions (see below for the list of questions). Responses to questions 1, 6, 7, 8, 11 and 12 were given one point if answered “yes” and 0 points if answered “no.” Question 10 (How did you teach spelling lessons: a. the same lesson was taught to the whole class, b. different lessons were taught to small groups or individuals, c. Both a and b) was worth one point for choice “a,” 2 points for choice “b,” and 3 points for choice “c.” Questions 14-36 were scored based on the teacher’s rating. For example, if they rated question 14 (My students learned spelling from word lists) as 3, then they received three points for that question. The maximum number of points for the Instructional Practices Questionnaire was 178.

Test items were grouped into questions that asked about the teachers’ use of research based spelling practices with the highest possible score in this category being 157. Test items 1, 6, 7, 8, 9, 10, 11, 12, and 14-36 were included in the research based spelling practices sub-score. Test items were also grouped into questions that asked teachers if they taught students specific spelling strategies with the highest possible score in this category being 48. Test items 23-28 and 30-31 were included in the spelling strategies sub-score.
Instructional Practices Questionnaire

1. Did you teach spelling to your students?
2. Did you utilize a spelling program?
3. How many spelling words did the students practice each week?
4. How were the words in each spelling list organized:
5. Area(s) of emphasis of your spelling program:
6. Did you test students’ memory for the words at the end of the week?
7. Were the same words reviewed and tested later in the semester?
8. When students misspelled words they were tested on, was anything done to help them?
9. How much classroom time was devoted to spelling instruction every week?
10. How did you teach spelling lessons? whole class or small group or both
11. Did you assign spelling homework?
12. Did you teach phonics as part of reading and/or spelling instruction?
13. How effective do you think your spelling instruction was?
14. My students learned spelling from word lists
15. My spelling lists were differentiated according to student ability
16. My spelling lists were organized according to patterns and rules of English spellings
17. I reviewed the words and patterns that I taught throughout the year
18. I distributed the study of spelling words in small amounts across the week
19. I used pretests
20. Students self-corrected their errors on pretests
21. My students copied the words from one to three times each
22. I taught a method of studying spelling words and I had students practice this method
23. I taught spelling strategies
24. I taught the spelling strategy of looking for visual patterns
25. I taught the spelling strategy of creating analogies
26. I taught the spelling strategy of sounding out
27. I taught the spelling strategy of applying spelling rules
28. I taught the spelling strategy of chunking
29. I incorporated word meaning into my spelling instruction
30. I taught the spelling strategy of examining word structure for prefixes, suffixes, and roots
31. I taught the spelling strategy of looking for word families across words
32. I provided my students with writing opportunities to practice and apply their spelling skills
33. My students were able to read the words they were required to spell
34. My spelling instruction involved direct instruction
35. I presented words in a pretest-teach-posttest format
36. My students kept a log of misspelled words to practice
37. Is there further information that I need to know to understand how you taught spelling this year?

Reading Instruction Questions

38. When your students came across an unfamiliar word as they were reading text, what strategy(ies) did you teach them to use to read the word?
39. Name the reading program that you used this year.
40. Direct instruction in phonics
41. Students read from basal readers
42. Students read leveled books
43. Students performed word study activities such as word sorts
44. Differentiated reading instruction

Linguistic knowledge survey.

A survey consisting of 24 multiple choice and short answer items was administered to the teacher participants as a measure of their linguistic knowledge. Items for the survey were obtained from various teacher knowledge surveys (Carlisle et al., 2009; Crim et al., 2008; Moats, 1994; Moats, 2009b; Moats & Foorman, 2003) and combined to measure the teachers’ knowledge of oral and written language including phonology, morphology, phonics, and orthography.

Teachers received one point for each correct answer for a maximum of 59 points. For questions that had multiple parts (Questions 1, 6, 9, 17, 23, and 24) teachers received one point for each part of the question. For example, Question 6 asked the teachers to identify the number of phonemes in six different words. For this question, the teacher received one point for each correctly identified word for a maximum of six points for that question.

In addition to a total score for the Linguistic Knowledge Survey, the questions were sorted into categories based on the linguistic skill being measured. This resulted in five separate sub-scores for the test. The categories included: syllable identification/counting (Question 1), phoneme identification/counting/matching (Questions 6 and 9), spelling conventions (Questions 3, 4, 5, 7, 8, 10, 11, 13, 14, 15, 16, 20, 21, 23 and 24), word parts-prefix/suffix/compound words (questions 2, 12, 19, 22 and 18) and morpheme counting (Question 17).
Procedures

Elementary school principals were contacted via telephone to present the study and determine their willingness to have their teachers and students participate in the study. After obtaining the principals’ permission and consent, all of the Grade 2 and 3 teachers in each school were sent an e-mail informing them of the study and inquiring about their interest in participating. Teachers who were interested in participating in the study were given additional detailed information about the study in the consent form. After teachers signed consent, they were given the packet of student spelling pretest materials to administer to their class. The pretests were administered by the classroom teacher in a whole class setting in the students’ own classroom. The test took approximately 20 minutes to complete. To ensure uniformity of administration, teachers read the following statement to the class, “We will now have a spelling test. There will be 40 words. I will pronounce each word, use it in a sentence, and pronounce it a second time. Try to spell each word the best you can. If you do not know how to spell the word, try to spell it the best you can.” Each spelling word was presented with a sentence containing the word, i.e. “Pet. I have a pet cat who likes to play. Pet”

In the spring, teachers were given the packet of materials containing the student spelling posttest, Instructional Practices Questionnaire, and Linguistic Knowledge Survey along with directions for each measure. Teachers administered the student spelling posttest to their class following the scripted directions which were identical to the pretest directions. The posttests were administered by the classroom teacher in a whole class setting in the students’ own classroom. Teachers completed the Instructional Practices Questionnaire and Linguistic Knowledge Survey on their own. Each teacher measure took approximately 30 minutes to
complete. After the teachers submitted all of the completed measures, they received payment for their participation.

**Design and Data Analysis**

This study employed a correlational research design aimed at finding relationships between two independent variables and one dependent variable.

**Independent variables.**

There were two independent variables in this study: teacher instructional practices and teacher linguistic knowledge. The score on the instructional practices measure was broken down into several sub-scores: total score, research based practices and strategy instruction. The score on the linguistic knowledge measure was also broken down into several sub-scores: total score, syllable identification/counting, phoneme identification/counting/matching, spelling conventions, word parts and morpheme counting.

**Dependent variable.**

The dependent variable in this study was the student gain score as measured by the growth from pretest to post test in the number of words spelled correctly. The gain score was calculated by subtracting the number of words spelled correctly on the pretest from the number of words spelled correctly on the posttest for each student participant.

The primary goal of the data analyses was to investigate relationships between the independent variables and dependent variable. The main research question of this study focused on the influence of teachers’ linguistic knowledge and their spelling instructional practices on students’ spelling gains.

Descriptive statistics were analyzed to compare teacher variables to examine differences across grade level teachers. Pearson product-moment correlation coefficients were computed to
assess the relationships between teacher characteristics for all teachers. An independent-samples t-test was conducted to compare the Grade 2 and Grade 3 teacher scores on both the Linguistic Knowledge Survey and Instructional Practices Questionnaire to explore differences between grade levels.

Student gain scores were analyzed using descriptive statistics to compare Grade 2 and Grade 3 results. To determine if there was ceiling effect, a Pearson product-moment correlation coefficient was computed to assess the relationship between words correct on the pretest and gain scores.

To address the research question of the relationship of teacher knowledge and instructional practices to student spelling gains, Pearson product-moment correlation coefficients were computed for both Grade 2 and Grade 3 students.

Hierarchical Linear Models (HLM) (Rindskopf, 2010) were also used explore the relationship between teacher characteristics and student spelling gains. HLM was used to control for the nested nature of the data because students were nested within their teacher’s classroom. The outcome variable in each HLM analysis was the students’ spelling gain score from pre to post test.
Chapter V Results

Teacher Measures

_Instructional practices questionnaire_.

The Instructional Practices Questionnaire was administered at the end of the school year. It required teachers to self-report on their classroom instruction throughout the year that the study took place. In addition, teachers were asked to describe their teaching experience, time spent in spelling instruction, and class size (means are reported in Table 3). The class size ranged from 17-26 with a mean of 21.81 for Grade 2 and 20.94 for Grade 3. The range of years of teaching experience ranged from 3 to 36 years with a mean of 18.44 years for Grade 2 and 20.5 years for Grade 3. _T_-tests revealed no significant grade differences on these measures (see Table 3).
Table 3

*T-test Comparing Teacher Mean Scores on the Linguistic Knowledge Survey and Instructional Practices Questionnaire*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Maximum Score</th>
<th>n</th>
<th>t(30)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Size</td>
<td>21.81</td>
<td>20.94</td>
<td></td>
<td>32</td>
<td>.84</td>
<td>.41</td>
</tr>
<tr>
<td>Years teaching</td>
<td>18.44</td>
<td>20.50</td>
<td></td>
<td>32</td>
<td>-.64</td>
<td>.53</td>
</tr>
<tr>
<td><strong>Teacher Knowledge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>37.44</td>
<td>39.31</td>
<td>59</td>
<td>32</td>
<td>-.84</td>
<td>.41</td>
</tr>
<tr>
<td>Syllables</td>
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<td>4.63</td>
<td>5</td>
<td>32</td>
<td>-.93</td>
<td>.36</td>
</tr>
<tr>
<td>Phonemes</td>
<td>5.88</td>
<td>6.75</td>
<td>11</td>
<td>32</td>
<td>-1.11</td>
<td>.28</td>
</tr>
<tr>
<td>Spelling Conventions</td>
<td>22.31</td>
<td>21.88</td>
<td>32</td>
<td>32</td>
<td>.37</td>
<td>.72</td>
</tr>
<tr>
<td><strong>Instructional Practices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>118.43</td>
<td>108.50</td>
<td>178</td>
<td>32</td>
<td>1.09</td>
<td>.28</td>
</tr>
<tr>
<td>Time spent in spelling instruction (min.)</td>
<td>99.38</td>
<td>48.13</td>
<td>200</td>
<td>32</td>
<td>3.29</td>
<td>.00*</td>
</tr>
<tr>
<td>Research Based Practices</td>
<td>106.00</td>
<td>98.19</td>
<td>157</td>
<td>32</td>
<td>.86</td>
<td>.40</td>
</tr>
<tr>
<td>Strategy Instruction</td>
<td>33.81</td>
<td>34.69</td>
<td>48</td>
<td>32</td>
<td>-.26</td>
<td>.80</td>
</tr>
</tbody>
</table>

* p < .05.
All of the second grade teachers reported that they taught spelling while three of the third grade teachers did not teach spelling. The three third grade teachers that indicated they did not teach spelling were referring to the traditional form of spelling instruction which consists of presenting students with word lists at the beginning of the week and testing students’ knowledge of the spellings of the words at the end of the week. While these three teachers did not follow this traditional form of spelling instruction, they did report that they taught spelling strategies throughout the week. For example, two of the teachers reported that they spent 20 minutes per week teaching spelling. All three of the teachers reported that they taught phonics in relation to spelling and they taught spelling strategies and spelling rules to their students. The total scores on the Instructional Practices Questionnaire for the three teachers were 25, 35, and 72; these scores indicated that the teachers did teach spelling.

The Instructional Practices Questionnaire contained questions about spelling instruction that required teachers to answer either “yes” or “no” (see Table 4). In total, 27 teachers utilized a spelling program, 14 in Grade 2 and 13 in Grade 3. Twice as many Grade 2 as Grade 3 teachers administered a posttest to assess student learning of the weekly spelling words. More Grade 2 than Grade 3 teachers retested students on the same spelling words later in the semester and re-taught misspelled words. All of the Grade 2 teachers assigned spelling homework, while 12 of the 16 third grade teachers did this. All of the Grade 2 and 13 of the Grade 3 teachers incorporated phonics into their spelling instruction.
Table 4  

*Instructional Practices Questionnaire Yes/No Questions*

<table>
<thead>
<tr>
<th>Question</th>
<th>Grade 2 Percent Yes</th>
<th>Grade 3 Percent Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of spelling program</td>
<td>87.50</td>
<td>81.25</td>
</tr>
<tr>
<td>Give pretest on words</td>
<td>87.50</td>
<td>81.75</td>
</tr>
<tr>
<td>Give posttest on words</td>
<td>87.50</td>
<td>75.00</td>
</tr>
<tr>
<td>Words tested later in the semester</td>
<td>62.50</td>
<td>43.75</td>
</tr>
<tr>
<td>Re-teaching of misspelled words</td>
<td>68.75</td>
<td>50.00</td>
</tr>
<tr>
<td>Whole class instruction</td>
<td>31.25</td>
<td>50.00</td>
</tr>
<tr>
<td>Small group instruction</td>
<td>6.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Whole class and small group instruction</td>
<td>62.50</td>
<td>37.50</td>
</tr>
<tr>
<td>Spelling homework</td>
<td>100.00</td>
<td>75.00</td>
</tr>
<tr>
<td>Phonics incorporated</td>
<td>100.00</td>
<td>81.25</td>
</tr>
</tbody>
</table>

Additional items on the Instructional Practices Questionnaire required teachers to respond on a 0-6 rating scale to questions. A rating of 0 indicated “Never” and a rating of 6 indicated “Always.” Mean ratings are reported in Table 5. Overall, teachers in both grade levels reported utilizing every strategy presented, although the responses varied between teachers. The highest scores for both of the grades were for the use of word lists that were organized by spelling patterns and rules (Grade 2 $M=5.75$, Grade 3 $M=4.69$), strategy instruction (Grade 2 $M=4.81$, Grade 3 $M=4.31$), visual patterns (Grade 2 $M=4.69$, Grade 3 $M=4.56$), applying spelling rules (Grade 2 $M=4.63$, Grade 3 $M=4.69$), incorporating word meaning (Grade 2 $M=4.94$, Grade 3
word structure (Grade 2 $M=4.81$, Grade 3 $M=5.13$), word families (Grade 2 $M=4.56$, Grade 3 $M=4.56$), giving students opportunities to use the words in writing (Grade 2 $M=4.31$, Grade 3 $M=5.00$), and being able to read the spelling words (Grade 2 $M=5.25$, Grade 3 $M=5.00$). The lowest scores were for keeping a log of misspelled words (Grade 2 $M=0.75$, Grade 3 $M=1.38$), using analogies (Grade 2 $M=2.19$, Grade 3 $M=2.81$), and self-correcting their own pretests (Grade 2 $M=2.81$, Grade 3 $M=2.13$).
Table 5

*Instructional Practices Questionnaire- Questions Consisting of a 0-6 Rating Scale*

<table>
<thead>
<tr>
<th>Question</th>
<th>Grade 2 Mean</th>
<th>SD</th>
<th>Grade 3 Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word lists</td>
<td>4.44</td>
<td>1.82</td>
<td>3.94</td>
<td>2.24</td>
</tr>
<tr>
<td>Differentiated lists</td>
<td>2.81</td>
<td>2.69</td>
<td>3.56</td>
<td>2.50</td>
</tr>
<tr>
<td>Lists organized by patterns and rules</td>
<td>5.75</td>
<td>0.58</td>
<td>4.69</td>
<td>1.99</td>
</tr>
<tr>
<td>Reviewed throughout year</td>
<td>4.88</td>
<td>1.15</td>
<td>3.50</td>
<td>1.71</td>
</tr>
<tr>
<td>Study small amounts across week</td>
<td>3.63</td>
<td>2.73</td>
<td>2.50</td>
<td>2.76</td>
</tr>
<tr>
<td>Pretests</td>
<td>3.31</td>
<td>2.75</td>
<td>3.75</td>
<td>3.00</td>
</tr>
<tr>
<td>Students self-correct pretests</td>
<td>2.81</td>
<td>2.95</td>
<td>2.13</td>
<td>2.87</td>
</tr>
<tr>
<td>Copied words 1-3 times</td>
<td>4.38</td>
<td>2.13</td>
<td>3.38</td>
<td>2.87</td>
</tr>
<tr>
<td>Method of studying</td>
<td>3.88</td>
<td>2.03</td>
<td>3.38</td>
<td>2.50</td>
</tr>
<tr>
<td>Spelling strategies</td>
<td>4.81</td>
<td>1.38</td>
<td>4.31</td>
<td>1.54</td>
</tr>
<tr>
<td>Looking for visual patterns</td>
<td>4.69</td>
<td>1.45</td>
<td>4.56</td>
<td>1.59</td>
</tr>
<tr>
<td>Creating analogies</td>
<td>2.19</td>
<td>1.94</td>
<td>2.81</td>
<td>2.29</td>
</tr>
<tr>
<td>Sounding out</td>
<td>4.56</td>
<td>1.63</td>
<td>4.38</td>
<td>1.31</td>
</tr>
<tr>
<td>Applying spelling rules</td>
<td>4.63</td>
<td>1.36</td>
<td>4.69</td>
<td>1.08</td>
</tr>
<tr>
<td>Chunking</td>
<td>4.19</td>
<td>1.83</td>
<td>4.00</td>
<td>1.75</td>
</tr>
<tr>
<td>Word meaning</td>
<td>4.94</td>
<td>1.24</td>
<td>4.81</td>
<td>1.60</td>
</tr>
<tr>
<td>Prefixes, suffixes, and roots</td>
<td>4.81</td>
<td>1.22</td>
<td>5.13</td>
<td>0.89</td>
</tr>
<tr>
<td>Word families</td>
<td>4.56</td>
<td>1.41</td>
<td>4.56</td>
<td>1.63</td>
</tr>
<tr>
<td>Writing opportunities</td>
<td>4.31</td>
<td>1.82</td>
<td>5.00</td>
<td>1.21</td>
</tr>
<tr>
<td>Able to read the words</td>
<td>5.25</td>
<td>0.86</td>
<td>5.00</td>
<td>1.67</td>
</tr>
<tr>
<td>Direct instruction</td>
<td>4.44</td>
<td>1.79</td>
<td>4.13</td>
<td>1.89</td>
</tr>
<tr>
<td>Pretest-teach-posttest</td>
<td>2.63</td>
<td>2.55</td>
<td>3.69</td>
<td>2.96</td>
</tr>
<tr>
<td>Log of misspelled words</td>
<td>0.75</td>
<td>1.24</td>
<td>1.38</td>
<td>2.00</td>
</tr>
</tbody>
</table>
The maximum total score on the Instructional Practices Questionnaire was 178 points. Responses to questions 1, 6, 7, 8, 11 and 12 were given 1 point if answered “yes” and 0 points if answered “no.” Question 10 was worth 1 point for choice “a,” 2 points for choice “b,” and 3 points for choice “c.” Questions 14-36 were scored based on the teacher’s rating. For example, if they rated question 14 as 3, then they received 3 points for that question. The Grade 2 mean total score was 118.43 with a standard deviation of 14.56. The Grade 3 mean total score was 108.50 with a standard deviation of 33.44. T-tests revealed no significant grade differences on the total score for the Instructional Practices Questionnaire (see Table 3).

Test items were grouped into questions that asked about the teachers’ use of research based spelling practices, for which the highest possible score in this category was 157. Test items 1, 6, 7, 8, 9, 10, 11, 12, and 14-36 were included in the research based spelling practices sub score. Grade 2 teachers reported greater use of research based practices ($M=106.00$, $SD=14.24$) than Grade 3 teachers ($M=98.19$, $SD=33.52$). T-tests revealed no significant grade differences on research based strategies (see Table 3).

Test items were also grouped into questions that asked teachers if they taught students specific spelling strategies, for which the highest possible score in this category was 48. Test items 23-28 and 30-31 were included in the spelling strategies sub score. Grade 2 and Grade 3 teachers had similar responses, $M=33.81$ $SD=9.63$ and $M=34.69$ $SD=9.43$, respectively. T-tests revealed no significant grade differences on teaching specific spelling strategies (see Table 3).

Teachers also reported the amount of minutes they spent teaching spelling each week. Grade 2 teachers spent twice as much time ($M=99.38$, $SD=56.39$ minutes) as compared to Grade 3 teachers ($M=48.13$, $SD=26.64$ minutes). T-tests revealed significant grade differences on the amount of time spent in weekly spelling instruction (see Table 3). This result shows that Grade 2
teachers spent significantly more time teaching spelling than did Grade 3 teachers. Grade 2 teachers also felt more effective ($M=4.44$) in their spelling instruction than Grade 3 teachers ($M=2.81$).

In addition to their spelling instructional practices, teachers were asked to report on their reading instructional practices. Teachers answered these questions on a 3 point scale where 0 indicated not at all, 1 indicated sometimes and 3 indicated an instructional practice that was used regularly. On average, Grades 2 and 3 teachers were more likely to differentiate reading instruction (Grade 2: $M=2.00$; Grade 3: $M=2.00$) and use leveled books (Grade 2: $M=2.00$; Grade 3: $M=1.94$) than use a basal reader (Grade 2: $M=0.94$; Grade 3: $M=1.06$). Grade 2 teachers scored significantly higher on the use of direct instruction in phonics ($M=1.75$) than the Grade 3 teachers ($M=1.06$) (see Table 6). $T$-tests revealed no significant grade differences on the other measures (see Table 6). Teachers’ reading instruction responses were not considered in any of the analyses conducted below.

Table 6

<table>
<thead>
<tr>
<th>Independent Samples Test</th>
<th>$t$</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct instruction in phonics</td>
<td>3.08</td>
<td>0.00</td>
</tr>
<tr>
<td>Students read from basal readers</td>
<td>-0.46</td>
<td>0.65</td>
</tr>
<tr>
<td>Students read leveled books</td>
<td>1.00</td>
<td>0.33</td>
</tr>
</tbody>
</table>
The total possible score on the Linguistic Knowledge Survey was 59 points. Teachers’ mean performance on each item is reported in Table 3. The mean total score for Grade 2 teachers was 64% correct and the mean total score for Grade 3 teachers was 66% correct. The highest scores for both Grade 2 and Grade 3 teachers occurred on questions measuring syllable knowledge (89% correct for Grade 2 teachers and 93% correct for Grade 3 teachers). Eighteen teachers (eight Grade 2 and 10 Grade 3) scored 100% on the syllable identification questions. The lowest score for both groups was for the morpheme identification questions (24% correct for Grade 2 and 43% correct for Grade 3). Fourteen teachers (nine Grade 2 and five Grade 3) scored 0 correct on the morpheme identification questions. The phoneme knowledge subscore result was 57% correct for Grade 2 and 61% correct for Grade 3. The spelling conventions subscore result was 69% correct for Grade 2 and 68% correct for Grade 3. The word parts subscore result was 68% correct for Grade 2 and 70% correct for Grade 3. T-tests revealed no significant grade differences on teacher knowledge (see Table 3).

Pearson product-moment correlation coefficients were computed to assess the relationships between teacher characteristics for all (N=32) teachers. Correlations by grade level were also computed and the data yielded similar results as the full sample. Therefore, the results for the full sample only are reported. Values are reported in Table 7. Several significant relationships were found between teachers’ linguistic knowledge and their instructional practices. There was a positive correlation between knowledge survey total and instructional practices total \((r = .45, p = .01)\), and knowledge survey total and strategy instruction \((r = .55, p = .00)\). This showed that the higher the teachers’ level of linguistic knowledge, the greater their score was on the instructional practices questionnaire. In addition, teachers with higher levels of
linguistic knowledge provided instruction in more spelling strategies to their students than did teachers with lower levels of linguistic knowledge.

Table 7

Correlations between Teacher Characteristics

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teaching Experience</td>
<td>1</td>
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<td></td>
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<td></td>
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<tr>
<td>2</td>
<td>Knowledge Survey Total</td>
<td>.14</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Syllable Knowledge</td>
<td>.18</td>
<td>.30</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>Phoneme Knowledge</td>
<td>.09</td>
<td>.76</td>
<td>.04</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Spelling Conventions Knowledge</td>
<td>.11</td>
<td>.88</td>
<td>.23</td>
<td>.58</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Word Parts Knowledge</td>
<td>.25</td>
<td>.11</td>
<td>.22</td>
<td>.01</td>
<td>-.03</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Morpheme Knowledge</td>
<td>.02</td>
<td>.66</td>
<td>.16</td>
<td>.29</td>
<td>.37</td>
<td>-.02</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Time Spent in Spelling Instruction</td>
<td>.06</td>
<td>.20</td>
<td>-.06</td>
<td>.26</td>
<td>.23</td>
<td>-.11</td>
<td>.00</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Instructional Practices Total</td>
<td>.21</td>
<td>.45</td>
<td>.20</td>
<td>.26</td>
<td>.50</td>
<td>.19</td>
<td>.17</td>
<td>.44</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Research Based Practices</td>
<td>.01</td>
<td>.20</td>
<td>.09</td>
<td>.14</td>
<td>.28</td>
<td>-.01</td>
<td>-.01</td>
<td>.90</td>
<td>.68</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Strategy Instruction</td>
<td>.05</td>
<td>.55</td>
<td>.13</td>
<td>.54</td>
<td>.56</td>
<td>.09</td>
<td>.12</td>
<td>.58</td>
<td>.72</td>
<td>.64</td>
</tr>
<tr>
<td>Mean</td>
<td>19.47</td>
<td>38.38</td>
<td>4.53</td>
<td>6.31</td>
<td>22.09</td>
<td>3.43</td>
<td>2.00</td>
<td>73.75</td>
<td>113.47</td>
<td>102.09</td>
<td>34.25</td>
</tr>
<tr>
<td>SD</td>
<td>9.03</td>
<td>6.31</td>
<td>.57</td>
<td>2.24</td>
<td>3.34</td>
<td>.67</td>
<td>2.17</td>
<td>50.59</td>
<td>25.87</td>
<td>25.64</td>
<td>9.38</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
There were significant positive correlations between spelling conventions knowledge and instructional practices (total $r = .50, p = .00$), spelling conventions knowledge and phoneme knowledge ($r = .58, p = .00$), and spelling conventions knowledge and morpheme knowledge ($r = .37, p = .04$). This shows positive relationships between the teachers’ level of spelling conventions knowledge, phoneme knowledge and morpheme knowledge which is not unexpected since all three areas are interrelated. Results also demonstrated a significant positive relationship between teachers’ instructional practices and their linguistic knowledge in the specific areas of spelling conventions ($r = .50, p = .05$).

There was a positive correlation between research based practices and time spent in spelling instruction ($r = .90, p = .01$). Indicating that the more research based practices that teachers implemented, the greater the amount of time they spent in spelling instruction each week. There were positive correlations between strategy instruction and phoneme knowledge ($r = .54, p = .00$), strategy instruction and spelling conventions knowledge ($r = .56, p = .00$), and strategy instruction and time spent in spelling instruction ($r = .58, p = .00$). Teachers who taught students more strategies for spelling showed higher levels of knowledge in phonemes and spelling conventions. They also spent more time in spelling instruction.

*Student Measures*

*Spelling pretest and posttest.*

The spelling pretest and posttest consisted of 40 words each and the tests were identical for both grades. Mean gain scores from pretest to posttest were calculated for each grade and are reported in Table 8. Grade 2 students outperformed Grade 3 students in terms of mean gain scores. However, ceiling effects limited gains that were possible for both grades.
Table 8

*Mean Performance of Students on Spelling Pretests and Posttests*

<table>
<thead>
<tr>
<th></th>
<th>Grade 2</th>
<th></th>
<th></th>
<th>Grade 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Words correct on pretest</td>
<td>331</td>
<td>15.67</td>
<td>8.96</td>
<td>305</td>
<td>27.67</td>
<td>7.78</td>
</tr>
<tr>
<td>Words correct on posttest</td>
<td>331</td>
<td>28.39</td>
<td>8.01</td>
<td>305</td>
<td>33.68</td>
<td>5.50</td>
</tr>
<tr>
<td>Gain score for words</td>
<td>331</td>
<td>12.73</td>
<td>6.17</td>
<td>305</td>
<td>6.01</td>
<td>4.16</td>
</tr>
</tbody>
</table>

Note. The maximum score was 40 words correct on each test.

Figures 1 and 2 demonstrate that as the students’ pretest scores increased, their posttest scores were limited due to a ceiling effect. To address the issue of a ceiling effect, students with high pretest scores (20 and above) were eliminated from the data. Figures 3 and 4 demonstrate that when students with pretest scores of 20 and above were removed from the data, their posttest scores were not limited. To measure whether the ceiling effect was addressed by removing students who scored 20 and above on the pretest, Pearson product-moment correlations were computed to assess the relationship between the number of words spelled correctly on the pretest and gains from pretest to posttest. When analyzing the full sample, a negative correlation was found for both Grade 2 ($r = -0.49, p < 0.00$) and Grade 3 ($r = -0.73, p < 0.00$). This shows that as the students’ pretest scores increased, their gain scores decreased which indicates a ceiling effect. Therefore, the gain scores for both grades are not meaningful because they were limited due to the ceiling effect.
Figure 1. Grade 2 full sample.
Figure 2. Grade 3 full sample.
Figure 3. Grade 2 students who scored less than 20 words correct on the pretest.
To remove the ceiling effects on gain scores, students with pretest spelling scores of 20 or more words correct were removed from the analysis: 105 Grade 2 students and 225 Grade 3 students. This left 226 lower scoring second graders and 50 lower scoring third graders in the database. A Pearson product-moment correlation coefficient was computed to assess the relationship between words spelled correctly on the pretest and gain scores for this new group of students. The correlations were very low, close to zero: Grade 2 students $r = .08$, $p < .05$; Grade 3 students, $r = -.06$, $p < .05$. Therefore, removing students who scored 20 words correct and above on the pretest eliminated ceiling effects from the data.
As a result of adjusting for ceiling effects, the analyses became focused on weaker spellers in both Grade 2 and Grade 3. Their mean performance on the pretest, posttest, and mean gain scores are reported in Table 9. The sample size was reduced for both grades, from 331 to 226 for Grade 2, and from 305 to 50 for grade 3. It is important to note that the power of subsequent analyses for Grade 3 is severely impacted by the loss of 84% of the sample of third graders. Limiting the sample to the weaker spellers yielded greater mean gain scores for Grade 2 and Grade 3 students ($M_s=14.92, 10.28$, respectively) than was found when analyzing the full sample (see Tables 8 and 9).

Table 9

Mean Words Spelled Correctly on the Pretest and Posttest by Students who Spelled Fewer than 20 Words Correctly on the Pretest

<table>
<thead>
<tr>
<th></th>
<th>Grade 2</th>
<th>Grade 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Words correct on pretest</td>
<td>226</td>
<td>10.49</td>
</tr>
<tr>
<td>Words correct on posttest</td>
<td>226</td>
<td>25.41</td>
</tr>
<tr>
<td>Gain score for words</td>
<td>226</td>
<td>14.92</td>
</tr>
</tbody>
</table>

Note. The maximum score was 40 words correct on each test.

Correlations were conducted to measure the relationship between pre and post test scores. For Grade 2, a positive and statistically significant correlation was found between the pre and post student spelling test scores: $r(226) = .67, p<.01$. For Grade 3, a positive and statistically significant correlation was found between the pre and post student spelling test scores: $r(50) = .61, p<.01$. 

A paired samples t-test was conducted to compare the pre and post student spelling tests for the subsets of students in each grade (see means in Table 9). The paired samples T-test for Grade 2 revealed a statistically reliable difference, \( t(225) = -38.59, p = .00, \alpha = .05 \). The paired samples t-test for Grade 3 revealed a statistically reliable difference between the mean pretest and posttest, \( t(49) = -16.76, p = .00, \alpha = .05 \). Since the gains are significant for both Grade 2 and Grade 3, then we can use a statistical model to predict the gains.

To address the question of the relationship between teacher knowledge and instructional practices and student spelling gains for Grade 2 students, Pearson correlation coefficients were computed between Grade 2 teacher characteristics and Grade 2 student mean spelling gains. Student data for each teacher was the mean gain in words spelled correctly from pretest to posttest by those students who spelled fewer than 20 words correctly on the pretest, and the number of students in the pool. Correlations are reported in Table 10. There were significant positive correlations between student mean gains in words and teacher phoneme knowledge \( (r = .53) \), time spent in spelling instruction \( (r = .51) \), strategy instruction \( (r = .55) \), and number of students in pool \( (r = .59) \). This suggests that poorer spellers in second grade made greater gains when their teachers had higher levels of phoneme knowledge, spent more time in spelling instruction, and taught more spelling strategies. In addition, the greater the number of poorer spellers in the class, the greater the spelling gains were for those students \( (r = .59) \). These findings suggest that when teachers had greater numbers of weaker spellers in their classrooms, they were able to provide better, more targeted instruction at their spelling level, thus producing greater gains. Inspection of the number of weaker spellers in individual teachers’ classrooms revealed a range varying from 10-19. It is important to note that there is one outlier in the Grade 2 data, one teacher had a high mean gain \( (M=24.17) \) that was much higher than the other mean.
gains (\(M =13.53\)) and a large number of students (\(N=18\)). This likely drove up the correlation between the variables.
Table 10
*Correlations for Grade 2 Teacher Characteristics*

<table>
<thead>
<tr>
<th>Grade 2, prewords&lt;20</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Class Size</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Teaching Experience (Years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Knowledge Survey Total</td>
<td></td>
<td>-.57*</td>
<td>.16</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Syllable Knowledge</td>
<td></td>
<td>-.09</td>
<td>.10</td>
<td>.36</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Phoneme Knowledge</td>
<td></td>
<td>-.56*</td>
<td>.21</td>
<td>.77**</td>
<td>.13</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Spelling conventions Knowledge</td>
<td></td>
<td>-.61*</td>
<td>.17</td>
<td>.93**</td>
<td>.32</td>
<td>.58*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Word Parts Knowledge</td>
<td></td>
<td>-.12</td>
<td>-.05</td>
<td>.15</td>
<td>.29</td>
<td>.10</td>
<td>.14</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Morpheme Knowledge</td>
<td></td>
<td>-.15</td>
<td>-.01</td>
<td>.72**</td>
<td>.15</td>
<td>.39</td>
<td>.58*</td>
<td>-.17</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Time Spent in Spelling Instruction</td>
<td></td>
<td>-.01</td>
<td>.14</td>
<td>.29</td>
<td>-.04</td>
<td>.50*</td>
<td>.14</td>
<td>-.05</td>
<td>.20</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Instructional Practices Total</td>
<td></td>
<td>-.16</td>
<td>.12</td>
<td>.53*</td>
<td>.38</td>
<td>.39</td>
<td>.41</td>
<td>.42</td>
<td>.42</td>
<td>.60*</td>
<td>1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11. Research Based Practices</td>
<td></td>
<td>-.18</td>
<td>.13</td>
<td>.50</td>
<td>.38</td>
<td>.38</td>
<td>.37</td>
<td>.41</td>
<td>.38</td>
<td>.61**</td>
<td>.35</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Strategy Instruction</td>
<td></td>
<td>-.50*</td>
<td>-.06</td>
<td>.57*</td>
<td>.04</td>
<td>.72**</td>
<td>.47</td>
<td>.22</td>
<td>.23</td>
<td>.72**</td>
<td>.58</td>
<td>.64**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13. Mean Gain in Words limited to students &lt; 20</td>
<td></td>
<td>-.28</td>
<td>.42</td>
<td>.36</td>
<td>.10</td>
<td>.53*</td>
<td>.34</td>
<td>.01</td>
<td>.03</td>
<td>.51*</td>
<td>.25</td>
<td>-.12</td>
<td>.55*</td>
<td>1</td>
</tr>
<tr>
<td>14. Number of Students in mean gain &lt; 20 pool</td>
<td></td>
<td>.27</td>
<td>.27</td>
<td>.10</td>
<td>-.17</td>
<td>.21</td>
<td>.07</td>
<td>.01</td>
<td>.04</td>
<td>.26</td>
<td>.07</td>
<td>.08</td>
<td>.09</td>
<td>.59*</td>
</tr>
<tr>
<td>Mean</td>
<td>21.81</td>
<td>18.44</td>
<td>37.44</td>
<td>4.44</td>
<td>5.88</td>
<td>22.31</td>
<td>3.38</td>
<td>1.44</td>
<td>99.38</td>
<td>100.13</td>
<td>118.13</td>
<td>33.81</td>
<td>13.53</td>
<td>14.13</td>
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<tr>
<td>SD</td>
<td>3.29</td>
<td>9.67</td>
<td>7.27</td>
<td>.63</td>
<td>2.42</td>
<td>3.88</td>
<td>.50</td>
<td>2.06</td>
<td>66.39</td>
<td>12.69</td>
<td>33.79</td>
<td>9.63</td>
<td>9.63</td>
<td>2.42</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
To address the question of the relationship between teacher knowledge and instructional practices and Grade 3 student spelling gains, Pearson correlation coefficients were computed. Spelling gains were limited to those 50 students who spelled fewer than 20 words correctly on the pretest. Results are shown in Table 11. There was a significant positive correlation between mean gain in words and teachers’ phoneme knowledge ($r = .53$), indicating that higher spelling gains were found in classes where teachers possessed higher levels of phoneme knowledge. The detection of significant relationships involving gains was limited possibly due to the small number of poor spellers across classes ($M = 3.13$).
Table 11

*Correlations for Grade 3 Teacher Characteristics*

<table>
<thead>
<tr>
<th>Grade 3, preword&lt;20</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Class Size</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td>1</td>
</tr>
<tr>
<td>2. Teaching Experience (years)</td>
<td>-28</td>
<td>1</td>
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</tr>
<tr>
<td>3. Knowledge Survey Total</td>
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<td>.06</td>
<td>1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4. Syllable Knowledge</td>
<td>-23</td>
<td>.25</td>
<td>.15</td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Phoneme Knowledge</td>
<td>-.24</td>
<td>-.12</td>
<td>.74**</td>
<td>-.17</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>6. Spelling conventions Knowledge</td>
<td>-.51*</td>
<td>.03</td>
<td>.85**</td>
<td>.11</td>
<td>.65**</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>7. Word Parts Knowledge</td>
<td>-.15</td>
<td>.46</td>
<td>.05</td>
<td>.16</td>
<td>-.08</td>
<td>-.17</td>
<td>1</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8. Morpheme Knowledge</td>
<td>-.05</td>
<td>-.02</td>
<td>.57*</td>
<td>.08</td>
<td>.09</td>
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<td>.02</td>
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<td></td>
</tr>
<tr>
<td>10. Instructional Practices Total</td>
<td>-.78**</td>
<td>.32</td>
<td>.61*</td>
<td>.17</td>
<td>.33</td>
<td>.71**</td>
<td>.13</td>
<td>.17</td>
<td>.78**</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>11. Research Based Practices</td>
<td>-.79**</td>
<td>.32</td>
<td>.61*</td>
<td>.17</td>
<td>.33</td>
<td>.71**</td>
<td>.13</td>
<td>.17</td>
<td>.78**</td>
<td>.98**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Strategy Instruction</td>
<td>-.65**</td>
<td>.16</td>
<td>.54*</td>
<td>.24</td>
<td>.33</td>
<td>.72**</td>
<td>.00</td>
<td>-.01</td>
<td>.81**</td>
<td>.90**</td>
<td>.91**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Mean Gain in Words limited to students &lt; 20</td>
<td>.08</td>
<td>.02</td>
<td>.33</td>
<td>.37</td>
<td>.53</td>
<td>.12</td>
<td>.12</td>
<td>.01</td>
<td>.30</td>
<td>.12</td>
<td>.00</td>
<td>.21</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14. Number of Students in mean gain &lt; 20 pool</td>
<td>.20</td>
<td>.30</td>
<td>-.05</td>
<td>.08</td>
<td>-.09</td>
<td>-.43</td>
<td>.13</td>
<td>.46</td>
<td>-.05</td>
<td>-.25</td>
<td>-.17</td>
<td>-.40</td>
<td>.20</td>
<td>1</td>
</tr>
</tbody>
</table>

| Mean    | 20.94 | 20.50 | 39.31 | 4.63 | 6.75 | 21.88 | 3.50 | 2.56 | 48.13 | 94.94 | 98.94 | 34.69 | 8.59 | 3.13 |
| SD      | 2.54  | 8.53  | 5.26  | .50  | 2.02 | 2.83  | .82  | 2.19 | 26.64 | 32.15 | 33.86 | 9.43  | 1.55 | 1.31 |

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).
To answer the research question concerning the contribution of teachers’ knowledge and practice to students’ spelling gains, Hierarchical Linear Models (HLM) (Rindskopf, 2010) were used to control for the nested nature of the data because students were nested within teacher classrooms. The outcome variable in each analysis was the students’ spelling gain score from pre to post test. Only the data for weaker spellers were used in the analyses.

For Grade 2, a preliminary analysis (see Formula 1) examining the amount of variance accounted for by the teacher level variables showed that the amount of true variance accounted for by the teacher level variables was significantly greater than zero (see Table 12). This indicates the presence of significant variance in student gain scores at the teacher level, indicating that teacher variables may account for differences in student gain scores. Since this result is statistically significant, it indicates that there is statistical justification for running HLM analyses. However, the variance between teachers (6.83) was much smaller than the intra-class variance among students (26.49).

**Formula 1- Grade 2**

**Level-1 Model:** \( GAINSCOR_{ij} = \beta_{0j} + r_{ij} \)

**Level-2 Model:** \( \beta_{0j} = \gamma_{00} + u_{0j} \)

Note. In the level 1 model, \( \beta_{0j} \) is the intercept; the average gain score within each student and \( r_{ij} \) is the error showing how much each student deviates from the average student gain score. In the level 2 model, \( \gamma_{00} \) is the average gain score across all teachers and \( u_{0j} \) is the error score showing how much each teacher deviates from the average gain score.
Table 12

*Hierarchical Linear Model Results for Direct Relation of Variance at Teacher Level to Grade 2 Student Level Gains*

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Standard Deviation</th>
<th>Variance Component</th>
<th>d.f.</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Level, $u_0$</td>
<td>2.61</td>
<td>6.83</td>
<td>15</td>
<td>76.71</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Student Level, $r$</td>
<td>5.15</td>
<td>26.49</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since the variance at the teacher level was significant, additional HLM analyses were conducted to find which specific teacher level variables contributed to the differences in student gain scores (see Formula 2).

**Formula 2 - Grade 2**

Level-1 Model: $GAINSCOR_{ij} = \beta_{0j} + r_{ij}$

Level-2 Model: $\beta_{0j} = \gamma_{00} + \gamma_{01} \times \text{(variable)} + u_{0j}$

Note. The difference between formula 1 and formula 2 is that formula 2 adds $\gamma_{01}$ which represents each teacher variable. This model was run with every teacher variable.

HLM was used to statistically analyze a data structure where students (Level-1) were nested within teachers (Level-2). Every teacher level variable was analyzed with HLM to see if any of the teacher level variables could be used to predict student level gain scores. Results are shown in Table 13. The regression coefficient relating teachers’ phoneme knowledge to student gain scores was positive and statistically significant ($b = 0.66, p = .031$). The variance component representing variation between teachers decreases greatly (from 6.83 to 4.70). This indicates that the level-2 variable phoneme knowledge explains a large portion of the teacher-to-teacher variation in spelling gain scores. More precisely, the proportion of variance explained
by phoneme knowledge is $\frac{6.83 - 4.70}{6.83} = .31$, which means that 31% of the explainable variation in spelling gain scores can be explained by teacher phoneme knowledge. This indicates that student gain scores were higher when their teacher’s level of phoneme knowledge was higher. Therefore, teacher phoneme knowledge can be used to predict student gains in spelling words.

Table 13

*Results of Hierarchical Linear Model Testing Relationship Between Teacher Knowledge and Practices and Grade 2 Pretest to Posttest Gains for Students with Lower Pretest Scores (<20 out of 40 Correct)*

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-ratio</th>
<th>Approx. d.f.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.71</td>
<td>0.73</td>
<td>20.02</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>CLASSSIZ, $\gamma_{01}$</td>
<td>-0.25</td>
<td>0.23</td>
<td>-1.07</td>
<td>14</td>
<td>0.30</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.70</td>
<td>0.69</td>
<td>21.30</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>YEARSTEA, $\gamma_{01}$</td>
<td>0.13</td>
<td>0.07</td>
<td>1.77</td>
<td>14</td>
<td>0.10</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.7</td>
<td>0.71</td>
<td>20.59</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>KNOWLED, $\gamma_{01}$</td>
<td>0.14</td>
<td>0.10</td>
<td>1.42</td>
<td>14</td>
<td>0.18</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.70</td>
<td>0.76</td>
<td>19.40</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>SYLLABLE, $\gamma_{01}$</td>
<td>0.51</td>
<td>1.24</td>
<td>0.41</td>
<td>14</td>
<td>0.69</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.71</td>
<td>0.64</td>
<td>22.87</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>PHONEME, $\gamma_{01}$</td>
<td>0.66</td>
<td>0.28</td>
<td>2.40</td>
<td>14</td>
<td>0.03</td>
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<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.70</td>
<td>0.72</td>
<td>20.41</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>SPELLING, $\gamma_{01}$</td>
<td>0.25</td>
<td>0.19</td>
<td>1.32</td>
<td>14</td>
<td>0.21</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.70</td>
<td>0.76</td>
<td>19.25</td>
<td>14</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>WORDPART, $\gamma_{01}$</td>
<td>-0.03</td>
<td>1.58</td>
<td>-0.02</td>
<td>14</td>
<td>0.98</td>
</tr>
</tbody>
</table>
Table 13 (continued)

Results of Hierarchical Linear Model Testing Relationship Between Teacher Knowledge and Practices and Grade 2 Pretest to Posttest Gains for Students with Lower Pretest Scores (<20 out of 40 Correct)

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-ratio</th>
<th>Approx. d.f.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.70</td>
<td>0.76</td>
<td>19.26</td>
<td>14</td>
</tr>
<tr>
<td>MORPHEME, $\gamma_{0l}$</td>
<td>-0.05</td>
<td>0.38</td>
<td>-0.12</td>
<td>14</td>
<td>0.90</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>12.14</td>
<td>1.38</td>
<td>8.80</td>
<td>14</td>
</tr>
<tr>
<td>TIMEININ, $\gamma_{0l}$</td>
<td>0.51</td>
<td>0.24</td>
<td>2.13</td>
<td>14</td>
<td>0.05</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>6.67</td>
<td>6.11</td>
<td>1.09</td>
<td>14</td>
</tr>
<tr>
<td>INSTRUCT, $\gamma_{0l}$</td>
<td>0.07</td>
<td>0.05</td>
<td>1.32</td>
<td>14</td>
<td>0.21</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>7.73</td>
<td>5.63</td>
<td>1.37</td>
<td>14</td>
</tr>
<tr>
<td>RESEARCH, $\gamma_{0l}$</td>
<td>0.07</td>
<td>0.05</td>
<td>1.25</td>
<td>14</td>
<td>0.23</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.71</td>
<td>0.65</td>
<td>22.80</td>
<td>14</td>
</tr>
<tr>
<td>STRATEGY, $\gamma_{0l}$</td>
<td>0.17</td>
<td>0.07</td>
<td>2.40</td>
<td>14</td>
<td>0.03</td>
</tr>
<tr>
<td>For INTRCPT1, $\beta_0$</td>
<td>INTRCPT2, $\gamma_{00}$</td>
<td>14.64</td>
<td>0.63</td>
<td>23.12</td>
<td>14</td>
</tr>
<tr>
<td>NUMBERTXE, $\gamma_{0l}$</td>
<td>0.70</td>
<td>0.27</td>
<td>2.61</td>
<td>14</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*Note. CLASSSIZ= total number of students in the class; YEARSTEA= years teaching; KNOWLED= knowledge survey total; SYLLABLE= syllable knowledge; PHONEME= phoneme knowledge; SPELLING= spelling conventions knowledge; WORDPART= knowledge of parts of words; MORPHEME= morpheme knowledge; TIMEININ= average time in weekly spelling instruction; INSTRUCT= instructional practice total; RESEARCH= use of research based practices; STRATEGY= strategy based instruction; NUMBERTXE= number of students with pretest<20.*

The regression coefficient relating teachers’ time spent in spelling instruction to student gain scores was positive and statistically significant ($b = 0.51, p = .05$). The variance component representing variation between teachers decreases greatly (from 6.83 to 5.18). This indicates that the level-2 variable, time spent in spelling instruction, explains a large portion of the teacher-to-teacher variation in spelling gain scores. More precisely, the proportion of variance explained by time spent in spelling instruction is $(6.83 - 5.18)/6.83 = .24$. Thus, about 24% of the explainable variation in spelling gain scores can be explained by time spent in spelling
instruction. This indicates that student gain scores were higher when their teacher spent more
time teaching spelling each week. Therefore, time spent in spelling instruction can be used to
predict student level gain scores.

The regression coefficient relating teachers’ instructing students in how to use strategies
to spell words to student gain scores was positive and statistically significant ($b = 0.17, p = .031$).
The variance component representing variation between teachers decreases greatly (from 6.83 to
4.75). This indicates that the level-2 variable, strategy instruction, explains a large portion of the
teacher-to-teacher variation in spelling gain scores. More precisely, the proportion of variance
explained by strategy instruction is $(6.83 - 4.75)/6.83 = .30$. Thus, about 30% of the explainable
variation in spelling gain scores can be explained by strategy instruction. This indicates that
student gain scores were higher when their teacher taught more spelling strategies. Therefore,
the teaching of spelling strategies can be used to predict student level gain scores.

The regression coefficient relating to the number of students who scored less than 20
words correct on the pretest per teacher to student gain scores was positive and statistically
significant ($b = 0.70, p = .02$). The variance component representing variation between teachers
decreases greatly (from 6.83 to 4.50). This indicates that the level-2 variable, number of students
who scored less than 20 on the pretest across teachers, explains a large portion of the teacher-to-
teacher variation in spelling gain scores. More precisely, the proportion of variance explained
by the number of students who scored less than 20 on the pretest is $(6.83 - 4.50)/6.83 = .34$.
Thus about 34% of the explainable variation in spelling gain scores can be explained by
the number of students who scored less than 20 on the pretest. This indicates that student gain
scores were higher when there were more students in the class who scored less than 20 words
correct on the spelling pretest. Therefore, the number of students who scored less than 20 words correct on the pretest can be used to predict student level gain scores.

These results match the results of the correlational analysis which found significant positive correlations between student mean gain in spelling words and teachers’ phoneme knowledge, time spent in spelling instruction, strategy instruction, and number of students who scored less than 20 on the pretest (see Table 10).

A second HLM analysis that combined all of the Grade 2 teacher variables that were significantly correlated with student spelling gains was explored (see Formula 3). The variables included in this model were teacher phoneme knowledge, time spent in spelling instruction, strategy instruction and the number of students who scored less than 20 on the pretest. The results of this model showed that only one variable, the number of students who scored less than 20 words correct on the pretest, was significant (see Table 14). The regression coefficient relating to the number of students who scored less than 20 words correct on the pretest per teacher to student gain scores was positive and statistically significant ($b = 0.61, p = .03$). The lack of relationship found for the other variables may be because they are correlated with each other.

**Formula 3- Grade 2**

**Level-1 Model**

$$GAINWORD_{ij} = \beta_{0j} + r_{ij}$$

**Level-2 Model**

$$\beta_{0j} = \gamma_{00} + \gamma_{01}*(PHONEME_j) + \gamma_{02}*(TIMEININ_j) + \gamma_{03}*(STRATEGY_j) + \gamma_{04}*(NUMBERTE_j) + u_{0j}$$
Table 14

Results of Hierarchical Linear Model Testing Relationship Between Teacher Knowledge and Practices for Variables with Significant Correlations and Grade 2 Pretest to Posttest Gains for Students with Lower Pretest Scores (<20 out of 40 Correct)

<table>
<thead>
<tr>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-ratio</th>
<th>Approx. d.f.</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>For INTRCPT1, β0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTRCPT2, γ00</td>
<td>0.84</td>
<td>4.24</td>
<td>0.20</td>
<td>11</td>
<td>0.85</td>
</tr>
<tr>
<td>PHONEME, γ01</td>
<td>0.18</td>
<td>0.36</td>
<td>0.50</td>
<td>11</td>
<td>0.63</td>
</tr>
<tr>
<td>TIMEININ, γ02</td>
<td>0.05</td>
<td>0.30</td>
<td>0.17</td>
<td>11</td>
<td>0.87</td>
</tr>
<tr>
<td>STRATEGY, γ03</td>
<td>0.11</td>
<td>0.11</td>
<td>1.04</td>
<td>11</td>
<td>0.32</td>
</tr>
<tr>
<td>NUMBERTE, γ04</td>
<td>0.61</td>
<td>0.25</td>
<td>2.42</td>
<td>11</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Note. PHONEME= phoneme knowledge; TIMEININ= average time in weekly spelling instruction; STRATEGY= strategy based instruction; NUMBERTE= number of students with pretest<20.

For Grade 3 data, a preliminary analysis (see Formula 4) examining the amount of variance accounted for by the teacher level variables showed that the amount of true variance accounted for by the teacher level variables is not significantly greater than zero (see Table 15). This indicates that there was not sufficient variance in the student gain scores by the teacher level variables and therefore, these variables may not account for differences in student gain scores. Since this result is not statistically significant, it indicates that there is not a statistical justification for running HLM analyses. Inspection of weaker Grade 3 spellers in individual teachers’ classrooms revealed that the distribution of 50 students among the teachers varied from one to six (M=3.13, SD=1.31). Too few students may explain why the HLM preliminary test failed.
Formula 4- Grade 3

Level-1 Model: \[ \text{GAINSCOR}_{ij} = \beta_{0j} + r_{ij} \]

Level-2 Model: \[ \beta_{0j} = \gamma_{00} + u_{0j} \]

Note. In the level 1 model, \( \beta_{0j} \) is the intercept; the average gain score within each student and \( r_{ij} \) is the error showing how much each student deviates from the average student gain score. In the level 2 model, \( \gamma_{00} \) is the average gain score across all teachers and \( u_{0j} \) is the error score showing how much each teacher deviates from the average gain score.

Table 15

Hierarchical Linear Model Results for Direct Relation of Variance at Teacher Level to Grade 3

Student Level Gains

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Standard Deviation</th>
<th>Variance Component</th>
<th>d.f.</th>
<th>( \chi^2 )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Level, ( u_{0j} )</td>
<td>1.37</td>
<td>1.87</td>
<td>15</td>
<td>19.77</td>
<td>0.18</td>
</tr>
<tr>
<td>Student Level, ( r )</td>
<td>4.13</td>
<td>17.07</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter VI Discussion

The purpose of this study was to identify teacher level variables that impact student spelling gains. In a yearlong study, Grade 2 and Grade 3 students’ spelling growth was measured by calculating gains made from a beginning of the year spelling pretest to an end of the year spelling posttest. Teacher level variables were identified through two measures, an Instructional Practices Questionnaire and a Linguistic Knowledge Survey.

Student Measures

The first research question sought to explore how much gain students made in spelling in Grades 2 and 3. It was hypothesized that students would show growth in their spelling performance from the fall to the spring. It was promising to see that on average, students did make spelling gains throughout the school year. Examination of the full sample revealed that the mean gains were 12.73 for Grade 2 and 6.01 for Grade 3. In the reduced sample consisting of weaker spellers, the mean gains were 14.92 for Grade 2 and 10.28 for Grade 3. Due to the issue of ceiling effects in both grades, the sample size was greatly reduced in Grade 2 from 331 to 226 and Grade 3 from 305 to 50. This resulted in keeping only the weaker spellers for the analyses.

Linguistic Knowledge

The second research question explored the teachers’ level of linguistic knowledge. Based on past research, it was hypothesized that the teachers’ levels of linguistic knowledge would be low (Crim et al., 2008; McCutchen et al., 2002b; Mather et al., 2001; Moats & Foorman, 2003; Piasta et al., 2009). The results of the current study supported this hypothesis because the mean total score for Grade 2 was 64% and Grade 3 was 66%. The results showed no significant grade level differences on the Linguistic Knowledge Survey.
Similar to the findings of Crim et al. (2008), Mather et al. (2001), and Washburn et al. (2011), the current study revealed that teachers performed well on syllable knowledge. The teachers did not perform well on spelling conventions, word parts, and phoneme knowledge. Similar results were found by Mather et al. (2001) and Washburn et al. (2011). The most challenging portion of the survey for both grade levels was morpheme identification questions. Similar results were found by Crim et al. (2008). Carreker et al. (2010) found similar results in that teachers did not demonstrate a thorough knowledge of phonemes or morphemes.

The low scores on the Linguistic Knowledge survey are concerning because teachers are expected to help their students make gains in spelling development. Since spelling is largely a linguistic task (Joshi et al., 2008-09; Treiman & Kessler, 2013), teachers with low levels of linguistic knowledge may not be able to help their students make adequate spelling gains.

Relationship between Teacher Knowledge and Student Spelling Gains

The third research question explored the impact of teachers’ linguistic knowledge on student spelling gains. It was hypothesized that positive relationships between teacher knowledge and student spelling gains would be found. For both Grades 2 and 3, a significant positive correlation was found between student spelling gains and teacher phoneme knowledge, thus supporting the hypothesis. However, all other types of teacher knowledge being measured (total linguistic knowledge, syllable, spelling conventions, word parts and morpheme) did not significantly correlate with student spelling gains. The results of the current study are similar to past research that has found positive relationships between teacher knowledge and student reading gains (McCutchen et al., 2002; McCutchen et al., 2002b; Moats & Foorman, 2003; Piasta et al., 2009; Spear-Swerling & Brucker, 2004). However, some research found no significant effects of teacher knowledge on student reading gains (Carlisle et al., 2009), similar
to what was found in the current study for all types of knowledge other than phoneme knowledge.

HLM analyses for Grade 2 found significant results showing that phoneme knowledge is a predictor of student level gain scores in spelling. HLM analyses for Grade 3 showed that the amount of true variance accounted for by the teacher level variables was not significantly greater than zero. Therefore HLM analyses were not justified for the Grade 3 data. This result was most likely due to the small sample size of Grade 3 students qualifying as poor spellers on our test.

**Spelling Instructional Practices**

The fourth research question examined the types of spelling instructional practices that teachers implement. It was hypothesized that the types of spelling instructional practices would be varied, from no spelling instruction to daily instruction. Similar to Graham et al. (2008), the results of the current study showed that all of the teachers in the study taught spelling. However, three of the third grade teachers did not present their students with traditional word lists and end of week spelling tests, but they did teach spelling strategies throughout the week. The total mean score on the Instructional Practices Questionnaire was 56% for Grade 2 and 53% for Grade 3. The mean score for the use of research based spelling practices was 75% for Grade 2 and 63% for Grade 3. The use of research based practices was found to be positively correlated with time spent in spelling instruction. The mean percentage for the teaching of specific spelling strategies was 70% for Grade 2 and 72% for Grade 3.

The mean amount of time spent in spelling instruction each week was 99.38 minutes for Grade 2 and 48.13 minutes for Grade 3; there was a significant difference between grades. The amount of time spent in spelling instruction for Grade 2 was similar to Graham et al.’s (2008) finding that teachers reported spending an average of 90 minutes per week teaching spelling.
However, the Grade 3 results in the current study were almost half of Graham et al.’s findings. The difference may be because Graham et al. combined Grade 1, 2 and 3 teachers. Since spelling is typically a major part of the Grade 1 curriculum, it is possible that greater minutes spent by Grade 1 teachers compensated for fewer minutes spent by Grade 3 teachers.

Both grades reported using word lists that were organized by spelling patterns and rules, strategy instruction, visual patterns, applying spelling rules, incorporating word meaning, word structure, word families, giving the students the opportunity to use the spelling words in writing, and students being able to read the spelling words. A large majority of teachers (100% Grade 2 and 81.25% Grade 3) incorporated phonics into their spelling instruction. Few teachers had the students keep a log of misspelled words, use analogies to spell new words, or have students self-correct their pretests. These results show that the majority of teachers in the study followed the basal speller and traditional views of spelling instruction which places an emphasis on learning words from lists that are organized by spelling patterns, phonics and rules (Heald-Taylor, 1998; Schlagal, 2002). The results of the current study support the findings of McNeill and Kirk (2014) which found that 74% of teachers taught phonics. The current results are higher, most likely because McNeill and Kirk’s sample included teachers up to Grade 6 where teachers in the upper elementary grades typically do not spend as much time teaching phonics as teachers in the earlier elementary grades.

Some teachers followed a developmental approach to teaching spelling where word lists and instructional practices are differentiated to address the students’ individual phase/stage of spelling development (Schlagal, 2002). The developmental approach to teaching spelling supports the stage/phase theories of spelling development (Ehri, 2005; Henderson, 1990). While approximately half of the teachers (68.75% Grade 2 and 50% of Grade 3) taught spelling in a
whole class method, many did combine it with small group instruction as well (62.5% Grade 2 and 37.5% Grade 3). However, only 6.25% of Grade 2 teachers and 0% of Grade 3 teachers taught spelling solely in a small group format. The Grade 2 results were similar to the findings of McNeill and Kirk (2014) which found that 67% of the teachers grouped their students. Similar to the findings of Fresch (2003), the current study revealed that the majority of teachers follow a traditional approach to spelling instruction. However, the current study found that some teachers incorporated a developmental approach into their traditional teaching by providing small group instruction.

Relationship between Instructional Practices and Teacher Knowledge

Similar to findings of McCutchen et al. (2002b), Carreker et al. (2010) and Spear-Swerling and Zibulsky (2014), the current study revealed a relationship between instructional practices and teacher knowledge. The total score on the Instructional Practices Questionnaire was found to be positively and significantly correlated with knowledge of spelling conventions and total teacher knowledge. Strategy instruction was found to be positively correlated with total teacher knowledge, phoneme knowledge, spelling conventions knowledge, and time spent in spelling instruction. Therefore, the greater the teachers’ levels of linguistic knowledge, the stronger their instructional practices. Piasta et al. (2009) found that teacher knowledge combined with instructional practices were found to have an impact on students’ word reading gains.

Relationship between Teacher Practice and Student Spelling Gains

The fifth research question examined the impact of teachers’ instructional practices on student spelling gains. It was hypothesized that positive relationships would be found between teacher practice and student spelling gains. Similar to the findings of Berninger et al. (2002), Foorman and Petscher (2010), and Graham et al. (2002), the current study revealed that
instructional practices impact spelling growth. The Grade 2 results supported the hypothesis with significant positive correlations between student spelling gains and time spent in spelling instruction, strategy instruction, and the number of students in the class who scored less than 20 on the pretest. HLM analyses found identical significant results where time spent in spelling instruction, strategy instruction, and the number of students who score less than 20 correct on the pretest could be used to predict weaker spellers’ gain scores. These results differ from Shippen, Reilly and Dunn (2008) and Graham and Santangelo (2014) who found that increased time in instruction did not result in greater spelling gains. The different results may be attributable to factors other than time spent in instruction. Shippen, Reilly and Dunn were able to control the type of spelling instruction that was provided while varying only the amount of time in instruction while the current study did not control the type of spelling instruction provided. Therefore, time in instruction along with different types of instruction may increase spelling gains more than just increased time alone. This was found in Foorman et al. (2006) where for less effective teachers, the more time they spent teaching grammar, mechanics and spelling, the lower the spelling outcomes for high ability students.

The Grade 3 results did not find significant positive correlations between student spelling gains and teachers’ instructional practices. In addition, HLM analyses for Grade 3 showed that the amount of true variance accounted for by the teacher level variables is not significantly greater than zero. Therefore HLM analyses were not justified for the Grade 3 data. The lack of significant findings for Grade 3 can be attributed to a variety of factors. There was a significant difference between grades for the amount of time spent in spelling instruction each week. Since it was found that the use of research based practices was positively correlated with time spent in spelling instruction, it appears that third grade teachers spent less time teaching research based
practices than second grade teachers. This could have resulted in a decrease in gain scores for third grade students. In addition, the recommended amount of time in spelling instruction is 60-75 minutes per week. The second grade teachers exceeded this recommendation, but the third grade teachers did not meet the recommendation since they taught spelling for an average of 48.13 minutes per week. Due to the removal of student data to address the ceiling effect, there was a small sample size of students which reduced the power of the analyses.

Unlike the findings of Abbott (2004), Brown and Morris (2005), Invernizzi and Hayes (2004), and Morris et al. (1995a) who showed a relationship between student spelling gains and differentiated spelling instruction, the current study did not find a significant relationship between these two variables. The lack of findings could be attributable to the fact that the teachers self-reported their use of differentiation. It is possible that actual practice differed from the teachers’ self-reports.

Limitations and Directions for Future Research

There were several issues in the current study that impacted the strength and interpretation of the findings. One limitation is that the study was an observational correlational study. Therefore, all relationships between variables that were found are not necessarily causal relationships. The relationships that were found could be due to factors other than the independent variables such as students’ reading ability or instructional practices that were not measured. Therefore, recommending advice to teachers based on the findings is tentative. This limitation can be addressed in future research by conducting an experimental study to establish causal relationships. In addition, future research might examine what effective teachers do to teach spelling.
The study did not involve actual classroom observation, but rather teachers’ reported instructional practices. This could result in inaccurate data of instructional practices because teachers might carry out instructional practices differently than they self-reported in the questionnaire. This limitation can be addressed in future research by conducting classroom observations instead of using a self-report measure.

Due to the issue of ceiling effects in both grades, the sample size was greatly reduced in Grade 2 from 331 to 226 and Grade 3 from 305 to 50. This resulted in keeping only the weaker spellers for the analyses. The power of the statistical analyses for Grade 3 was severely impacted by the loss of 84% of the sample of third graders.

The Grade 3 HLM analyses showed that the amount of true variance accounted for by the teacher level variables did not significantly differ from zero. Therefore HLM analyses were not justified for the Grade 3 data. This result was most likely due to the small sample size of students. The inability to conduct HLM analyses on the Grade 3 data set reduced the ability to draw conclusions from the data because the data analyses for Grade 3 was limited to correlational analyses.

A threat to the internal validity of the study that must be considered is the possibility of statistical regression. Since the student subjects selected for participation in the study were selected based on extreme scores on the pretest, it is possible that their gain scores were due to the tendency to regress towards the mean on the post test. The last three limitations can be addressed in future research by revising the spelling test to include more challenging words. This would prevent ceiling effects and the need to exclude higher performing students.

Additional threats to the internal validity of the study include student and teacher characteristics that were not measured. For example, the students’ reading level, SES status,
English language proficiency and special education status were not accounted for in this study. The only knowledge about student characteristics was the student spelling test scores. Therefore, the unknown student characteristics could have impacted the results of the study. In addition, teachers’ experiences in staff development in the areas of linguistic knowledge, spelling development and spelling instruction were not measured. Therefore, these teacher characteristics could have impacted the results of the study.

The study did not examine where teachers acquired their knowledge about linguistics and spelling instructional practices and it did not include information regarding the types of professional development offered to teachers or the teachers’ experiences taking courses in linguistics. Since pre-service general education teachers typically receive limited coursework in how to teach reading and spelling, it is possible that the teachers in the study had limited exposure to linguistics. In addition, since professional development varies by school district, it is possible that teachers received varying levels of instruction in linguistics as in-service teachers. Without the knowledge of the types of professional development or coursework offered to the teachers, it is not possible to determine if professional development or coursework impacted the teachers’ linguistic knowledge or instructional practices.

A final limitation of this study is that the results cannot be generalized to populations with demographics different from the sample. The student participants in the study were primarily white middle class students attending schools with low proportions of English Language Learners. The teachers were all white, mostly female and they worked in schools where both the students and teachers were stable in that the schools had a low teacher turnover rate and there were low numbers of transient students. Therefore, due to the homogeneity of the sample, the results can only be generalized to white middle class suburban schools.
Conclusions and Implications

Despite the limitations, this study adds to the literature on teacher knowledge, spelling instructional practices and student spelling achievement. Specifically, in Grade 2, relationships were found between gain scores and teacher phoneme knowledge, time spent in weekly spelling instruction, teaching of spelling strategies, and the number of students who scored less than 20 words correct on the pretest. In Grade 3, a relationship was found between gain scores and teacher phoneme knowledge. In addition, teachers did not perform well on measures of phoneme knowledge. Given the relationship between student spelling gains and teachers’ phoneme knowledge, these results support the need for teacher education in linguistic knowledge, specifically in the area of phoneme knowledge.

Effective spelling instruction involves teaching spelling as a linguistic skill and teachers need to have knowledge of English orthography to be able to teach spelling effectively (Bourassa & Treiman, 2009; Carreker et al., 2010; Moats 2009b; Moats & Foorman, 2003). However, the results of the current study showed that teachers have low levels of linguistic knowledge. To address this, teacher education programs and staff development for in-service teachers should focus on phonemic awareness, orthographic awareness and morphological awareness because instruction in these three linguistic skills supports spelling development. Therefore, teachers need to have sufficient knowledge in these linguistic skills in order to effectively teach spelling to their students.

As was seen in the current study, teacher knowledge impacts instructional decision making. Specifically, linguistic knowledge was significant and positively correlated with instructional practices. However, teachers may have some misunderstandings about appropriate methods of spelling instruction (Vallecorsa et al., 1985). Carreker et al. (2010), McCutchen et
al. (2002), Moats and Foorman (2003), and Spear-Swerling and Brucker (2004) found that professional development resulted in improvements in teacher knowledge, practice and student literacy gains. Therefore, there is a need for teacher professional development in research based spelling practices.
Appendix A- Scripts

Recruitment Scripts:

Recruitment phone script requesting school principals to allow their school to participate in the study:

Hello, my name is Alison Puliatte and I am a graduate student at the CUNY Graduate Center. I am conducting a research study entitled: Relationship of Students' Spelling Gains to Teacher Knowledge and Teacher Practice.

I am calling to ask your permission to allow me to conduct research in your school. I am seeking 30 teachers to participate in this study; 15 grade 2 teachers and 15 grade 3 teachers. Each teacher will participate in two surveys and administer two spelling tests consisting of 40 words to their students. One survey asks about teachers’ spelling instructional practices and one survey asks about teachers’ linguistic knowledge. The time commitment of each teacher is expected to be 90 minutes over a span of one school year. Each session will take place in the subjects’ classroom. Teachers who participate in this study will receive $100.00 in cash after completion of the study.

All data gathered for the study will remain confidential and all student identifiers will be removed by the classroom teacher. Therefore, I will not have access to identifiable student information.

With your permission, I would like to email and/or call your teachers to recruit them for my study. Thank you for your time.

Recruitment e-mail script requesting teachers to participate in the study:

Hello, my name is Alison Puliatte and I am a graduate student at the CUNY Graduate Center. I am conducting a research study entitled: Relationship of Students' Spelling Gains to Teacher Knowledge and Teacher Practice.

I am calling/emailing to ask if you would be interested in participating in a research study. Your participation involves completing two surveys and administering two spelling tests to your students. The time commitment is expected to be 90 minutes over a span of one school year. For your participation in this study you will receive $100.00 in cash after completion of the study.

All data gathered for the study will remain confidential and all student identifiers will be removed by the classroom teacher. Therefore, I will not have access to identifiable student information.

Are interested in participating in the study? Thank you for your time.
Script- Linguistic Knowledge Survey

This survey asks a wide variety of questions about linguistic knowledge. Some of the questions asked in this survey may be challenging and contain information that is not common knowledge in elementary schools. Please answer each question to the best of your ability. If you are unsure of an answer, you may leave the item blank.

All answers will remain confidential.

Thank you for your participation.

Script- Instructional Practices Questionnaire

This questionnaire is based on the instructional practices you followed this year when teaching spelling and reading to your students. Please answer each question to the best of your ability based on how you taught spelling and reading during the 2013-14 school year.

All answers will remain confidential.

Thank you for your participation.
Appendix B- Sample Principal Agreement

To Whom It May Concern,

I agree to participate in Alison Puliatte’s research study: Relationship of Students’ Spelling Gains to Teacher Knowledge and Teacher Practice. I agree that the students will take part in one spelling pretest and one posttest. This type of testing is part of our normal program and practices in our school. Data will be collected on already existing procedures and stripped of all identifiers. I agree to have the teachers give Alison the students’ scores from the tests as coded data without identifiers. I agree to have Alison solicit participation of teachers on a voluntary basis to administer the spelling tests and complete two surveys. The teachers will sign an informed consent form to participate in the study.

Sincerely,

School Principal
Appendix C- Teacher Consent

CITY UNIVERSITY OF NEW YORK

The Graduate School and University Center

Department of Educational Psychology

CONSENT TO PARTICPATE IN A RESEARCH PROJECT

Project Title: Relationship of Students’ Spelling Gains to Teacher Knowledge and Teacher Practice

Principal Investigator: Alison Puliatte
Graduate Student
The Graduate School and University Center
365 Fifth Avenue
New York, NY 10016-4309
(516) 623-3411

Faculty Advisor: Dr. L. Ehri
Professor
The Graduate School and University Center
365 Fifth Avenue
New York, NY 10016-4309
(212) 817-8285

Site where study is to be conducted:

Introduction/Purpose: You are invited to participate in a research study. The study is conducted under the direction of Alison Puliatte, Graduate Student, and CUNY Graduate School. The purpose of this research study is to analyze the impact of teacher knowledge and practice on student spelling gains. The results of this study may add to the generalized knowledge of spelling development and instruction.

Procedures: Approximately 30 individuals are expected to participate in this study. Each subject will participate in two surveys and administer two spelling tests consisting of 40 words to their students. The time commitment of each participant is expected to be 90 minutes over a span of one school year. Each session will take place in the subjects’ classroom.

Possible Discomforts and Risks: The risks from participating in this study are no more than encountered in everyday life. If you are upset as a result of this study you should contact Alison Puliatte.

Benefits: There are no direct benefits. However, participating in the study may increase general knowledge of spelling development and instruction.
**Voluntary Participation:** Your participation in this study is voluntary, and you may decide not to participate without prejudice, penalty, or loss of benefits to which you are otherwise entitled. If you decide to leave the study, please contact the principal investigator, Alison Puliatte, to inform her of your decision.

**Financial Considerations:** For your participation in this study you will receive $100.00 in cash after completion of the study.

**Confidentiality:** The data obtained from you will be collected via written document. The collected data will be accessible to Alison Puliatte, Dr. Ehri, IRB Members and staff. The researcher will protect your confidentiality by coding and securely storing the data. The collected data will be stored in paper format and on a computer. The consent will be kept separate from data.

**Contact Questions/Persons:** If you have any questions about the research now or in the future, you should contact the Principal Investigator, Alison Puliatte, (516) 623-3411, apuliatte@gc.cuny.edu. If you have any questions concerning your rights as a participant in this study, you may contact Kay Powell, IRB Administrator, The Graduate Center/City University of New York, (212) 817-7525, kpowell@gc.cuny.edu.

**Statement of Consent:**

“I have read the above description of this research and I understand it. I have been informed of the risks and benefits involved, and all my questions have been answered to my satisfaction. Furthermore, I have been assured that any future questions that I may have will also be answered by the principal investigator of the research study. I voluntary agree to participate in this study. By signing this form I have not waived any of my legal rights to which I would otherwise be entitled. I will be given a copy of this statement.”

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<th>Signature of Subject</th>
<th>Date Signed</th>
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<td>Signature of Person Explaining Consent Form</td>
<td>Date Signed</td>
</tr>
<tr>
<td>Printed Name of Investigator</td>
<td>Signature of Investigator</td>
<td>Date Signed</td>
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</tbody>
</table>
Appendix D

Student Spelling Test

Directions for teachers:

- To protect the identity of the students, assign each student a code following this format: first letter of first name, first letter of last name and a number (for the number, begin with 1 and end with the total number of students in your class). For example, if the first student’s name is John Smith, his code is JS1.

- The students will write their code on the test. Do not allow the students to write their name on the test.

- Keep a record of the codes you assigned to the students because the students will need to use the same code for the post test at the end of the year.

- Allow the students to take a 10-20 minute break after word 20.

- Read this statement to the students: “We will now have a spelling test. There will be 40 words. I will pronounce each word, use it in a sentence, and pronounce it a second time. Try to spell each word the best you can. If you do not know how to spell the word, try to spell it the best you can.”
Appendix D Continued

1. pet I have a pet cat who likes to play. pet
2. knife The knife is sharp. knife
3. rob A raccoon will rob a bird’s nest for eggs. rob
4. eyes We see with our eyes. eyes
5. carries She carries apples in her basket. carries
6. buy We buy bread at the store. buy
7. riding They are riding their bikes to the park today. riding
8. lose Small things are easy to lose. lose
9. sled The dog sled was pulled by huskies. sled
10. comb A comb has teeth. comb
11. blade The blade of the knife was very sharp. blade
12. right He throws the ball with his right hand. right
13. fright She was a fright in her Halloween costume. fright
14. laugh The funny cartoon makes me laugh. laugh
15. thorn The thorn from the rose bush stuck me. thorn
16. honest An honest person tells the truth. honest
17. tries He tries hard every day to finish his work. tries
18. any Have you any pennies? any
19. shine He rubbed the coin to make it shine. shine
20. half She cut the apple in half. half

Allow the students to take a 5 minute break now

21. wait You will need to wait for the letter. wait
22. blood Blood is red. blood
23. drive I learned to drive a car. drive
24. table The dish is on the table. table
25. ship The ship sailed around the island. ship
26. listen Listen to the sound of the wind. listen
27. serving The restaurant is serving dinner tonight. serving
28. pigeon The pigeon eats popcorn in the park. pigeon
29. lump He had a lump on his head after he fell. lump
30. talk Babies cannot talk. talk
31. crawl You will get dirty if you crawl under the bed. crawl
32. should We should be home before dark. should
33. third I was the third person in line. third
34. shopping She went shopping for new shoes. shopping
35. train I rode the train to the next town. train
36. spoil The food will spoil if it sits out too long. spoil
37. shower The shower in the bathroom was very hot. shower
38. favor He did his brother a favor by taking out the trash. favor
39. friendship A friendship often starts at school. friendship
40. weigh Butchers weigh the meat before they wrap it. weigh
Appendix E
Instructional Practices Questionnaire

Name _____________________________________       Date ____________________

- How many years have you been teaching? _______________________________
- What grade do you currently teach? ________________________________
- How long have you been teaching this grade? __________________________
- List any other grades you have taught __________________________________
- How many students are in your class? ________________________________
- How many students in your class have an IEP? _________________________
- How many students in your class are English Language Learners? __________

The following questions pertain to the type of spelling instruction that you have provided to your students this year. Please answer each question to the best of your ability.

1. Did you teach spelling to your students?  Yes   No

2. Did you utilize a spelling program?     Yes        No         If yes, which program?

3. How many spelling words did the students practice each week? ______________

4. How were the words in each spelling list organized (circle all those that apply):
   - By spelling pattern
   - By frequency
   - By grade equivalence
   - By students’ need to know
   - No apparent organization
   - Drawn from the spelling program
   - Drawn from student writing
   - Drawn from content areas
   - Other (explain)

5. Circle the area(s) of emphasis of your spelling program:
   - Phoneme awareness
   - Letter sounds
   - Consonant and vowel sound-spelling correspondences
   - Spelling patterns
   - Inflections(word endings)
   - Compounds
   - Syllabication
   - Morpheme instruction
   - Prefixes
   - Roots
   - Suffixes
   - Other (Explain)
6. Did you test students’ memory for the words at the end of the week?  Yes
   No

7. Were the same words reviewed and tested later in the semester?  Yes
   No

8. When students misspelled words they were tested on, was anything done to help
   them further in learning the words, such as re-teaching or re-testing?  Yes
   No

9. How much classroom time was devoted to spelling instruction every week?
   (circle the approximate amount of minutes spent on spelling instruction)
   0 20 40 60 80 100 120 140 160 180 200+

10. How did you teach spelling lessons:
    a. the same lesson was taught to the whole class
    b. different lessons were taught to small groups or individuals
    c. Both a and b

11. Did you assign spelling homework?  Yes  No

12. Did you teach phonics as part of reading and/or spelling instruction?  Yes  No

13. How effective do you think your spelling instruction was?
    Rate your effectiveness on a scale of 0-6 where 0 is the least effective and 6 is the most
    effective
    0 1 2 3 4 5 6

Rate items 14-36 according to your spelling instructional practices on a scale of 0-6,
where 0 indicates that you never did this and 6 indicates that you always did this. Circle
the number below each item.

Never  Occasionally  Often  Always

14. My students learned spelling from word lists
   0 1 2 3 4 5 6

15. My spelling lists were differentiated according to student ability
   0 1 2 3 4 5 6

16. My spelling lists were organized according to patterns and rules of English
    spellings
   0 1 2 3 4 5 6
<table>
<thead>
<tr>
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<th>Never</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
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<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>and patterns that I</td>
<td></td>
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<tr>
<td>taught throughout the</td>
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<td>2</td>
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<td>in small amounts across</td>
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<td>out</td>
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<tr>
<td>roots</td>
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</table>
31. I taught the spelling strategy of looking for word families across words
Never Occasionally Often Always
0 1 2 3 4 5 6

32. I provided my students with writing opportunities to practice and apply their spelling skills
Never Occasionally Often Always
0 1 2 3 4 5 6

33. My students were able to read the words they were required to spell
Never Occasionally Often Always
0 1 2 3 4 5 6

34. My spelling instruction involved direct instruction
Never Occasionally Often Always
0 1 2 3 4 5 6

35. I presented words in a pretest-teach-posttest format
Never Occasionally Often Always
0 1 2 3 4 5 6

36. My students kept a log of misspelled words to practice
Never Occasionally Often Always
0 1 2 3 4 5 6

37. Is there further information that I need to know to understand how you taught spelling this year? If yes, please explain.

The remaining items refer to your reading instruction.
38. When your students came across an unfamiliar word as they were reading text, what strategy(ies) did you teach them to use to read the word?
39. Name the reading program that you used this year.

To what extent were the following practices part of your reading instruction this year (circle one for each item)?

40. Direct instruction in phonics
   Not at All Some Regularly Use

41. Students read from basal readers
   Not at All Some Regularly Use

42. Students read leveled books
   Not at All Some Regularly Use

43. Students performed word study activities such as word sorts
   Not at All Some Regularly Use

44. Differentiated reading instruction
   Not at All Some Regularly Use
Appendix F
Linguistic Knowledge Survey

Name _________________________________    Date ___________________________

1. How many spoken syllables are in each word?
   nationality 1 2 3 4 5
   enabling 1 2 3 4 5
   incredible 1 2 3 4 5
   shirt 1 2 3 4 5
   cleaned 1 2 3 4 5

2. Which of the following words has a prefix? (select one)
   a.) missile
   b.) distance
   c.) commit
   d.) interest
   e.) furnish

3. If a student spells the word “electricity” as “elekrisuty’ which of the following is most likely true?
   a.) The student does not know sound-symbol correspondence
   b.) The student has a poor ear for the sounds in our language
   c.) The student does not know the spelling of the base word
   d.) The student has a poor visual memory
   e.) All of the above

4. The /k/ sounds in lake and lack are spelled differently. Why is lack spelled with ck?
   a.) The /k/ sound ends the word.
   b.) The word is a verb.
   c.) ck is used immediately after a short vowel
   d.) c and k produce the same sound
   e.) There is no principle or rule to explain this

5. Why is there a double n in stunning?
   a.) Because stun ends in a single consonant letter preceded by a single vowel letter, and the “ing” begins with a vowel.
   b.) Because the final consonant is always doubled when adding –ing
   c.) Because the letter u has many different pronunciations
   d.) Because the consonant n is not well articulated and needs to be strengthened
   e.) There is no principle or rule to explain this
6. How many phonemes or distinct sounds are in each word?

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<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

7. A student writes: “I have finely finished my math project.” Her misspelling of the word *finally* most likely indicates that she:

a.) Is not attentive to the sounds in the word  
b.) Does not know basic letter-sound relations  
c.) Has not matched spelling to the meaningful parts (morphemes) of the word  
d.) Has a limited vocabulary  
e.) Has a limited knowledge of sight words

8. Which of the following is a feature of English spelling?

a.) A silent e at the end of a word always makes the preceding vowel long  
b.) Words never end in the letters “j” and “v.”  
c.) When two vowels go walking, the first one does the talking.  
d.) A closed syllable must begin with a consonant  
e.) All of the above.

9. Read the first word in each line and note the sound that is represented by the underlined letter or letter cluster. Then circle the word or words on the line that contain the same sound.

a.) push  

b.) weigh  

c.) was  

d.) intend  

e.) ring  

10. All of the following are irregular, high frequency words except (select one):

   when  does  were  said

11. A nonsense word that does not follow English spelling patterns is (select one):

   shease  toyn  squive  clow

12. A word with a prefix and suffix is (select one):

   unable  replaster  mistletoe  requirement

13. A word that is an example of the “y rule” for adding endings is (select one):

   easier  hoping  enjoyable  plowed
14. Which of these words is NOT a magic-e syllable (select one)?
   time peace hope wage drove

15. Which word has a final or ending consonant blend (select one)?
   plaque sting blithe quaint which

16. Which word begins with an open syllable that contains a long vowel (select one)?
   favor pleasant sunny planet comet

17. How many morphemes are in each word? (A morpheme is the smallest meaningful unit in the grammar of a language)
   Salamander 1 2 3 4 5
   Crocodile 1 2 3 4 5
   Attached 1 2 3 4 5
   Unbelievable 1 2 3 4 5
   Finger 1 2 3 4 5
   Pies 1 2 3 4 5

18. Which word is a compound word (select one)?
   otherwise selfish butternut wrapped although

19. Which word has a prefix (select one)?
   delicious proactive mistletoe super hamburger

20. Which word is an example of this spelling rule: drop silent e when adding a suffix that begins with a vowel (select one)?
   grimy lady stately beautifully strangely

21. Which word is an example of this spelling rule: double the final consonant of a closed syllable that ends in one consonant when adding a suffix beginning with a vowel (select one)?
   ripple accommodate grassy winning happy

22. Which word does not have a prefix, root, suffix construction (select one)?
   prevalidate returnable unhistorical subtraction anxiety

23. Several examples of students’ misspellings of words are listed below. Some might be corrected by citing a spelling rule and some just need to be memorized because there is no rule. Indicate which are subject to rules and which are not.
   Write Rule or Memorize on each line
   a. Student wrote pileing for piling: _______________________
   b. Student wrote claped for clapped: _______________________
   c. Student wrote curcus for circus: _______________________
   d. Student wrote ritch for rich: _______________________
   e. Student wrote cut for cute: _______________________
   f. Student wrote glair for glare: _______________________
   g. Student wrote picnicing for picnicking: _______________________

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24. Before children learn conventional spellings of words, they can use their letter knowledge to invent plausible phonetic spellings that are incorrect but contain letters that bear a relationship to at least some sounds that children detect when they say the words. Below are printed some invented spellings. Some are phonetically plausible and some are not. **Place a check next to those spellings whose letters are all phonetically plausible.**

- ______ MOSTUR for monster
- ______ HIKT for hiked
- ______ NICR for nature
- ______ JRS for dress
- ______ BODM for bottom
- ______ MUTN for muffin
- ______ SGAT for skate
- ______ BUPE for bumpy
- ______ YL for while
- ______ GEM for game
- ______ HRK for truck
- ______ BOD for boat
Appendix G
Linguistic Knowledge Survey- Answer Key

Name ____________________________ ANSWER KEY ____________________________ Date ____________________________

1. How many spoken syllables are in each word?

<table>
<thead>
<tr>
<th>Word</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>shirt</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>cleaned</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. Which of the following words has a prefix? (select one)
   a.) missile
   b.) distance
c.) commit
d.) interest
e.) furnish

3. If a student spells the word “electricity” as “elekrisutry’ which of the following is most likely true?
   a.) The student does not know sound-symbol correspondence
   b.) The student has a poor ear for the sounds in our language
c.) The student does not know the spelling of the base word
d.) The student has a poor visual memory
e.) All of the above

4. The /k/ sounds in lake and lack are spelled differently. Why is lack spelled with ck?
   a.) The /k/ sound ends the word.
b.) The word is a verb.
c.) ck is used immediately after a short vowel
d.) c and k produce the same sound
e.) There is no principle or rule to explain this

5. Why is there a double n in stunning?
   a.) Because stun ends in a single consonant letter preceded by a single vowel letter, and the “ing” begins with a vowel.
b.) Because the final consonant is always doubled when adding –ing
c.) Because the letter n has many different pronunciations
d.) Because the consonant n is not well articulated and needs to be strengthened
e.) There is no principle or rule to explain this
6. How many phonemes or distinct sounds are in each word?

<table>
<thead>
<tr>
<th>Word</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>straight</td>
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<td>4</td>
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<td>6</td>
<td>7</td>
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<td>5</td>
<td>6</td>
<td>7</td>
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<tr>
<td>lodged</td>
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<td>2</td>
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<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

7. A student writes: “I have \textit{finely} finished my math project.” Her misspelling of the word \textit{finally} most likely indicates that she:

a.) Is not attentive to the sounds in the word
b.) Does not know basic letter-sound relations
c.) \textbf{Has not matched spelling to the meaningful parts (morphemes) of the word}
d.) Has a limited vocabulary
e.) Has a limited knowledge of sight words

8. Which of the following is a feature of English spelling?

a.) A silent \textit{e} at the end of a word always makes the preceding vowel long
b.) \textbf{Words never end in the letters \textit{“j” and \textit{“v.”}}}
c.) When two vowels go walking, the first one does the talking.
d.) A closed syllable must begin with a consonant
e.) All of the above.

9. Read the first word in each line and note the sound that is represented by the underlined letter or letter cluster. Then circle the word or words on the line that contain the same sound.

<table>
<thead>
<tr>
<th>a.) \textit{push}</th>
<th>although</th>
<th>sugar</th>
<th>duty</th>
<th>pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>b.) \textit{weigh}</td>
<td>pie</td>
<td>height</td>
<td>raid</td>
<td>friend</td>
</tr>
<tr>
<td>c.) \textit{was}</td>
<td>miss</td>
<td>nose</td>
<td>votes</td>
<td>rice</td>
</tr>
<tr>
<td>d.) \textit{intend}</td>
<td>this</td>
<td>whistle</td>
<td>baked</td>
<td>medal</td>
</tr>
<tr>
<td>e.) \textit{ring}</td>
<td>sink</td>
<td>spindle</td>
<td>Rheingold</td>
<td>signal</td>
</tr>
</tbody>
</table>

10. All of the following are irregular, high frequency words except (select one):

\textit{when} \quad \textit{does} \quad \textit{were} \quad \textit{said}

11. A nonsense word that does not follow English spelling patterns is (select one):

\textit{shease} \quad \textit{toyn} \quad \textit{squive} \quad \textit{clow}

12. A word with a prefix and suffix is (select one):

\textit{unable} \quad \textit{replaster} \quad \textit{mistletoe} \quad \textit{requirement}

13. A word that is an example of the \textit{“y rule”} for adding endings is (select one):

\textit{easier} \quad \textit{hoping} \quad \textit{enjoyable} \quad \textit{plowed}
14. Which of these words is NOT a magic-e syllable (select one)?

   time   peace   hope   wage   drove

15. Which word has a final or ending consonant blend (select one)?

   plaque   sting   blithe   quaint   which

16. Which word begins with an open syllable that contains a long vowel (select one)?

   favor   pleasant   sunny   planet   comet

17. How many morphemes are in each word? (A morpheme is the smallest meaningful unit in the grammar of a language)

<table>
<thead>
<tr>
<th>Word</th>
<th>Morphemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salamander</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>Crocodile</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>Attached</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>Unbelievable</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>Finger</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>Pies</td>
<td>2 3 4 5</td>
</tr>
</tbody>
</table>

18. Which word is a compound word (select one)?

   otherwise   selfish   butternut   wrapped   although

19. Which word has a prefix (select one)?

   delicious   proactive   mistletoe   super   hamburger

20. Which word is an example of this spelling rule: drop silent e when adding a suffix that begins with a vowel (select one)?

   grimy   lady   stately   beautifully   strangely

21. Which word is an example of this spelling rule: double the final consonant of a closed syllable that ends in one consonant when adding a suffix beginning with a vowel (select one)?

   ripple   accommodate   grassy   winning   happy

22. Which word does not have a prefix, root, suffix construction (select one)?

   prevalidate   returnable   unhistorical   subtraction   anxiety

23. Several examples of students’ misspellings of words are listed below. Some might be corrected by citing a spelling rule and some just need to be memorized because there is no rule. Indicate which are subject to rules and which are not.

   Write Rule or Memorize on each line
   a. Student wrote pileing for piling: _______ RULE ________
   b. Student wrote claped for clapped: _______ RULE ________
   c. Student wrote curcus for circus: _______ RULE ________
   d. Student wrote rich for ritch: _______ RULE ________
   e. Student wrote cut for cute: _______ RULE ________
   f. Student wrote glair for glare: _______ MEMORIZE ________
   g. Student wrote picnicing for picnicking: _______ RULE ________
24. Before children learn conventional spellings of words, they can use their letter knowledge to invent plausible phonetic spellings that are incorrect but contain letters that bear a relationship to at least some sounds that children detect when they say the words. Below are printed some invented spellings. Some are phonetically plausible and some are not. **Place a check next to those spellings whose letters are all phonetically plausible.**

- [ ] X MOSTUR for monster
- [ ] HIKT for hiked
- [ ] NICR for nature
- [ ] JRS for dress
- [ ] BODM for bottom
- [ ] MUTN for muffin
- [ ] SGAT for skate
- [ ] BUPE for bumpy
- [ ] YL for while
- [ ] GEM for game
- [ ] HRK for truck
- [ ] BOD for boat
References

*Early Literacy Guidance: Prekindergarten - Grade 3.* New York State Education Department, Albany, New York.


