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Previous studies (e.g., Daffern & Critten, 2019; Fresch, 2003; Moats, 1994; Reid Lyon & Weiser, 2009) have indicated that Speech-language Pathologists (SLPs), Regular Educators (REs), and Special Educators (SEs) have below average linguistic knowledge, utilize instructional practices that favor the visual view of spelling and do not frequently engage in interprofessional collaboration. These studies have examined knowledge and practices of SLPs, REs and SEs in the context of reading. No study has compared SLPs', REs', and SEs linguistic knowledge across three specific knowledge language domains (phonology, morphology, and orthography). No study has compared the importance these professionals attribute to phonological awareness and visual memory for spelling development, nor has any study examined their orthographic knowledge, their instructional spelling practices, nor how often they collaborate with one another in spelling assessment and instruction. The present study was designed to fill this gap in the literature.

Participants were 28 SLPs, 30 REs, and 27 SEs working in the North Carolina public schools. Participants were recruited through social media sites targeted for North Carolina SLPs, REs, and SEs, respectively. All participants completed an online questionnaire, that was based on previous research examining knowledge and instructional practices, as well as novel questions created by the author. The Spelling Knowledge and Practices Questionnaire (SKPQ) included 44 questions. Of these questions, 15 were original questions developed by the author. These 15 questions were

modeled after the content of questions used in previous surveys, but they differed from the questions in previous surveys with respect to format from the original questions (e.g., fill-in-blank), number of answer choices (e.g., adding/reducing answer choices so answer choices were consistent across a section) and difficulty of the questions. For example, the difficulty of the questions was increased by adding more morphologically complex words. Three questions from previous surveys addressed interprofessional collaboration.

REs and SEs rated visual memory as significantly more important than phonemic awareness and although they rate phoneme awareness as important, they did not rate it as important as SLPs. As predicted, SLPs' scored significantly higher than REs and SEs on the phonological, morphological and orthographic subtests. However, none of the groups demonstrated *expert* level knowledge, including SLPs. All three groups reported instructional practices that were not aligned with the linguistic view of spelling. SLPs collaborated at significantly higher rates than did REs and SEs, despite all three groups rating their academic preparation in the area of interprofessional collaboration at similar levels.

These findings corroborate a body of research spanning over 20 years. Studies examining linguistic knowledge and instructional practices have advocated more rigorous academic preparation for regular and special education teacher candidates and speech-language pathology students. However, academic preparation is only one portion of the solution. Comprehensive reform at state and local levels must occur for education professionals to implement instructional practices that align with a linguistic view of literacy. Moreover, states should adopt the Federal Government's suggestions about

streamlining IDEA in order to reduce administrative workloads experienced by SLPs,

REs and SEs to increase opportunities for their interprofessional collaboration to

facilitate linguistically-based literacy instruction.

NORTH CAROLINA EDUCATION PROFESSIONALS' LINGUISTIC KNOWLEDGE

AND INSTRUCTIONAL AND COLLABORATIVE PRACTICES

IN THE AREA OF SPELLING

by

Mariam M. Abdelaziz

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Approved by

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APPROVAL PAGE

This dissertation, written by Mariam M. Abdelaziz, has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Spelling has been described as the "abandoned step-child" of literacy instruction, often neglected by lawmakers determining educational policy, literacy curricula, and the research community in education (Joshi, Treiman, Carrecker, & Moats, 2009). Within the classroom, spelling instruction is not often of prime concern and is relegated to a weekly word list that students must learn in order to complete a weekly assessment, the "Friday Spelling Test." This is unfortunate because strong spelling abilities support other academic areas such as reading and writing.

The legacy of the Friday Test may be perpetuated for a number of reasons. First, school districts often do not have curricula to teach spelling as is routine practice with reading instruction. Without a structured set of procedures to follow, teachers must devise their own methods for teaching spelling, which may not always be systematic, explicit, nor language based (e.g., focusing on language aspects such as phonology, morphology, and orthography). Second, research shows that teachers lack comprehensive knowledge of the linguistic aspects of spelling and, subsequently, cannot provide the type of instruction necessary for students to progress beyond memorizing words to understanding the inherit logic of English spelling.

Contemporary spelling instruction continues to favor a traditional "drill-and-practice" method, despite evidence that spelling is a language-based skill (Fresch, 2003;

Moats, 2014; Puliatte & Ehri, 2019), that supports teaching spelling through memory. The drill-and-practice method discounts the important role spelling contributes to literacy ability as a whole and supports a visual view of spelling development. Spelling and reading share a reciprocal relationship (Ehri, 2000). When students decode a word, they are breaking the word down into its component parts, conversely, when students spell, they combine these parts to produce a word. Spelling instruction provides an opportunity for students to learn about the structure and rules associated with English orthography, including understanding the relationship between sounds and the letters that represent them, thus supporting reading (Ehri, 1997). In order for students to become *fully* literate, they must be able to, not only quickly and accurately, recognize words, but also spell them quickly and accurately. One of the best methods to do so is to teach spelling patterns that can be generalized across many words (Fox, 2005).

For spelling instruction to progress from a memory-based perspective to a linguistic one, regular (REs) and special educators (SEs) as well as speech-language pathologists (SLPs), should understand which aspects of language contribute to spelling ability. Phonological, morphological, and orthographic knowledge, primarily, contribute to spelling ability (Joshi et al., 2009; Moats, 2004). However, research findings over 20 years have indicated that REs and SEs do not have complete knowledge of these aspects of language (e.g., Daffern & Critten, 2019; McCutchen et al., 2009; McCutchen et al., 2002; Moats, 1994, 2009, 2011, 2014; Moats & Foorman, 2003; Moats & Lyon, 1996; Reid Lyon & Weiser, 2009). SLPs receive more systematic instruction in, and are more

knowledgeable of, language structure, but they do not typically provide the bulk of direct literacy instruction for students (Moats & Lyon, 1996).

The studies examining these linguistic aspects of phonology, morphology, and orthography, have done so within the context of reading, not spelling. Although reading and spelling share a reciprocal relationship, these studies (e.g., Mather, Bos, & Babur, 2001; McCutchen, 2009) only discuss how knowledge of these language aspects only contribute to reading development and not to spelling. These studies have examined knowledge as it relates to reading development, however, they do not focus on orthographic knowledge, an important component of understanding English language structure and learning to spell. Education professionals' lack of knowledge of the specific language structures such as phonemes and inflected endings results in their providing little to no *explicit* and *systematic* spelling instruction for students. This is problematic as evidence shows that this type of instruction is necessary for students to achieve high levels of literacy, including word-level reading and spelling, particularly for struggling students (Moats, 2009). For instance, by having strong knowledge about the importance of the phonological aspects of spelling, REs and SEs would know to encourage invented spelling by their students, as they understand this is an appropriate part of spelling development. Direct, explicit, and systematic spelling instruction should include spelling words that are based on specific orthographic patterns, not arbitrary lists that do not result in generalization of those patterns to a broad number of words. In addition to a formal assessment based on orthographic patterns, alternative methods of spelling assessment beyond the "Friday Spelling Test," should be implemented (e.g., comprehensive spelling

inventories). In accordance to selecting words based on orthographic patterns, teachers should also respond to students' misspellings from a linguistic perspective. For example, rather than re-writing misspelled words, or "sounding words out," (a strategy that can only be used with a number of English words), teachers should be prepared to help students make connections to previously learned patterns and/or teach the novel spelling pattern. Teacher knowledge and instructional practices in these language aspects have been shown to positively influence student outcomes on measures of spelling (Daffern & Critten, 2019). Thus, it is critical for teachers to possess high levels of linguistic knowledge, particularly in the areas of phonology, morphology, and orthography in order for effective spelling instruction to occur.

Teachers' linguistic knowledge, however, is not the only aspect of effective instruction. Teachers' views about the importance of instructional factors, such as those that are critical for spelling development, can also influence their classroom practices (Alquraini, 2012) and, subsequently, positively or negatively impact their students' outcomes. Contemporary spelling practices such as the "Friday Spelling Test" and rote memorization of spelling words indicate that teachers continue to view visual memory as an important factor in the development of spelling proficiency. Consequently, they are not implementing a language-based approach to spelling. One of the cornerstones of the language-based approach to spelling development is understanding the connection between oral speech and print. Understanding this connection as well as having knowledge of how sounds can be manipulated within a word, known as phonemic awareness, is an important factor in spelling proficiency and in spelling instruction.

However, given the research (e.g., Moats, 1994; Puliatte & Ehri, 2017) that indicates teachers do not have strong phonological knowledge, they likely do not rate instructional factors related to phonology (e.g., phonemic awareness) as highly important.

SLPs, with their explicit knowledge of language structure, particularly in the domains of phonology, morphology, and orthography, are in a prime position to facilitate collaborative learning opportunities that can influence how teachers perceive spelling as well as their instructional practices with REs and SEs. However, research suggests that SLPs, regular educators (REs), and special educators (SEs) typically work independently from one another in a "silo" approach when providing language and literacy-based services for students (Fallon & Katz, 2011).

There are clearly a number of factors that influence how spelling is taught to young children. These include educator preparation, linguistic knowledge, instructional practices, and collaborative efforts. Previous studies that have examined education professionals' linguistic knowledge have done so broadly, or focused too specifically on one language area (e.g., phonology). No study has compared and contrasted SLPs', REs', and SEs linguistic knowledge across three specific knowledge language domains (phonology, morphology, and orthography). Moreover, no study has compared the importance these professionals attribute to phonological awareness and visual memory for spelling development, examined their orthographic knowledge, their instructional spelling practices, nor how often they collaborate with one another in spelling assessment and instruction. The present study was designed to fill this gap in the literature.

CHAPTER II

REVIEW OF THE LITERATURE

A. Introduction

This chapter discusses previous literature concerning SLPs,' REs, and SEs knowledge of language aspects that influence spelling development. The narrative opens with a description of the historical view of spelling; followed by a review of the various factors that influence spelling development. Research findings regarding the teacher's role in spelling acquisition is followed by a discussion of SLPs, REs, and SEs' knowledge of language structure, and is elaborated on by a discussion of research regarding education professionals' instructional practices related to spelling. These are followed by section discussing research findings concerning inter-professional collaborative practices in school-based settings. The chapter concludes with a synopsis of the literature discussed in this chapter and explains the rationale for the present study.

B. Historical View of Spelling

Spelling is more than simply stringing letters together; it is the representation of oral language in written form. However, spelling was not always considered to be a language-based skill. Historically, English was considered to be "a visual language, not a phonetic language" (Hendrickson, 1967, p. 39). Subsequently, spelling was also considered to be a visually-based skill. The rationale for this was that *all* letters cannot be

heard, however, they can all be seen. Although proficient spellers do develop word-specific orthographic memory, it is not without a linguistic foundation.

It is first necessary to understand why the assumption that spelling was visual came to be and why this belief has persisted over time. Misperceptions that English is a visual memory-based skill indicate a lack of knowledge of the linguistic regularity of English as well as the history of the English language which can account for "peculiar" spellings (e.g., the silent *g* in *signature*, which is derived from the word *sign*).

One of the earliest times the visual basis was challenged was in the early 1970s. Carol Chomsky (1970) argued that the relationship between English orthography and phonology was closer than popularly assumed at the time. Chomsky acknowledged that there *appear* to be inconsistencies in English spelling, explaining that English's deep orthography results in a lack of direct sound-letter correspondence. However, she explained that under closer inspection, English orthography is "a near optimal system for representing the spoken language" (Chomsky, 1970, p. 288). Chomsky explains that an understanding of phonemic variations, of both vowels and consonants, due to word positions (i.e. allophones) or dialect and accent (e.g., American or British English), can account for why phonemes do not always appear to correspond to the graphemes that represent them. She argued that

> pronunciation shifts that occur as a language changes over time appear to be the result of changes in phonological rules rather than changes in the spellings themselves. For this reason, a stable orthography remains effective over time in spite of changes in the way a language is pronounced. (Chomsky, 1970, p. 295)

For example, *anxious* and *anxiety* are related and have the same orthographic origins, but they differ in pronunciation.

Chomsky also emphasized the importance of children learning Latinate and polysyllabic derived forms of words in order to understand "peculiar" spellings such as *maj<u>or</u>-maj<u>or</u>ity.* Further, Chomsky noted that instruction in this area can explain harder-to-learn spelling concepts such as reduced vowels (e.g., *ab<u>o</u>lition-ab<u>o</u>lish*) and silent letters (e.g., *mus<u>c</u>le-mus<u>c</u>ular*). Reduced vowels occur when the stress moves from the first syllable to the second (e.g., long *a* turning into a schwa). In contemporary spelling research, knowledge of etymology continues to be a hallmark of effective spelling instruction and will be discussed in a later section of this literature review.

In addition to Chomsky, Charles Read's initial exploration of young children's phonological and spelling abilities also refuted the visual view of spelling. In contrast to the visual basis that promotes visual memorization of single words, Read (1971) postulated that spellers are, generally, able to pronounce a variety of unfamiliar words due to phonological skills. Further, Read noted that there must also be a degree of (subconscious) knowledge of spelling rules which supports the spelling and reading of new words. This is evidenced by young children's implicit knowledge of allophonic variations:

> Children possess some phonological knowledge in their pre-school years. Otherwise, they could not judge if two different speakers were saying the same thing; they could not understand a speaker of another dialect, however slightly different; ultimately, they could not understand English at all, for speech sounds can and do vary in a multitude of ways. (Read, 1971, p. 2)

In this seminal work, Read sought to understand how preschool and kindergarten children classified phonemes by examining their phonological, or invented, spellings.

Read found that the children in his study often spelled words based on phonemic placement, (e.g., *stopt* for *stopped)*. This finding suggests that young children had some implicit knowledge of phonology as evidenced by phonemic characteristics in their original spellings. He affirmed that spelling was a language-based skill that was based on phonological knowledge by stating that "a child may come to school with a knowledge of some phonological categories and relations [and thus] without conscious awareness, he may seek to relate English spelling to these in some generally systematic way" (Read, 1971, p. 33). Other early research examining spelling development (e.g., Beers, Beers, & Grant, 1977; Ellis, 1994, 1996; Gentry, 1984) also reported that young children learn to spell in a developmental pattern, starting with invented, or phonological spelling. Although these early studies suggest that young children have implicit phonological knowledge, this cannot occur without knowledge of the alphabetic principle and beginning phonological development.

More contemporary research maintains that spelling is a language-based skill and continues to invalidate the belief that English spelling is unsystematic or illogical. Arra and Aaron (2001) aimed to juxtapose the visual and linguistic views by conducting two studies in which they questioned whether a linguistic approach method of instruction, focusing on phonological awareness (PA), would improve spelling outcomes over a visual method in second grade students. Their findings indicated that the linguistic approach was more effective in improving spelling outcomes than the visual method.

Thus far, all of the literature reviewed in this paper has focused on only one aspect of language, phonology. Although phonology is an important building block to both spelling and reading, it is not the only necessary foundational skill. Spelling also draws upon other types of linguistic knowledge including morphology, orthography and semantics (Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Bourassa & Treiman, 2009; Perfetti, Rieben, & Fayol, 1997). Although most of young children's early original spellings appear phonological in nature, other knowledge types are being utilized to spell. As "spelling is the encoding of linguistic forms into written forms" (Perfetti et al., 1997, p. 23), it is logical to expect that morphemic units, phonemes, syllables, and vocabulary would be represented in written language. However, these knowledge types are not used homogeneously (Bourassa & Treiman, 2009). As a child's vocabulary expands, the degree to which he or she will rely on the other knowledge types will increase or decrease. A more detailed explanation of these knowledge types and their contributory role in spelling development will be provided in the following section.

In research surrounding the language domains that contribute to spelling, special focus has been on the degree of predictability, or systematicity, of English orthography. Educational scientists "have estimated that the spellings of nearly 50% of English words are predictable based on sound-letter correspondences that can be taught. Another 34% of words predictable except for one sound" (Joshi et al., 2009, p. 6); indicating that the overwhelming majority (84%) of English spellings are predictable. The predictability of a word's spelling is based on the following factors:

1. Word origins and history

2. Syllable patterns

3. Morphology

4. Letter patterns (Joshi et al., 2009; Moats, 2005).

Given that English is highly regular, the question that must be asked is "why are most spellers not aware of these patterns?" Treiman (2018) presents a case for statistical learning, or learning without trying. The premise of statistical learning is that humans implicitly learn skills, such as oral language, through exposure to specific patterns in their environments (Plante & Gómez, 2018). In oral language, there are phonotactic patterns, meaning that some sounds or sound combinations occur more frequently or more likely together than others (Treiman, 2018). The same is true for spelling. English orthography contains graphotatic patterns that, Treiman (2018) states, are implicitly learned by children as young as pre-school age. She provides the example of pre-school children who do not have to be explicitly taught that the letter *i* is more likely to follow the letter *b* than the letter *n*; "they must have picked up this information on their own" (Treiman, 2018, p. 645). Further, the National Reading Panel (NRP) Report (NRP Report, 2000) emphasizes that most children require systematic phonics instruction to become proficient readers.

C. Theories of Spelling Development

The transition from viewing spelling as a visual and memory-based skill to a linguistic one also introduced theories focusing on delineating which aspects of language shape spelling development. Several theories have been proposed about the specific

factors that influence spelling development. The following theories are not an exhaustive list of all theories of spelling development. There are many perspectives on how spelling development occurs in young children. The following three theories are distinguished from one another based on linear and non-linear perspectives of spelling development and are the foundation from which the linguistic knowledge blocks measured in the present study.

Stage Theory (e.g., Beers et al., 1977; Ellis, 1994, 1999; Gentry, 1984) is one of the earliest linguistically based theories of spelling development. This theory posits that young children learn to spell in a developmental pattern, starting with invented, or phonological spelling. An example of how this theory is operationalized is the *Words Their Way Program* by Bear, Invernizzi, Johnston, and Templeton (2004). This program coordinates spelling instruction with students' spelling development across 5 distinct stages. Stages within this program account for phonological, morphological, orthographic, and semantic aspects of reading. There are merits to the Stage Theory, particularly that its linear structure makes it easier to teach spelling. However, more recent research questions this linear perspective stating that children may not learn to spell in distinct stages, rather, the spelling development process may be more complex and intertwined (Daffern, Mackenzie, & Hemmings, 2015).

Dual-Route Theory (Colthart, 1985; Sheriston, Critten, & Jones, 2016) and Triple-Word Form Theory (TWFT; Daffern et al., 2015) both follow a nonlinear approach to spelling. Dual-Route Theory highlights both lexical and non-lexical pathways, or routes to successful reading and spelling. The first pathway is lexical,

focusing on the "mental lexicon and word-specific orthographic and phonological memory" (Sheriston et al., 2016, p. 404). The second pathway is non-lexical and focuses on decoding through sound-letter correspondence rules. Although the skills in both pathways are important to spelling, Dual-Route Theory does not consider the role of morphology in spelling. Further, this theory views the two pathways as completely distinct from one another (Sheriston et al., 2016). However, another perspective, TWFT, supports a more flexible and interactive approach of linguistic knowledge.

TWFT posits that phonology, orthography and morphology develop and work with one another in tandem (Daffern et al., 2015). TWFT is similar to Perfetti and Hart's (2002) Lexical Quality Hypothesis (LQH). However, the LQH only examines phonology, orthography, and semantics and does not consider morphology as a contributing factor to spelling. Further the LQH is not as heavily supported as TWFT, which has been corroborated by multiple brain imaging studies (e.g., Berninger, Abbot, Nagy, & Carlisle, 2010; Richards, Aylward, Berninger, et al., 2006; Richards, Aylward, Field, et al., 2006).

TWFT is supported by brain imaging studies as well as multiple studies across grade levels. Although these studies do not always use the term TWFT, their stance on the contributory and interactive role of phonology, morphology, and orthography on spelling is congruent with TWFT. For example, Berninger et al. (2010) investigated the phonological, morphological, and orthographic skills of children from first to sixth grade and found all three types of knowledge uniquely contributed to pseudoword and word-specific orthographic spelling. Similarly, Apel, Wilson-Fowler, et al. (2012) indicated that all three knowledge types were important for reading and spelling. However, they

noted that morphology uniquely predicted spelling and reading comprehension and that morphology and orthography together, uniquely predicted word-level reading. Other studies (e.g., Kim, Apel, & Al Otaiba, 2013; Nunes, Bryant, & Olsson, 2003) have also reported that early elementary-school students draw on multiple types of linguistic knowledge to read and spell.

TWFT does not include semantic knowledge as a unique contributor to spelling development. In studies examining all four linguistic knowledge types (i.e. phonology, morphology, orthography, and semantics), semantics was not indicated as a unique contributor to spelling development (e.g., Apel et al., 2011; Kim et al., 2013). Conversely, other studies have indicated that semantic knowledge supports spelling development (e.g., Caravolas, Kessler, Hulme, & Snowling, 2005; Ouellette & Sénéchal, 2008; Sénéchal & Lefevre, 2002). However, the relationship between the two abilities was only weakly-moderately correlated. One reason for this weak correlation may be that "morphological awareness tasks typically tap into either the semantic or the semantic-syntactic aspects of morphology (Apel, Wilson-Fowler, et al., 2011, p. 1291). Given that semantic knowledge may be "embedded" within morphological knowledge, the present study exclusively examined teachers' knowledge of the skills associated with TWFT. A description of the knowledge blocks is in the upcoming section of this review.

D. Factors That Impact Spelling

For many years, spelling was viewed as a visually-based skill (e.g., Lesiak & Lesiak, 1979). It has been more than 20 years, however, since Perfetti, Trieman, and others have convincingly shown that spelling, like reading, is a language-based skill with

phonological awareness not visual memory, being the best predictor of spelling achievement (Arra & Aaaron, 2001; Giles & Terrell, 1997; Kamhi & Hinton, 2000). For example, Giles and Terrell (1997) sought to understand what skills differentiated between good and poor spellers in a group of school-age children using visual memory measures. Their findings indicated that visual memory was not a reliable differentiator between good and poor spellers. Similar to Giles and Terrell (1997), Kamhi and Hinton (2000) argued that poor spellers rely on visual memory more than good spellers, because of their below average phonological knowledge abilities.

Arra and Aaron (2001) sought to explicitly compare a language-based approach (utilizing phonological knowledge) and a visually-based approach to see which group of students would make the most gains in their spelling. The students in the visual group were shown target words for specific increments of time over a set period. The language-based group were given phonemic awareness instruction (e.g., manipulating phonemes within a word). Both groups were given the same amount of instructional time. Arra and Aaron found that the language-based group significantly outperformed the visual group on a measure of spelling.

Although the language bases of spelling have been common knowledge in the research community for over 20 years (e.g., Chard & Dickson, 1999; Majsterek & Ellenwood, 1995; Quick & Erickson, 2018), many teachers continue to believe that good spelling is tied to visual memory. The "Friday Spelling Test" is evidence of this. Students are given a weekly test, often without an orthographic pattern (Fresch, 2003) and asked to supply the correct spelling of words with little to no word-study type practice. To

determine how prevalent this view is among education professionals, the present survey questioned SLPs, REs, and SEs to evaluate how important phonemic awareness and visual memory were to spelling development. Given the current state of spelling instruction in public K-12 classrooms, it was hypothesized that REs and SEs would rate visual memory as high as phonemic awareness. SLPs, however, have broader and deeper linguistic knowledge, would rate phonemic awareness greater than visual memory.

There are, of course, other factors that also influence spelling development beyond specific linguistic knowledge (e.g., phonological, morphological, and orthographic) including reading level and vocabulary. In the upcoming section of this literature review the importance of phonological, morphological, and orthographic knowledge will be discussed.

D.1. Language Domains

A combination of discrete linguistic skills work in tandem in spelling development. Knowledge of phonology, morphology, and orthography all uniquely contribute to an individual's spelling performance (Apel, Wilson-Fowler, et al., 2012). A brief explanation of each knowledge type is provided below.

D.1.a. Phonology. Phonology, is the "aspect of language concerned with rules governing the structure, distribution, and sequencing of speech-sound patterns" (Owens, 2016, p. 19). Within phonology is a diverse skill set which include: isolating, blending, segmenting, adding, deleting, and substituting phonemes. These skills, in addition to rhyming and counting syllables, fall under the umbrella of phonological awareness, which is a strong predictor of reading development (Wagner & Torgesen, 1987). Other

early studies, have also identified the causal role phonological knowledge plays on

learning to read (Chard & Dickson, 1999; Majsterek & Ellenwood, 1995; Stahl &

Murray, 1994).

Given that spelling and reading have been dubbed "two sides of the same coin"

(Ehri, 2000), it is not surprising that phonological awareness (PA) also plays a significant

contributory role in spelling development. In order for children to successfully spell a

word, they must phonemically segment the word and then match the correct grapheme(s)

to represent the sound (Bourassa & Treiman, 2001). Early studies examining the

contributory role of phonology in spelling (e.g., Ball & Blachman, 1991; Blachman, Ball,

Black, & Tangel, 1994; Blachman et al., 1990; Graham, 1999) reported that instructing

elementary-school students in sound-letter correspondence and other components of PA

had positive impacts on spelling development. Focusing on phonology, and PA skills, in

particular, supports spelling by teaching children about the alphabetic system, also known

as sound-letter correspondence (Troia, 2004). In addition, the ability to break down

words into their smallest phonemic parts (i.e., segmenting) helps children spell unfamiliar

words for which they do not have an orthographic memory.

Novice spellers often have phonological based errors when first learning to spell

(Bahr, Sillian, Berninger, & Dow, 2012). For example, young children often use

phonological knowledge to spell *pizza* as *peetsa*; essentially, young children spell words

based on how they sound, not necessarily orthographic patterns. Similarly, young

children often reduce consonant clusters in their spelling (Bourassa & Treiman, 2001).

For example, the *n* in *hand,* or *snow,* is commonly omitted in young children's spelling,

but not when *n* is in the initial place as in *note* (Bourassa & Treiman, 2001). These phonologically based errors indicate that phonological knowledge contributes to spelling development, particularly in young spellers. More recent studies examining PA among other linguistic skills have also corroborated these findings (e.g., Kim et al., 2013).

D.1.b. Morphology. Morphology is an aspect of language that deals with the rules for the smallest units of meaning, morphemes (Levey, 2019). Most early research on spelling instruction focused on learning phoneme-grapheme correspondences (e.g., Ball & Blachman, 1991; Blachman et al., 1994; Blachman et al., 1990; Graham, 1999). However, Carlisle (1987) posited that attention should also be focused upon the morphophonemic structure of the English language because phonology and morphology are "intricately embedded" in the English language (Carlisle, 1987, p. 92). An examination of middle schoolers' spelling errors reveals that transpositions of *ie* were common for base morphemes such as *chief* or *belief* (Carlisle & Liberman, 1983). However, the *ie* transposition was not common in words such as *babies* or *parties*. The reason for this is due to the morphological role the *ie* plays in these different words. In the multi-morphemic words, *ie* occurs at a morphemic boundary (Carlisle & Liberman, 1983). This morphemic boundary is where the "plural marker -*s* is added to the base *baby*" (Carlisle, 1987, p. 92).

Morphemes can be classified into two groups: free and bound morphemes. Free morphemes can occur in isolation (e.g., *lamp*). A bound morpheme, on the other hand, cannot occur in isolation and requires a free morpheme to attach to (e.g., plural *s-lamps*). Within bound morphemes, there are two subtypes: derivational morphemes which can

change the class of a word (e.g., *mad-madness)* and inflectional morphemes which can

change the tense of a word (e.g., *pat-patted*). Knowledge of the two types of bound

morphemes is necessary for effective spelling instruction. Derived forms are harder to

learn than inflected ones because they are (a) not as common, (b) require root word-

specific knowledge, and (c) and do not always appear to be rule-based (Carlisle, 1987). In

a study comparing poor and average readers on their ability to read derived words for

which the base word has a phonological shift, Carlisle, Stone, and Katz (2001) reported

differences in poor readers' ability to decode less transparent, or words that do not readily

match up with their derived pair words.

The awareness and understanding of morphology, morphological knowledge,

directly supports spelling in three ways. First, the spellings of bound morphemes (e.g.,

affixes) are consistent across word combinations (Apel et al., 2012). Therefore, having an

understanding of the morphological structure of words can support spelling of unfamiliar

words for which a word-specific orthographic memory does not exist. Second, strong

morphological knowledge skills, provide insight into the relationship between base words

and their derived forms (Apel et al., 2012). This insight can help spellers spell a word

correctly even "when the derived forms are not necessarily transparent in their

orthography or phonology to the base word or root (e.g., *admit-admission*)" (Apel,

Masterston, & Brimo, 2012, p. 228.) Third, morphological knowledge supports spelling

by providing understanding of the spelling rules related to modifying a word (Apel et al.,

2012).

For example, an individual with strong morphological skills will know that when adding the inflected *-ing* to a single syllable word, the final letter must be doubled (e.g., *sip-sipping*). In addition, morphological knowledge can provide information about statistically predictable patterns which supports students' spelling of morphologically complex words (Carlisle, 1988; Quick & Erickson, 2018). Further, "as morphological awareness promotes understanding of the relatedness between derived words, it limits the range of orthographic spelling patterns, facilitating spelling accuracy" (Quick & Erickson, 2018, p. 510). Morphological knowledge can also support the process of storing linguistic information into the mental lexicon (Nagy, Berninger, & Abbot, 2006).

Morphology also encompasses etymology. Etymology, or word history, can be characterized by roots of words (e.g., Greek, Latin, Old English) or specific letter(s) that distinguish meaning. As previously stated, English spelling integrates a variety of skills including morphology and etymology (Bowers & Bowers, 2017). As such, English is a morphophonemic language, "in which spellings have evolved to represent phonemes, morphemes, and etymology in an orderly way (Bowers & Bowers, 2017, p. 125). Despite this, little to no instructional focus is placed on teaching word history. However, the International Dyslexia Association's Professional Standards and Practices Committee outlines the importance of teaching word history citing teaching "historical influences on English spelling patterns, especially Anglo-Saxon, Latin, and Greek" and "identify[ing] and categoriz[ing] common morphemes in English, including Anglo-Saxon compounds, inflectional suffixes, and derivational suffixes; Latin-based prefixes, roots, and derivational suffixes; and Greek-based combining forms" (Henry, 2017, p. ??).

Teaching etymology and morphology has typically been associated with older students, such as middle schoolers (e.g., Bowers & Bowers, 2018; Meyer, Frey, Kissel, & Wood, 2008). However, morphological awareness skills are present in students as early as in the first grade (Apel & Henbest, 2016). Understanding a word's etymology can clarify "irregular" spellings. Etymological knowledge explains the presence, absence, and pronunciation of "borrowed" English words. For instance, words with Greek origins follow a different syllable structure, resulting in silent letters such as *pterodactyl* (Meyer et al., 2008). In terms of pronunciation, borrowed words from Spanish, French, and Italian (e.g., *burrito*, *suite*, *piano*) maintain the /i/ (as in Pete) sound for the letter *i*, not the short vowel sound, /I/ (as in pig). This type of understanding can reduce the perception of irregularity in English spelling.

Beyond learning popular Greek and Latin roots, learning how individual letters can serve as etymological markers can support successful spelling. For example, Bowers and Bowers (2017) explain that the *w* in the word *two* is actually a marker for duality, as seen in words such as *twice* and *twins*. Hutcheon, Campbell, and Stewart (2012) created word lists for early middle school students (n=46) with a focus on etymology. Students were separated into three different groups, with two groups serving as controls. Results from this study indicated that the etymological approach improved spelling in the girls of the experimental group. This finding may be due to the small sample of boys (n=15), which was half of the girls' sample size (n=31). However, in a study with a larger sample size (n= 120), 5- to 7-year-old students who received explicit instruction in morphology, phonology, *and* etymology resulted in significant improvements in reading and spelling

in comparison to a phonics-only control group (Devonshire, Morris, & Fluck, 2013). In addition, Devonshire et al. (2013) recommended that a linguistic approach should include instruction in etymology as well as in phonology and morphology.

D.1.c. Orthography. Orthographic pattern knowledge, in general terms, is the understanding of how to spell words correctly (Apel, 2011; Apel et al., 2012). Historically, the writing system was thought to be completely separate from the reading system (Ellis, 1985). Both Ellis (1985) and Berninger, Cartwright, Yates, Swanson, and Abbot (1994) refuted this notion. Berninger et al. (1994) examined the fine motor, orthographic, phonological, working memory, verbal intelligence, writing, and reading systems of 300 students to determine the relationship among these systems. Using a variety of measures for these systems, Berninger et al. found that the reading and writing system overlapped in their orthographic and phonological processes, suggesting a closer relationship between these two systems than originally thought. More recently, Burt (2006) examined the relationship between orthographic processing and word-level reading and spelling in a number of studies in the reading literature. Her conclusion indicated that a relationship existed between orthographic processing skills and reading and spelling, citing that orthographic processing skills tap into the orthographic knowledge needed for both reading and writing.

Orthographic knowledge has two components: mental graphemic representations (MGRs), which will be discussed in an upcoming section, and knowledge of orthographic patterns. Orthographic pattern knowledge includes the alphabetic principle and orthotactic rules (Apel, 2011). Novice spellers begin successfully spelling words with

direct sound-letter correspondences (Bahr et al., 2012). Soon, children begin

demonstrating some awareness of specific orthographic patterns, or features (Cassar &

Treiman, 1997). Orthotactic rules, or patterns, "govern how speech must be represented

in writing" (Apel, 2011, p. 593). These are the rules for which letters can and cannot be

combined. An example of an orthotactic rule is that *-ng* does not occur at the beginning

of English words. Apel et al. (2012) identify four subsets of orthographic pattern

knowledge:

1. Sound-letter correspondence;

2. Knowledge of possible and impossible letter combinations;

3. Knowledge of the spelling rules related to base/root words;

4. Knowledge possible and impossible letter positions.

Given that English spelling is highly rule based and over 80% of words have a

predictable pattern (Joshi et al., 2009), it is not surprising that orthographic knowledge

would be a significant and unique predictor of spelling ability. When a writer is spelling a

new or unfamiliar word, he/she can draw upon their orthographic knowledge to

determine plausible letter sequence or pattern. The four knowledge subsets provided by

Apel et al. (2012) are useful when spelling unfamiliar words, however, most people do

not have all four types of knowledge. This is because traditional spelling instruction does

not require students to actively think about patterns.

However, research has consistently shown that knowledge of letter patterns is

associated with, and predicts, spelling (Apel, Wilson-Fowler, et al., 2011; Berninger,

Abbott, Nagy, & Carlisle, 2009; Nunes, Bryant, & Olsson, 2009). Orthographic

knowledge not only supports spelling, but word learning in general. Wagovich, Pak, and Miller (2012) compared children with high and low language skills to examine their orthographic development skills within the context of natural reading experiences. Their findings indicated that children in both groups were able to recognize orthographic forms, or patterns, in rare words, suggesting that even children with low-language skills can develop orthographic knowledge during reading experiences.

Similarly, orthographic facilitation, or the phenomenon of learning a spoken word more accurately when its graphemic equivalent is also presented, has been shown to be an effective word learning strategy with young children with dyslexia (Baron et al., 2018). This is because when children learn a novel word, they typically have both phonological and semantic representation linked together in their mental lexicon. Individuals with strong orthographic knowledge skills have a third, orthographic, representation that holds the specific letter sequence that supports the (already existing) phonological representation. Given that sound-letter correspondence is a component of orthographic knowledge, it is not surprising that building upon this knowledge through orthographic facilitation would support word learning.

As previously stated, orthographic knowledge has two components: knowledge of orthographic patterns and mental graphemic representations (MGRs). MGRs are "the stored mental representations of specific written words or word parts" (Apel, 2011, p. 593). There are varying terms for specific mental representations of written words such as orthographic memory representations and mental orthographic images (e.g., Conrad,

2008; Cunningham, 2005). For the purposes of this paper, word-specific orthographic information includes MGRs and other orthographic mental representations.

Having a specific mental representation of a word's orthographic structure leads to successful spelling and, subsequently, easier writing as less cognitive load is placed on spelling and can be allotted to creating a cohesive message. Studies examining word-specific orthographic information in children with varying abilities have, collectively, found that this type of knowledge develops relatively early. The development of this skill is based upon sensitivity to orthographic regularities, short-term memory abilities related to serial ordering, and age. Biname and Poncelet (2016) examined how 204 French-speaking children from second to sixth grade, developed and maintained novel detailed orthographic representations in their long-term memory. Their results revealed a significant effect for age, with the younger children being slower to acquire word-specific orthographic knowledge of words. The investigators posited that this age effect could be due to second-graders' less fixed mapping between sounds and letters which resulted in "shallower learning and weaker orthographic representations that, as a result, were prone to disappear quickly in the longer term memory" (Biname & Poncelet, 2016, p. 28).

Similarly, Wolter and Apel (2010) examined how typically developing and language impaired kindergartners ($n=$ 81) developed word-specific orthographic memory. Unsurprisingly, the typically developing children outperformed the children with language impairment. However, Wolter and Apel's findings indicated that children with language impairment could still develop and obtain word-specific orthographic memory of novel pseudowords, although less robustly. Given that this type of orthographic

information supports not only spelling, but sentence and paragraph writing as well, children with language impairment may be at risk for demonstrating literacy difficulties.

Four years later, many of the same students from the Wolter and Apel (2010) study were assessed again (Wolter, Self, & Apel, 2011). Findings from this follow-up study indicated that initial acquisition of word-specific orthographic information, in Kindergarten, predicted fourth grade word-level decoding and spelling for both the typically developing children and those children with language impairments. Kindergarten acquisition of word-specific orthographic information predicted pseudo-word reading and reading comprehension in the language impaired group. Typically developing adult spellers also rely on word-specific orthographic information, or memory, to spell. Mitchell, Kemp, and Bryant (2001) questioned whether adults relied on morphological or word-specific knowledge when spelling simple words in two separate studies. Results from both studies suggested that most adults in the sample relied upon word-specific knowledge when spelling simple words.

Children develop word-specific orthographic information through repeated exposure to orthographic patterns. With each exposure, children notice probable orthographic patterns in a word and make a mental note of them. This type of statistical learning was examined by Henbest and Apel (2018) during a pseudoword task with typically children ranging in age from 5 to 6 years old. Their results indicated that young children can fast map mental orthographic representations of words and that this ability related to future literacy success (3 months post testing).

Beyond explicit repeated readings, word-specific orthographic memory can be established implicitly through natural reading experiences. Wagovich et al. (2012) compared the orthographic word knowledge growth of children with low-language abilities and high-language abilities peers by reading stories that contained rare words over a two-three-day period. Post-test results indicated that children in both groups made significant growth in their ability to recognize the orthographic forms of rare words. However, the degree to which they were able to do so differed, with the low-language group having less defined orthographic representations. Collectively, the findings from these studies highlight the importance of developing word-specific orthographic information from an early age to support spelling and reading.

Systematic instruction results in fewer students reading below grade level (Bos, Mather, Dickson, Podhajski, & Chard, 2001). This is particularly important for younger children (e.g., first and second grade) who "tend to remain poor readers throughout school, with a substantial proportion eventually identified as students with learning disabilities" (Mather et al., 2001, p. 472).

E. Teacher Role in Spelling Acquisition

Direct, explicit, and systematic spelling instruction, focusing on the phonological, morphological, and orthographic aspects of language is necessary to build strong connections between oral and written language. Many studies have demonstrated the positive effect on student spelling ability when they are given explicit instruction on these aspects of language (Moats, 2009). A consistent theme among these studies is that a multi-faceted approach, combining all of these aspects together, yields the strongest

results. For example, Nunes et al. (2003) implemented a small group, 12-week intervention for 7- and 8-year-olds, in which children received instruction in either phonological spelling rules (phonological training or phonological training with writing) or morphological spelling rules (morphological training or morphological training with writing). They found that children who received either type of intervention performed better on a standardized reading measure than the control group. Further, children who received writing intervention (at the sentence level), regardless of the knowledge type, performed better on a standardized spelling measure than the control group, thus highlighting the importance of explicitly teaching morphological and phonological spelling rules. In addition to morphology and phonology, Kim et al. (2013) examined the role of orthographic knowledge on first grade students receiving response-to-intervention. Their findings indicated that these three knowledge types uniquely contributed to spelling ability. A synthesis of five intervention studies by Squires and Wolter (2016) focusing on orthographic pattern knowledge, which included teaching morpheme patterns and phoneme-grapheme correspondence, revealed that systematic and explicit instruction in orthographic knowledge significantly improved spelling abilities in students with reading disabilities from kindergarten to ninth grade. Although this synthesis only included five studies, the overall number of students participating in those studies totaled over 400.

Direct and systematic language instruction is necessary, but it is not the only component of effective spelling instruction. Students also require teachers who are knowledgeable of English-language structure (e.g., phonology, morphology, and orthography). Lack of this knowledge can negatively impact the quality of instruction

that students receive (Moats, 1994; Reid Lyon & Weiser, 2009). Teacher effectiveness is so critical, that even a single academic year of poor instruction can have long-term negative effects (Marzano, Pickering, & Pollock, 2001; Sanders & Rivers, 1996; Wright, Horn, & Sanders, 1997). The impact of one year of poor instruction cannot be remedied by better instruction the following year. In fact, it may take multiple years of quality instruction to undo the damage of a single school year (Reid Lyon & Weiser, 2009; Sanders & Rivers, 1996). In the following sections, studies that have examined teachers' and SLPs' knowledge of English-language structure are reviewed.

F. Educator Knowledge of Language Structure

Regular educators (REs) provide the majority of spelling instruction for all students. Special educators (SEs) may also support students with disabilities in spelling in either the regular and/or resource classroom. Spelling is within the scope of practice of SLPs; however, they do not typically address students' spelling needs in direct therapy service. For explicit and systematic spelling instruction to occur, it is necessary that REs have robust knowledge of specific language elements and how they play a central role in spelling acquisition and mastery. As professionals in *specialized* education, one could assume that SEs should have more *specific* and explicit knowledge than REs of how aspects such as phonological awareness, morphological knowledge, and orthographic knowledge contribute to spelling and literacy development at large. One would expect that SEs would have more in-depth knowledge of language structure and evidence-based literacy practices than teachers with less specialization, and this is generally true (Nougaret, Scruggs, & Mastropieri, 2005). SEs have an even greater responsibility to

have this knowledge as they are charged with teaching the most vulnerable students, who require even more explicit and systematic specially designed instruction.

The first study examining educators (REs, SEs, and SLPs) was completed by Moats (1994). In this study, a small sample of experienced educators (*n*=89), in roughly equal sized groups, participated in a short class focusing on phonology, phonics, and morpheme awareness. Prior to taking the course, participants completed a questionnaire requiring them to count phonemes and morphemes in words, identify blends and digraphs, and define terms related to language structure and instruction such as *inflection* and *derivation* and phonological awareness. The participants, predominantly, struggled with these tasks. The REs and SEs performed similarly. The SLPs performed better than both teacher groups, but still performed lower than expected. Since that time, many studies have examined education professionals' linguistic knowledge, focusing primarily on that of REs and SEs. The following three sections will discuss studies examining the knowledge, practices, and perceptions of SLPs, REs, and SEs regarding phonology, morphology and orthography.

As previously stated, teachers' knowledge of specific aspects of language structure is a necessary component contributing to the quality of their spelling instruction. If teachers are to provide effective spelling instruction, they must have an understanding of these foundational skills and their role in the development of spelling. Unfortunately, since Moats's (1994) study, a trail of research indicates that both REs and SEs knowledge of various language aspects is still not adequate to meet the needs of the most at-risk students. The following studies have examined teachers' knowledge of language structure

across years of experience (pre- and in-service level) as well as studies of the knowledge

of practicing SLPs regarding language structure.

F.1. Phonology

A large proportion of the studies addressing education professionals' linguistic

knowledge have primarily focused on phonology. This is not surprising as phonemes are

the building blocks of words in spoken language. In Moats's (1994) study, a small sample

(*n*=57) of REs, SEs, reading teachers, and SLPs were surveyed on their linguistic

knowledge. Although Moats did target other domains of language (e.g., morphology and

orthography), most of the items in her questionnaire focused on phonology. Although

SLPs displayed more phonological-related knowledge than did the other three groups of

professionals, all participants performed lower than expected. For example, most

participants could not count the phonemes in a set of five words (32% on average).

Conversely, participants scored much higher on the syllable counting task (77%).

Mather et al. (2001) and Bos et al. (2001) both compared pre- and in-service

regular elementary level teachers' (*n*=293 pre-service, 131 in-service and *n*=252, 286,

respectively) linguistic knowledge. Both questionnaires included approximately 20-items

modified from the survey instruments of Moats (1994) and others (e.g., Lerner, 1997;

Rath, 1994). Both studies reported findings similar to those of Moats regarding

phonology. Mather et al. (2001) revealed that an extremely small percentage of

participants could count phonemes correctly. For example, only pre-service (2%) and in-

service (19%) teachers could count the phonemes in the word *box*. Similarly, Bos et al.

(2001) found that less than 53% of teachers could count phonemes in more complex phonemic words.

A pervasive theme across studies examining phonological awareness skills of teachers is their difficulty with counting phonemes. Spencer, Schuele, Guillot, and Lee (2008) compared SLPs' phonological knowledge to REs, SEs, and reading teachers using a questionnaire similar to that of Moats. As with Moats's (1994) study, SLPs' phonological knowledge was greater than that of the other groups, but still lower than expected. In fact, in reviewing SLPs phonemic awareness scores, in which SLPs averaged 37.34 points out of 47 points (79.44%), Spencer et al. (2008) noted that SLPs did not demonstrate *expert skill*. Teachers from the other three groups on average scored 17 points below the total possible number of points. Again, the area that all participants struggled with was counting phonemes (e.g., *ox*).

Generally, studies examining teachers' phonological knowledge have found that at least half of education professionals surveyed have below average phonological skills, specifically with counting phonemes (McCutchen, 2002, 2009; Puliatte & Ehri, 2017). Washburn, Joshi, and Cantrell (2011), however, measured pre-service teachers' phonological knowledge with more positive findings. Almost all participants could define a phoneme (92%) and over half (71%) could count phonemes correctly. It is important to note that Washburn et al. measured pre-service teachers who were still receiving instruction at the time of testing.

Phonological knowledge has been the most assessed area in studies examining education professionals' linguistic knowledge. A persistent theme across all studies

spanning over 20 years has indicated that education professionals' phonological

knowledge is not strong enough to provide appropriate language instruction. These

studies have primarily focused on education professionals' ability to define, count, and

manipulate phonemes as well as count syllables. Therefore, the present study examined

these aspects of phonological knowledge to determine if any improvements in education

professionals' knowledge have been made over time. The questionnaire in the present

study encompassed 25 questions that assessed REs,' SEs,' and SLPs' abilities to count

phonemes and syllables and match a target sound from a list of words.

F.2. Morphology

Morphological knowledge is a necessary for component of spelling development.

Although phonology has been the main focus of education professionals' linguistic

knowledge, morphological knowledge of these professionals, particularly in recent years

has also been examined, but not to the same extent. One of the earliest studies examining

morphological knowledge was Moats's (1994) study. In this study, Moats found that

although SLPs had more morphological knowledge than the other three groups of

educators (REs, SEs, and reading teachers), all four groups had morphological skills that

were lower than expected. For example, only a small percentage of participants could

identify inflected word forms (21%) or identify the number of morphemes in a word

(27%).

Although other studies (e.g., Bos et al., 2001; Mather et al., 2001) have examined

linguistic knowledge modeled after Moats's questionnaire, they did not examine

morphological knowledge. Washburn et al. (2011) examined pre-service teachers (n=91)

morphological knowledge. The findings from this study were more positive than Moats's findings, but still lower than expected. For example, on a sorting task, approximately half of respondents were able to sort prefixes (65.14%), root words (45.14%), and suffixes (51.71%). Conversely, in a study examining phonological and morphological knowledge, Puliatte and Ehri (2017) found that teachers' weakest area was in morphology. Additionally, another study by Washburn et al. (2019) examining RE and SE's morphological knowledge found similar results: participants did not demonstrate a good knowledge base of the morphological structure of words. For example, both REs and SEs struggled to correctly count morphemes for morphologically complex words (between 3-15%).

Although morphological knowledge is a highly researched area within the field of speech-language pathology (e.g., Apel & Henbest, 2016), very few studies have examined SLPs' morphological knowledge within the communication sciences and disorders profession. Good (2019) explored SLPs' service provision and found that the majority of SLPs reported addressing morphological knowledge in their intervention with students with language disorders (83.5%). However, Good did not examine SLPs' actual morphological knowledge. Fallon and Katz (2011) examined SLPs' reported confidence of their knowledge of various linguistic aspects. For morphological knowledge, the majority (80%) of SLPs reported high to moderate confidence in intervening to improve morphological skills. Although both Good (2019) as well as Fallon and Katz (2011) report positive findings related to SLPs frequency and confidence in providing morphological knowledge intervention, SLPs knowledge was not actually measured.

Minimal research within the field of communication sciences and disorders has examined SLPs' morphological knowledge and that studies examining REs and SEs morphological knowledge have indicated lower than expected performance. The studies that have examined morphological knowledge in education professionals have focused on defining a morpheme, counting morphemes, and sorting morphologically complex words into their component parts. The present study examined SLPs morphological knowledge with three tasks adapted from previous research (Fox, 2005; Moats, 1994; Wilson-Fowler & Apel, 2015). The first task included # of items asking respondents to sort inflected endings based on how they sounded (e.g., *-ed = id, t,* and *d*). The second task required respondents to identify two rules related to morphology (e.g., does the spelling of a root word is usually affected by adding a prefix?). The third task asked respondents to add the appropriate morpheme to complete a sentence (e.g., weary. The doctor asked the patient to rate his _____on a scale from 1 to 5).

F.3. Orthography

An integral part of learning to spell is understanding the structure of English orthography, however the majority of studies examining linguistic knowledge have not focused on this aspect of language. Moats's (1994) study examined orthographic knowledge of SLPs, REs, SEs, and reading teachers. SLPs had greater knowledge, but still below expected levels. Generally, all four groups of participants performed poorly in the following areas: identifying consonant blends (10%), digraphs (0%), schwa in written words (45%), and explaining when certain orthographic features such as *ck* (30%) and double *m* (20%) are used.

Mather et al. (2001) and Bos et al. (2001) used a modified version of Moats's survey with pre- and in-service teachers and reported similar results. Less than half or participants knew characteristics of English orthography (e.g., matching blends, diphthongs, and schwa to its definition). Similarly, Bos et al. (2001) reported that less than two-thirds of teachers could define orthographic structures such as consonant blends and digraphs. McCutchen (2002, 2009) also reported similar results. Spear-Swerling and Brucker (2003, 2004, 2006) implemented a series of studies also examining both pre- and in-service teachers' knowledge of language structure. Of the three tasks participants were given, one highlighted orthography, the graphophonemic segmentation of words: In this task, participants wrote down the numbers of phonemes and the letter(s) that corresponded to them in a set of targeted words. Across all three studies, participants' scores on this subtest were lower than anticipated.

Given that the majority of studies examining linguistic knowledge have not addressed orthography, particularly in comparison to phonology and morphology, the present study measured education professionals' orthographic knowledge with three tasks consisting of 10 total questions adapted from Fox (2005). The first task asked respondents to identify specific orthographic features (e.g., a digraph). The second task required respondents to identify how specific consonant sounds (e.g., /s/) were represented orthographically. Similarly, the third task asked respondents to identify how specific vowel sounds (e.g., *long a*) were represented orthographically.

G. Instructional Practices

Minimal research has focused on teachers' spelling instructional practices spellings and no studies have examined SLPs' instructional practices in spelling. For instance, Brownell et al. (2009) measured linguistic knowledge of SEs as well as their instructional practices. However, observation of instructional practices strictly focused on classroom management and not spelling. The studies that have specifically observed or questioned educators about their instructional practices related to spelling have questioned educators about the origin of spelling words and the frequency of spelling assessment.

Johnston (2001) surveyed 42 teachers (REs) across grades second to fifth about their spelling practices. The majority of respondents reported using some sort of formal program (93%) to teach spelling. Within the area of "formal instruction," three categories became evident: use of published series, a combination approach, and an alternative approach. Exactly half of respondents (50%) reported using a published series in their spelling instruction. The teachers reported that the published series contained lists that shared common spelling features and taught specific common phonics skills. From the group that used a published series (*n*=21), almost a quarter (21%) utilized a combination approach in which they used words from the content area and/or reading materials in addition to the publish series. In an alternative approach, the other half (50%) of respondents reported using informal methods such as a teacher-created weekly word list originating from the following sources: words from a thematic unit or content areas (67%), words that were spelled incorrectly during writing tasks (29%), words from

reading materials (19%), common high frequency words from grade-level lists (19%), rewriting a word 3-5 times (29%), and words that were based on common letter patterns (29%). Although the last instructional method (words based on letter patterns) is promising, the rest of the alternative approaches are reflective of a drill and practice, or memory-based approach, as the words from the other sources did not likely have similar letter patterns. McNeil and Kirk (2014) indicated that half of their teachers reported rewriting misspelled words as an instructional strategy. Puliatte and Ehri (2017) also reported sounding words out as a strategy to respond to student errors (*M*=4.46, on a scale of 0-6 for frequency).

Fresch (2003) also examined teachers' spelling practices (*n*=355) in a nationwide survey and found that the majority of respondents reported having specific time for spelling instruction each week (98%) and that formal spelling instruction was necessary for development (73%). Similar to Johnston's (2001) findings, a high percentage of teachers reported using basal spellers to determine instruction. Teachers were also asked to provide information about their concerns related to spelling instruction. From these findings, Fresch (2003) surmised that the teachers did not have a strong foundation in spelling instruction. Puliatte and Ehri (2017) had more positive findings in terms of origins of spelling words. Using a scale from 0 to 6 (never-always), teachers reported high rates of word families (*M*=4.56), visual patterns (*M*=4.62), lists organized by patterns and rules (*M*=5.22). Overall, teachers reported a moderately frequent level of utilizing orthographic patterns in their spelling words.

These studies have examined how where teachers' spelling lists come from. Of these studies, only one (Puliatte & Ehri, 2017), also questioned teachers about the frequency of their spelling assessment. This study found that the majority (81.25%) of teachers gave students an end of week test, or the "Friday" Spelling Test. The present study, examined education professionals' spelling practices more extensively across six areas, with one question per area: the frequency of spelling assessment, origins of spelling words (e.g., from grade-level lists or orthographic patterns), frequency of spelling words being based on orthographic patterns, how professionals respond to student errors, alternative methods of spelling assessment, and how spelling proficiency is determined.

H. Interprofessional Collaboration

Collaboration is a necessary component of a multidisciplinary team (e.g., a public school). The American Speech-Language Hearing Association (ASHA) has adopted the World Health Organization (WHO) definition of collaboration, which includes two components: interprofessional education (IPE) and interprofessional practice (IPP). IPE is defined as "an activity that occurs when two or more professions learn about, from, and with each other to enable effective collaboration and improve outcomes for individuals and families" (WHO, 2010, p. 13). IPP, on the other hand, "occurs when multiple service providers from different professional backgrounds provide comprehensive healthcare or educational services by working with individuals and their families, caregivers, and communities to deliver the highest quality of care across settings" (WHO, 2010, p. 13). Collaboration (e.g., IPE and/or IPP) is a required responsibility for school-based SLPs. In

2010, ASHA's Ad Hoc Committee on the Roles and Responsibilities of School-Based

SLPs outlined pursuing and implementing collaborative opportunities and services with

teachers as an important component of their duties.

SLPs and REs and SEs have different areas of knowledge and expertise. It is

expected that these educational professionals combine their efforts in a collaborative

service delivery model to benefit all students, but particularly those students with special

needs. SLPs, in particular, can uniquely contribute their expertise in linguistic knowledge

and differentiated instruction to improve student literacy outcomes. In fact, Farquharson,

Tambyraja, Logan, Justice, and Schmitt (2015) used hierarchical linear modeling to

determine SLPs' contributions to student growth in grammar, vocabulary, and word-level

decoding. Findings from this study indicated that SLPs do contribute to students'

language and literacy growth within a single academic year; however, more research is

necessary to determine the degree of that contribution.

Beyond the unique contribution SLPs directly make to students in a 1:1 or small

group setting (e.g., through pull-out services), SLPs contribute to student literacy

outcomes by sharing their skills and knowledge through engaging in collaborative

practices with teachers. Examinations of the impact of collaborative models of service on

student performance have been conducted for over 20 years. For example, Ellis,

Schlaudecker, and Regimbal (1995) implemented a collaborative consultative model of

service delivery to address basic language concepts (e.g., before, center, fewest). With the

support of one SLP and a university faculty member, a RE and a PE teacher targeted

these concepts with students in their respective settings. Prior to the beginning of the

intervention, the team met twice for 30-minute sessions to plan for the 8-week intervention. Once the intervention began, the SLP met with the teachers weekly to provide support (e.g., strategies to facilitate teaching and using the target words). The students received an hour of intervention, 30 minutes from each teacher. At the end of the intervention, the students who were in the consultative group made significantly more progress than students in the control group.

The findings from the Ellis et al. (1995) study laid a foundation for future research in collaborative practice. Throneburg, Calvert, Sturm, Paramboukas, and Paul (2000) compared three different service models: a collaborative approach; a classroom-based intervention model (with SLP and classroom teacher working independently); and a traditional pull-out model for children in 12 Kindergarten through third grade classrooms composed of 177 students in a 12-week intervention. Similar to the intervention in the Ellis et al. (1995) study, the SLP met with the teacher to develop plans prior to the intervention and they also met during the semester during scheduled collaborative meetings. At these meetings, educators planned activities to target vocabulary, discussed data, and shared their knowledge. The students who received speech-language services also participated in traditional pullout sessions in both the collaborative approach and the classroom-based groups, as it was deemed necessary to explicitly monitor progress on Individualized Education Program (IEP) goals.

Findings from the Throneburg et al. (2000) study indicated that all students made gains, however the students in the collaborative approach made the most gains. Of interest is that the collaborative approach had the most far-reaching student impact.

Students who were not in special education, but who were in the collaborative group, also made significant gains academically. More recently, Henbest, Apel, and Mitchell (2019) used a consultative collaboration approach to implement a morphological awareness program with a SLP and two general education teachers and 30 students. As with previous studies, a meeting by the SLP and teachers took place to develop lesson plans and to schedule a weekly collaboration. After this initial meeting, the teachers participated in a two-hour online module on morphological awareness. Upon completion of the modules, the teachers implemented morphological awareness lessons. Although the teachers did not make significant growth on the post-tests of their morphological awareness, the students did make significant gains from pre- to post test results. The findings from the Henbest et al. (2019) study demonstrate how and why SLPs should collaborate to share their explicit knowledge of language structure with classroom teachers, as it can have a positive effect on students' morphological knowledge which is a predictor of word-level reading and reading comprehension.

Although collaboration among education professionals has a positive influence on student literacy outcomes, studies over a period of time examining SLPs' collaboration practices reveal that they do not always do so (e.g., Beck & Dennis, 1997; Paramboukas, Calvert, & Throneburg, 1998; Pfeiffer, Pavelko, Hahs-Vaughn, & Dudding, 2019). Brandel and Loeb (2011) questioned a sample (n=1,897) of SLPs about their service delivery models for students with disabilities, ranging in severities of disabilities. The typical service delivery employed by SLPs who responded to the survey was pullout (74.06%), regardless of the severity of a disability. Only a small percentage (12.08%) of

SLPs indicated engaging in co-teaching in the regular education classroom. These findings are similar to the results of the annual ASHA Schools Survey (2018; $n=2,170$) which reported that SLPs, on average, spent two hours a week on collaboration and most of their time was spent in direct contact using traditional pull out services. Combined, the studies examining how school-based SLPs provide services to students suggest that SLPs are not often engaged in collaborative practices with teachers.

Research that points to SLPs not consistently participating in collaborative service delivery models have also examined several reasons why this occurs. The first reason, is attributed to the education and preparation of SLPs. The Council on Academic Accreditation (CAA) only recently added IPE to its curriculum requirements (CAA, 2020). However, federal law mandates a collaborative approach to determine eligibility and provide services to special education students (IDEA, 2004). Therefore, teaching collaborative practices should be a standard part of Communication Sciences and Disorders (CSD) graduate curricula, despite IPE only formally being added to SLP preparation standards within the last 2 years. According to a survey by ASHA (ASHA, 2016b), most CSD professionals do not receive formal education nor training in of IPP. As a whole, only 29% of CSD professionals had received some type of instruction in collaborative practices. Within the subsample of school-based SLPs, the percentage was slightly higher (36%). Other surveys by ASHA (2016b, 2017; $n=147, 212$) found that SLPs did receive formal training on IPP (63.9% and 72.6%). Glennen (2017) also reported that IPE/IPP were not a significant part of their curriculum.

The second reason SLPs do not engage in collaboration practices is lack of resources, most notably, time. In the Throneburg et al. (2000) study, the SLP who participated in a collaborative approach spent seven hours per week either directly serving children or collaborating with teachers. This was more than the classroom-based model in which SLPs and teachers worked independently (4 hours) or the pull-out model (5 hours). Despite the collaborative approach being the most effective for the students, it was also the most time-consuming activity for the SLPs. The school participating in the study received funds to pay for substitute teachers to cover regular educators' classrooms while they planned with SLPs. However, this type of compensation is not readily available in the overwhelming majority of public schools. The third reason SLPs do not engage in collaboration practices may be lack of willingness from other professionals. A small and informal survey study (*n*=11) questioned SLPs about their experiences with IPP in pediatric settings (e.g., schools or private practice) and indicated this as a consistent theme across respondents (Giess & Serianni, 2018). Thus, given that the most common method of service delivery in special education is pull-out services, it is not surprising that most professionals tend to work in "silos" with their students. In the present study, education professionals' interprofessional collaborative practices were assessed by asking each professional group to indicate how frequently they collaborated with the other two professional groups.

I. Purpose of the Study

Some of the most significant linguistic factors that contribute to student literacy outcomes including mastering skills such as phonological awareness, morphological

awareness, and orthographic knowledge have been discussed in this review of the literature. Findings regarding the importance of educator knowledge of language structure have been focused on extensively and REs', SEs', and SLPs' knowledge bases have been compared. Overall, these three education professionals have different expertise. It is necessary for them to integrate their skill sets in order to provide students with explicit, systematic, and ethically responsible literacy instruction. Without collaborative efforts, opportunities for improving professionals' knowledge of language structure through IPE, service delivery through IPP, students' acquisition of literacy will not be attained. Thus, students will not be empowered with a large part of the knowledge and skills necessary to enable them to be literate citizens.

Whereas the studies in this literature review have examined education professionals' linguistic knowledge, they have done so broadly, or focused too specifically on one language area (e.g., phonology). No study has compared and contrasted SLPs', REs', and SEs linguistic knowledge across three specific knowledge language domains (phonology, morphology, and orthography). Further, no study has compared the importance these professionals attribute to phonological awareness and visual memory for spelling development, their instructional spelling practices nor examined how often they collaborate with one another in spelling assessment and instruction. The purpose of the present study was to fill this gap in the literature. Four specific research questions as listed below were posed to address the importance of two instructional factors (phonemic awareness and visual memory); professionals'

phonological, morphological and orthographic knowledge; their instructional spelling practices; as well as their interprofessional collaboration.

1. Are there differences in how the three groups of professionals rated the importance of phoneme awareness and visual memory for spelling development? Based on previous research and current spelling assessment practices in the k-12 public schools that support a visually- based approach to spelling versus a linguistically based one, it was predicted that REs and SEs will rate visual memory as equally important to phonemic awareness. SLPs, with their more explicit linguistic knowledge, will not rate visual memory as high as phonemic awareness.

2. Are there differences in spelling-related phonological, morphological, and orthographic knowledge among SLPs, REs, and SEs? Overall, it was predicted that SLPs will have the most phonological, morphological, and orthographic knowledge and there will be no differences among REs and SEs' phonological, morphological, and orthographic knowledge. There were three sub-questions for this research question:

    a. Which specific items for the three knowledge types best differentiated the groups? For phonology, it was predicted that the phoneme manipulation tasks which includes counting and matching phonemes will differentiate the most among the groups as previous research indicates that this is REs' and SEs' weakest phonological area. For morphology, it was anticipated that the sorting inflected endings and the morpheme manipulation tasks

will differentiate SLPs from REs and SEs. For orthography, the task requiring participants to identify how specific consonant tasks were presented orthographically would differentiate SLPs from REs and SEs the most, given that this task requires knowledge of the relationship between speech and print.

b. Which specific items for the three knowledge types were most similar across the three groups? For phonology, it was expected that all three groups will perform similarly on the counting syllables task, as previous research shows that this is the strongest area for all three groups. For morphology, it was predicted all groups will be able to explain morphological rules. For orthography, it was anticipated that all groups will be able to identify orthographic features (e.g., digraphs and consonant blends) with similar accuracy.

c. Are there differences across the three knowledge types? (For example, did the groups have more phonological knowledge than orthographic and morphological knowledge?) Given the large focus on phonological knowledge in language and literature instruction, it was anticipated that the highest scoring area for all three groups would be in the area of phonology, followed by morphology, and then orthography.

d. How does the academic preparation of SLPs, REs, and SEs relate to their knowledge of phonology, morphology, and orthography? It was predicted that all groups will receive the most instruction in phonology, followed by

morphology, and then orthography. Further, SLPs will have the most

instruction in all three language areas and REs and SEs will have received

similar levels of language instruction.

3. What are the instructional practices for spelling among SLPs, REs, and SEs?

    It is anticipated that REs' and SEs' instructional practices would favor a visual

    memory approach utilizing a "Friday Spelling Test", using spelling words that

    were not based on orthographic patterns, and would not address underlying

    linguistic considerations when correcting students' misspellings. SLPs'

    instructional practices would favor a language-based approach. There were

    also two sub-questions for research question three:

    a. Which instructional practices were implemented the most by each

        profession? It was expected that REs and SEs would choose spelling

        words based on thematic units or grade-level lists whereas SLPs would

        choose words that share similar orthographic patterns. It was also expected

        that REs and SEs would respond to students' misspellings by having

        students "sound-it-out"; whereas SLPs would be more likely to teach

        students orthographic patterns in response to misspellings.

    b. Are instructional practices in line with a linguistic approach to spelling?

        The previous research in the area of spelling practices suggests that

        contemporary spelling instruction is not in line with the linguistic

        approach to spelling. Although progress is evident (e.g., more teachers are

        beginning to use words based on orthographic patterns), a large portion of

instructional practices continue to adhere to a visually-based approach that does not address the linguistic aspects of spelling. Therefore, it was predicted that REs' and SEs' approach to spelling will favor a visual approach. SLPs' instructional practices will be more in line with a linguistic approach.

4. Do SLPs collaborate more than REs and SEs? Based on previous research (e.g., Giess & Serianni, 2018), it was predicted that SLPs, REs, and SEs will report that they have little collaboration with other professionals. There was also one sub question for research question four:

(a) Do SLPs, REs, and SEs report feeling prepared to collaborate with other professionals during their academic preparation? Since IPP and IPE were only added as a requirement of academic instruction in CSD programs in the last 2 years, it was expected that many SLPs would report not feeling prepared to collaborate. Similarly, given that education professionals typically work independently of on another, REs and SEs would not rate high levels of preparation for collaborating with other professionals in providing literacy and spelling instruction.

CHAPTER III

METHOD

A. Participants

To qualify for both the regular (RE) and special educator (SE) groups, teachers had to have received at least a bachelor's degree in Elementary Education and a teaching license from the North Carolina Department of Public Instruction (NCDPI). SLPs were certified by ASHA and licensed to practice in North Carolina through NCDPI as well. The above inclusionary criteria are requirements for education professionals working in the North Carolina public schools.

A total of 135 responses were received in response to the questionnaire. Of the 135 responses, 85 were used for the analysis for this study. Responses were reviewed for consent and completion of the questionnaire, leaving 85 respondents in the final sample (SLP= 28, RE=30, SE= 27). The majority of respondents (n=67) had received at least a master's degree. A small number of respondents (n=6) had bachelor's degrees in fields outside of education (e.g., lateral entry). A full description of the participants can be seen in Table 1.

Table 1

Respondents' Demographic Summary

		Profession		
		SLP *n*=28	Regular Education *n*=30	Special Education *n*=27
Education	Bachelor's	1	14	4
	Bachelor's- Lateral Entry	0	3	3
	Master's	25	13	19
	Doctorate	2	0	1
Age	22-29 years	8	11	5
	30-39 years	10	10	11
	40-49 years	3	8	4
	50 + years	7	1	7
Grades Taught	K-2	1	13	4
	3-5	4	12	7
	Both	23	5	16
Years of Experience	1-5 years	10	12	5
	6-10 years	10	9	9
	11 + years	8	9	13
Multilingual	Yes	6	5	3
	No	22	25	24

B. Recruitment Procedures

Education professionals were recruited using social media (e.g., Facebook). Snowballing (Blair & Blair, 2015), a method in which respondents are asked to share with other individuals who may be interested and are eligible was also utilized to disseminate the questionnaire.

C. Coverage Bias

Coverage bias, or the issue of population members not being represented in the sampling frame, is a critical issue that needs to be addressed in a survey study. The present questionnaire was administered online. The target population, including SLPs, REs, and SEs, had high levels of online access; therefore, potential coverage bias was minimal. Online access includes having a county-issued computer, tablet, or laptop and a county-issued email address. To maximize respondent participation and reduce non-response bias, a link to the questionnaire was sent out on three social media pages pertaining to regular and special education as well as speech-language pathology professionals in mid-late November, 2019. After 2 weeks, a second post was shared on the same three sites. A feature in Qualtrics called, "Prevent Ballot Box Stuffing," was enabled so participants who had already completed the questionnaire could not take it again. The data was then reviewed to determine if it was representative of the population, in terms of profession (e.g., SLP, regular, or special educator).

D. Measures

D.1. Spelling Knowledge and Practices Questionnaire (SKPQ)

All education professionals' linguistic knowledge, collaborative practices, and educational experiences were collected through an electronic survey tool called Qualtrics. The 44-item Spelling Knowledge and Practices Questionnaire (SKPQ) questionnaire was based on previous research that investigated education professionals' spelling-related knowledge in the areas of phonology, morphology, and orthography (e.g., Bos et al., 2001; Carlisle, 2001; Mather et al., 2001; Moats, 1994; Wilson-Fowler & Apel, 2015).

In the area of respondents' views on instructional factors, linguistic knowledge, and instructional practices, the SKPQ included 44 questions. Of these questions, 15 were original questions by the author. These 14 questions were modeled after questions used in previous similar surveys, however, they differed in format (e.g., fill-in-blank), number of answer choices (e.g., adding/reducing answer choices so answer choices were consistent across a section). The difficulty of the questions from previous surveys was increased (e.g., by adding more morphologically complex words). In the area of collaboration, three original questions were added. Five questions were included concerning respondents' demographic information as well as two questions about their educational experiences. The complete SKPQ questionnaire appears in Appendix A.

D.2. Content Experts and Content Validity

Content validity, or how well a test measures what it purports to measure was established using a two step-process. The first step involved creating a large pool of questions related to views of instructional factors related to spelling, linguistic knowledge (e.g., phonology, morphology, and orthography), instructional practices and educational experiences. This pool of prospective questions was identified based on previous research (e.g., Bos et al., 2001; Carlisle, 2001; Mather et al., 2001; Moats, 1994; Wilson-Fowler & Apel, 2015) and original questions developed by the principal investigator. A draft item pool of 69 questions were proposed for the SKPQ. Following the development of a draft of the questionnaire, both a school-based SLP and an elementary-education teacher (RE) reviewed the questionnaire to provide feedback on the test-taking experience (e.g., time it

took to complete, clarity of the questions). The reviewers did not recommend any changes to the draft version of the SKPQ.

The second step incorporated modified elements of the Content Validity Index (CVI) method with Content Experts (CEs). The CVI is a method in which CEs rate the relevance of a questionnaire's items by either using approval or disapproval ratings (e.g., yes or no) or ranking statements (e.g., highly valid, moderately valid, minimally valid; Aiken 1980). By doing so, it is possible to quantify CEs' judgments and supply a coefficient alpha. This information leads to a statistical-based decision that determines the relevance of the items' relevancy to the questionnaire topics (Polit & Beck, 2006). The CVI method should be conducted in two parts (Lynn, 1986). The first, the relevance of each individual test item must be examined. Second, the overall relevance of the questionnaire as a whole should be examined. To control variance in the responses, Lynn (1986) recommends between using five to ten CEs.

A team of five CEs with doctorates in the fields of Education and Speech-Language Pathology reviewed the questionnaire to determine its validity and made edits as necessary. Instead of reporting relevancy using a numeric scale, a round table discussion review of each item of the questionnaire occurred. CEs reviewed the wording, difficulty, relevance, and order of the questions during a two-hour discussion. This led to the questionnaire being reduced from 69 items to 44 items.

D.3. Contents of the SKPQ

The SKPQ contained eight sections. Below is a description of each section.

D.3.a. Demographics. This section included eight questions that asked respondents about their demographic information such as their profession (e.g., regular educator or SLP), language status (e.g., mono or multi-lingual), years of experience, and highest level of education.

D.3.b. Collaborative Experiences. This section asked respondents about their collaborative practices including the nature of their collaboration (e.g., consultative services) and the degree to which respondents collaborated with one another and other colleagues from the same field. Three original questions comprised this section.

1. What is the nature of your collaboration with other education professionals? (check all that apply)

2. I collaborative with the following education professionals: (Likert frequency; check all that apply)

3. My college education prepared me to collaborate with other education professionals: (Likert agreement)

D.3.c. Spelling Practices. This section incorporated nine questions that asked respondents to share their instructional practices related to spelling. Questions asked respondents about the frequency of spelling assessment and instruction, specifically in the areas of phonology, morphology and orthography. Questions also asked about the source of the word-lists they used in spelling instruction and how they corrected spelling errors. These nine questions were original questions created by the author. Spelling practicing

questions were formatted on a 5-point Likert scale and multiple-choice options. The nine

Spelling Practices questions are listed below.

1. Spelling words come from (check all that apply):

2. Spelling words come from a district curriculum (Likert frequency):

3. Spelling words come from a thematic unit (e.g., a lesson about snowmen;

   Likert frequency):

4. Spelling words come from grade-level lists (Likert frequency):

5. Spelling words are based on sound patterns (Likert frequency):

6. How do you measure spelling proficiency?

7. What do you consider a **passing** spelling grade?

8. What are other ways, besides a spelling test, that you assess spelling

   proficiency?

9. What do you do when students spell a word incorrectly? (check all that apply)

D.3.d. Views of Instructional Factors Related to Spelling Instruction. This

section asked respondents to answer five questions about the importance of instructional

factors associated with spelling instruction. Statements about spelling instruction were

provided and respondents designated the degree to which they agreed or disagreed with

the statements. Of these five questions, three were modified from Mather et al. (2001). In

Mather et al.'s questionnaire, respondents were asked to read statements and determine if

they were true or false. For the SPKQ, three statements were taken from those developed

by Mather et al. and revised to be answered as True. Respondents then identified how

strongly they agreed or disagreed with the statement. The other two questions were created by the first author. They are as follows:

1. Spelling words based on how they sound (e.g., spelling pizza as *peetza*) should be encouraged

2. Phoneme awareness is a crucial skill for learning how to spell (Mather et al., 2001)

3. Visual memory is important for accurate spelling (Mather et al., 2001)

4. Knowing what a word means is important for spelling

5. Knowing how to read a word is important for spelling a word (Mather et al., 2001)

D.3.e. Phonology. The 26 items in this section asked respondents to count phonemes, syllables, and match a target phoneme from a list of words. These items were extracted entirely from the items used in previous research (Bos et al., 2001; Moats, 1994).

1. A phoneme refers to (Bos et al., 2001)

2. How many speech sounds are in the following words? (nine items; Moats, 1994)

3. How many syllables are in the following words? (nine items; Moats, 1994)

4. Choose the word or words that have the same sound as the sound in parentheses in the first word (six items; Moats, 1994)

D.3.f. Morphology. Questions in this section asked respondents to answer four questions about morphology that involved grouping words with inflected endings based on how they sound and answering questions about morphological rules. Of the four items, only one was an original question by the first author. A second question was modified from Fox (2005), the original question was fill-in-the-blank. For the SPKQ, that particular question was changed to fit in a True/False format. The remainder of the questions came from previous research (Moats, 1994; Wilson-Fowler & Apel, 2015).

1. The spelling of a root word is usually affected by adding a prefix (Fox, 2005).

2. Group the following words based on how they sound.

3. The *ly* ending in *sadly* and *unfairly* changes the base word's (Moats, 1994).

4. Change the word so that it fits in the sentence (Wilson-Fowler & Apel, 2015).

D.3.g. Orthography. This section requested respondents to identify orthographic features (e.g., consonant cluster) and describe how speech sounds are presented in writing with 10 tasks. Of these 12 questions, eight were developed by the author and asked respondents how specific sounds are created orthographically.

1. From the list of words below, identify which ones contain a consonant blend-check all that apply (six items; Fox, 2005).

2. From the list of words below, identify which ones contain a consonant digraph—check all that apply (six items; Fox, 2005).

3. A ____ is two combined letters that represent on single speech sound (Fox, 2005).

4. Which word below does **not** have the short u sound?

5. Which word below does **not** have the /s/ sound?

6. Here are two ways to spell the /f/ sound: funny and laugh. What is a third way?

7. Here are two ways to spell the /sh/ sound: sugar and shell. What is a third way?

8. Which is not a way that English spells the "long u" sound?

9. Which is not a way that English spelled the "long a" sound?

10. Which is not a way that English spells the "long e" sound?

E. Data Collection and Analysis

E.1. Data Collection Tools

Data for the SKPQ was collected through an online survey platform, Qualtrics.

E.2. Scoring and Reliability

Scoring was done completely online. Correct answers were entered into an Excel sheet and respondents' answers were compared. For the open-ended questions, a variety of responses were noted as "acceptable" (e.g. capitalization variations and/or ordering of answers) to decrease the likelihood that correct answers were marked as incorrect. Open-ended answers were also reviewed by the Principal Investigator to make sure no correct answers were omitted. Each question was worth one point, which resulted in both a score from each of the three language sections as well as an overall linguistic knowledge score from the phonology, morphology, and orthography sections.

E.3. Analyses

The first research question examined how education professionals rated the importance of instructional factors of phonemic awareness and visual memory on the role of spelling development by using 3 (professions) by 2 (factor) repeated measures ANOVA with follow up paired samples t-tests to examine within-group differences and independent samples t-tests to compare between-group differences.

To answer the second research question regarding group differences in phonologic, morphologic, and orthographic knowledge among SLPs, REs, and SEs, three one-way Analysis of Variance (ANOVA) were run on the raw data with follow up Tukey HSD post hoc tests. A 3 (professions) by 3 (knowledge type) repeated measures ANOVA with follow up pairwise comparisons to examine within-group differences and Tukey HSD to compare between-group differences were run. Descriptive statistics (e.g., percent totals) were reported to describe which specific items differentiated the three groups, and which specific items were most similar across the groups.

The third question examined the instructional practices related to spelling among the three groups using descriptive statistics (percent totals). The fourth research questioned asked if SLPs collaborate more than do REs and SEs. A one-way ANOVA with follow up Tukey HSD post-hoc test was performed to determine which group collaborated the most.

E.4. Data Management

All survey responses were confidential. No identifiable information was collected (e.g. name). The Principal Investigator turned off the collection of IP addresses within

Qualtrics in order to protect respondents' confidentiality. The data were stored in a

password protected spreadsheet, within Box, that only the Principal Investigator and

faculty advisor had access to on a password protected computer, that only the research

team (Principal Investigator and faculty advisor) had access to. Data will be deleted after

5 years.

CHAPTER IV

RESULTS

This study posed four general research questions with several sub questions:

1. Are there differences in how the three groups of professionals rate the importance of phoneme awareness and visual memory for spelling development?

2. Are there differences in spelling-related phonological, morphological, and orthographic knowledge among SLPs, REs, and SEs?

   a. Which specific items for the three knowledge types best differentiated the groups?

   b. Which specific items for the three knowledge types were most similar across the three groups?

   c. Are there differences across the three knowledge types? (For example, did one group display more phonological knowledge than orthographic and morphological knowledge?)

   d. How does the academic preparation of SLPs, REs, and SEs relate to their knowledge of phonology, morphology, and orthography?

3. What are the instructional practices for spelling among SLPs, REs, and SEs?

   a. Which instructional practices were implemented the most by each profession?

b. Are instructional practices in line with a linguistic approach to spelling?

4. Do SLPs collaborate more than REs and SEs?

a. Do SLPs, REs, and SEs report feeling that their academic preparation

prepared them to collaborate with other education professionals?

A. RQ1

The first research question examined whether or not beliefs about the importance of phoneme awareness, and visual memory differed among the three groups. Table 1 presents these data. A 3 (profession) x 2 (instructional factor) repeated measures ANOVA was used to analyze the difference in ratings of importance of instructional factors related to spelling development among the different groups of education professionals. The main effect for profession was not significant (F (2, 82) = .203, $p >$ .05). However, the main effect for instructional factors (F(1,82) = 4.027, $p < .001$, η^2=.04) was significant with a small effect size (.04). In addition, a significant profession x factor interaction was present (F (2, 82) = 4.96, $p < .05$, η^2=.10) with a moderate effect size (.10). The interaction can be seen in Table 2 and in Figure 1.

Table 2

Repeated Measures ANOVA on Profession with Importance Ratings (Test of Between Subjects Effects)

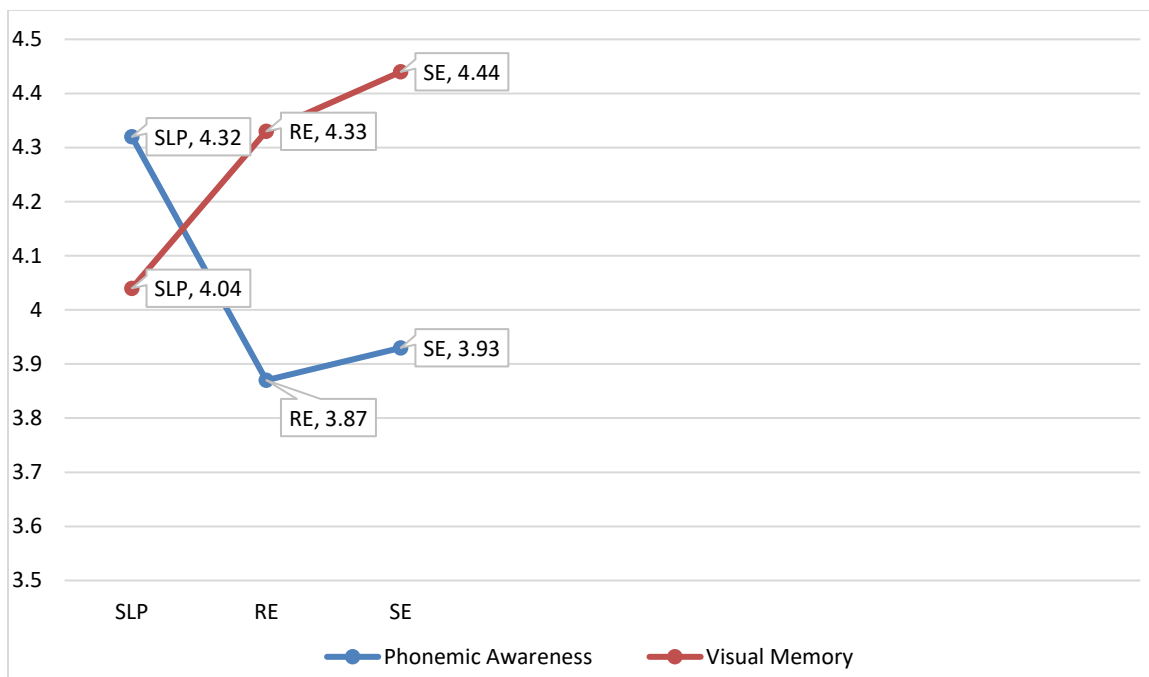| Effect	Mean Square	df	F	Sig.	Partial Eta Squared
Profession	.131	2	.203	.817	.005
Profession*Factors	2.843	2	4.964	.009	.10
Factors	2.300	1	4.027	.048	.04
Error	.5730	82			

Figure 1. Interaction Between Profession and Importance Rating of Instructional Factors.

Although all three groups rated phonological awareness and visual memory as being important, with an average approximate score of 4 on a 5-point scale (see Table 3), there were significant between and within group differences. Planned comparisons indicated that SLPs rated phonemic awareness significantly more important than REs ($t(56)$=-2.46, p<.05) and SEs ($t(53)$=-2.51, p<.05). However, there were no significant differences in how REs and SEs rated visual memory significantly when compared to SLPs (REs: $t(56)$= 1.31, p>.05; SEs:($t(53)$=1.71, p>.05). Post-hoc paired t-tests showed that REs and SEs also rated visual memory significantly more important than phonological awareness [REs: (29)=-2.13, p<.05; SEs: ($t(26)$=-2.56, p<.05). The difference between SLPs' rating of phonemic awareness and visual memory did not reach significance ($t(27)$=1.61, p>.05).

Table 3

Means and SDs of Instructional Factors

Subject Area	Profession	*M*	*SD*
	SLP	4.32	.60
Phonemic Awareness	RE	3.86	.763
	SE	3.92	.539
	SLP	4.036	.823
Visual memory	RE	4.33	.869
	SE	4.44	.916

B. RQ 2

The SPKQ encompassed subtests for phonological, morphological, and orthographic knowledge. The phonology and morphology subtests consisted of four tasks which corresponded to 25 and 6 questions, respectively. The orthography subtest had three tasks which corresponded to 10 questions. Three one-way ANOVAs, with Bonferroni correction ($p<.017$) to reduce Type 1 error, and follow up Tukey HSD ($p<.05$) confirmed that these differences were significant: phonology- $F(2, 82) = 33.44$, $p<.001$, $\eta^2=.449$; morphology- $F(2, 82) = 8.94$ ($p<.001$, $\eta^2=.179$); orthography- $F(2, 81) = 8.32$, $p<.001$, $\eta^2=.152$. The effect size for all three analyses were found to exceed Cohen's (1988) benchmark for a large effect ($\eta^2=.14$).

Table 4 presents the means and standard deviations (SDs) for these three knowledge types according to group. As can be seen in this table, the language scores for SLPs were higher than those of the of REs and SEs across all three knowledge types indicating that SLPs' phonological, morphological, and orthographic knowledge was

significantly greater than that of REs and SEs. Although the REs performed slightly better than the SEs on orthographic knowledge, this difference did not reach significance ($p>.001$).

Table 4

Means and SDs of Linguistic Knowledge

Profession	Phonology (M, SD)		Morphology (M, SD)		Orthography (M, SD)	
SLP	19.75	3.79	4.14	1.67	5.46	1.93
Regular Education	13.60	2.93	2.30	1.84	4.06	2.31
Special Education	12.96	3.54	2.70	1.65	3.03	2.37

To determine whether there were differences across the three linguistic knowledge types, the data in Table 4 were converted to percentages because there were differences in the number of items for each knowledge type. These data are presented in Table 5.

Table 5

Percentage Scores of Linguistic Knowledge

Profession	Phonology	Morphology	Orthography
SLP	79.20%	68.33%	54.00%
Regular Education	54.40%	38.33%	40.00%
Special Education	51.84%	45.00%	31.00%

A 3 (profession) x 3 (linguistic knowledge) repeated measures ANOVA, with a

Green-House Giesser correction (*p*=.897), confirmed the significant group differences

found with the one-way ANOVAs, *F*, (2, 82) = 17.65, *p* < .001). See Table 6. Partial eta

square was .326, indicating a large effect size. Follow up Tukey HSD post-hoc analysis

(*p* < .05) revealed results similar to the post-hoc analyses from the three one-way

ANOVAs: SLPs' phonological, morphological, and orthographic knowledge was

significantly greater than that of the other two groups. The main effect for knowledge

(*F*(1.80,147.18) = 27.79, *p*<.001) was also significant. Post-hoc pairwise comparisons

indicated that performance on the phonological subtest was significantly better than

performance on the morphological subtest (*p*<.05).

Table 6

Repeated Measures ANOVA on Profession with Linguistic Knowledge Scores

Effect	Mean Square	df	F	Sig. *Green	Partial Eta Squared (ηp^2)
Knowledge	9324.84	1.79	27.79	.000	.188
Profession	16111.63	2	17.65	.000	.326
Error	49382.35	147.17			
Interaction					
Profession x Knowledge	717.917	3.59	2.14	.086	.040

Performance on the morphological subtest was also significantly better than

performance on the orthographic subtest. Although the interaction between profession

and knowledge was not significant (*F*(3.59, 147.18) = 2.14, *p*>.05), it is notable that the

REs performed similarly on the morphological and orthographic subtests. The difference between these two subtests was based solely on the higher scores that SLPs and SEs demonstrated on the morphological subtest. The effect size of the interaction (.04) was small.

Although SLPs performed significantly better than both REs and SPEDs, none of the groups performed 85% or greater on any of linguistic knowledge subtests. Percentage correct scores were calculated for each of the 36 questions to determine which specific aspects of phonological, morphological and orthographic knowledge were comparable across the three groups and which aspects contributed to the better performance of the SLPs. As can be seen in Table 3, all groups scored the highest on the phonological knowledge subtest, followed by the morphological and the orthographic knowledge subtests, with the exception of REs scoring 2% higher in orthography than morphology.

As shown in Table 7, within each linguistic subtest, the questions were analyzed to identify which items the three groups responded similarly or differently from one another. In the Phonology section, there were four tasks: defining a phoneme, counting phonemes, counting syllables, and matching phonemes. REs and SLPs scored similarly to one another (10% and 7.1%) scoring two times greater than SE (3.7%). However, these scores were extremely low across all groups. In the second phonological task, participants were asked to count the phonemes of nine different words (e.g., fix, quack). Both REs and SEs scored within 1% of each other (45.9% and 44.03%), while SLPs scored almost twice as high at 83.30%. The third phonological task required respondents to count syllables in 9 words (e.g., recreational). All three groups scored similarly on this task

with SLPs scoring the highest (88.49%), very closely followed by REs (88.23%) and then SEs (79.84%). The final task in the phonological knowledge section asked respondents to match a phoneme to a group of target words (e.g., check all words that have the /u/ sound). Similar to the counting phonemes task, REs and SEs scored very closely to one another (32.80% and 29.62%). SLPs scores on this task were more than twice as high (70.23%) as the scores for the REs and SEs.

Table 7

Question Analysis

Task	(# of Items/task)	SLP	Regular Education	Special Education
Phonology				
Define a phoneme	1	7.1%	10.0%	3.7%
Counting phonemes	9	83.30%	45.9%	44.03%
Counting syllables	9	88.49%	88.23%	79.84%
Matching phonemes	6	70.23%	32.80%	29.62%
Morphology				
Sorting inflected endings	1	70.23%	28.90%	48.13%
Identify morphology rules	2	71.40%	36.65%	24.05%
Morpheme manipulation	1	60.70%	70.00%	77.80%
Orthography				
Identify orthographic features	3	42.83%	32.20%	22.20%
Identify orthographic representation of consonant sounds	4	63.10%	33.33%	29.60%
Identify orthographic representation of long vowel sounds	3	42.83%	47.77%	39.50%

The morphology subtest comprised three tasks. The first task, sorting inflected endings, asked respondents to group inflected endings based on their sound (e.g., planted, walked). SLPs scores (70.23%) were more than 20% higher than SEs (48.1%) and more than double the scores of REs (28.9%). The second task involved answering multiple-choice questions about morphological rules (e.g., the -ly suffix changes a word's _____). Again, SLPs (71.40%) scored almost twice as REs (36.65%) and almost three times greater than SEs (24.05%). The final task, morpheme manipulation, asked respondents to change a target word so that it appropriately fit into a sentence (e.g., weary → weariness). This was the only task in which SEs scored higher than SLPs (77.8% and 60.70%). REs scored in between SPEDs and SLPs at 70.00%.

The third subtest had three tasks. Task 1 asked respondents to identify specific orthographic features (e.g., a consonant blend). SLPs scored (42.83%) 10% greater than REs (32.20%) and twice as great as SEs (22.20%). The second task asked respondents to determine how specific consonant sounds are represented orthographically (e.g., /s/ = s, c). On this task, SLPs (63.10%) scored twice as high as REs (33.33%) and SEs (29.60%). Similar to the second task, the third, and final, task in the orthographic section required respondents to determine how specific long vowel sounds are represented orthographically (e.g., long a). This was the only task that REs (47.77%) scored slightly higher than SLPs (42.83%); SEs followed closely behind SLPs (39.50%).

Respondents were also questioned about their academic preparation in the areas of phonological knowledge (phonology), morphology as it related to reading and spelling development (morphology), and the structure of English orthography (orthography).

SLPs received the most language instruction across all three areas, with phonology being the greatest (100%), followed by morphology (67.85%), and then orthography (25%). REs and SEs received the most instruction in phonological awareness. However, REs' second greatest area of academic preparation was in morphology (30%), followed by orthography (16.67%). SEs, However, reported receiving more instruction in orthography (14.81%) and then in morphology (11.12%).

As can be seen in Table 8, SLPs (100%), REs (86.66%), and SEs (88.88) were the most prepared in the area of phonology. This was followed by morphology, as it related to reading and spelling development, with SLPs receiving the most instruction in this area (67.85%), followed by REs (30.00%) and SEs (11.12%). Finally, SLPs (25.00%) REs (16.67%), and SEs (14.81%). received the least amount of instruction in orthography. Overall, SLPs reported receiving the most linguistic instruction, followed by REs, and then SEs.

Table 8

Academic Preparation

Topic Area	Received Instruction	SLP	Regular Educator	Special Educator
Phonological Awareness	Yes	100%	86.66%	88.88%
	No	0	13.34%	11.12%
Morphology as it Related to Reading and Spelling Development	Yes	67.85%	30%	11.12%
	No	32.15%	70%	88.88%
Structure of English Orthography	Yes	25%	16.67%	14.81%
	No	75%	83.33%	85.19%

C. RQ 3

The third research question focused on the instructional practices of regular educators, special educators, and SLPs in the area of spelling. This question encompassed assessment (where spelling words came from, how spelling is assessed, and how proficiency is determined) and intervention (how spelling errors are addressed). Tables 9-13 highlight the practices related to both assessment and instruction for regular and special educators and SLPs.

C.1. Origins of Spelling Words

To answer the question of the source of the spelling words they use in lessons, respondents were given the choices of district curriculum, thematic unit, and grade-level lists as well as "not sure." Participants could choose as many options as they deemed appropriate. Regular educators reported that the majority of their spelling words were from either a thematic unit (46.67%) or from grade-level lists (56.67%). Special educators, on the other hand, reported that spelling words came from a thematic unit (37.04%) or a district curriculum (37.04%). Over half of SLPs (60.71%) reported that they did not know the source of spelling words, which is much greater than that reported by REs (20%) and SEs (37.04%).

Table 9

Origins of Spelling Words

Source of Spelling Words	SLP	Regular Educator	Special Educator
District Curriculum	32.14%	13.33%	37.04%
Thematic Unit	21.43%	46.67%	37.04%

Table 9

Cont.

Source of Spelling Words	SLP	Regular Educator	Special Educator
Grade-Level Lists	32.14%	56.67%	25.93%
Not Sure	60.71%	20.00%	37.04%

C.2. Spelling Words Based on Orthographic Patterns

In addition to asking respondents about the source of their spelling words,

respondents were also asked to indicate to what degree spelling words were based on

orthographic patterns (see Table 10). Of the three education professionals, nearly a third

of special educators (29.63%) reported that their spelling words were often based on

orthographic patterns. Whereas, less than a fourth of regular educators (20%) and SLPs

(21.43%) reported that spelling words were "always" or "often" based on sound patterns.

Approximately half of the respondents across all three professional groups reported

spelling words were "seldom" or "never" based on orthographic patterns (43.33% regular

educators, 48.15% special educators, and 42.86% SLPs).

Table 10

Frequency of Spelling Words Based on Orthographic Patterns

Frequency	SLP	Regular Educator	Special Educator
Always (100%)	7.14%	16.67%	7.14%
Often (80%)	14.29%	3.33%	29.63%
Sometimes (60%)	35.71%	30.00%	14.81%
Seldom (40% or less)	21.43%	6.67%	22.22%
Never (0%)	21.43%	43.33%	25.93%

C.3. Frequency of Spelling Assessment

Respondents were asked about the frequency of their spelling assessments (see

Table 11). The most common (76.67%) method among REs was a weekly spelling test.

No REs reported assessing spelling more than once a week. Approximately a third

(29.63%) of SEs assessed spelling on a weekly basis. REs assessed spelling the most

frequently among all of the groups, with approximately half of SEs (44.44%) and SLPs

(50%) reporting that they did not implement formal measures of spelling.

Table 11

Frequency of Spelling Assessment

	Frequency		
Profession	More Than Once Per Week	Weekly Test	Less Than Once Per Week
SLP	3.57%	17.86%	3.57%
Regular Educator	0.00%	76.67%	29.63%
Special Educator	3.57%	3.33%	7.41%

C.4. Alternative Methods of Spelling Assessment

In addition to a traditional spelling test, respondents were asked about alternative

methods of spelling assessment (see Table 12). The most common method (REs 73.33%,

SEs 74.07%, and SLPs 71.43%) across all three professions was informally assessing

spelling through writing samples. Word study activities were also common among

regular (46.67%) and special educators (37.04%), while only a fourth of SLPs (25%)

reported doing so. Approximately one-fourth of all respondents (REs 23.33%, SEs

18.52%, and SLPs 21.34%) reported not using any alternative forms of spelling

assessment.

Table 12

Alternative Methods of Spelling Assessment

	Method			
Profession	Comprehensive Spelling Inventory	Word Study Activities	Writing Samples	None
SLP	28.57%	25.00%	71.43%	21.43%
Regular Educator	30.00%	46.67%	73.33%	23.33%
Special Educator	22.22%	37.04%	74.07%	18.52%

C.5. Responding to Student Errors

To understand how the education professionals in this study responded to student

misspellings, respondents were presented with seven strategies and prompted to note

which methods they employed. The two most common methods among all respondents

was to "cue the student to sound out a word" (80% RE, 92.59% SE, and 78.57% SLP)

and "provide the correct spelling" (76.67% RE, 59.26% SE, and 64.29% SLP). The three

least common methods were to: (a) accept the invented spelling (20% RE, 18.52% SE,

and 28.57% SLP); (b) help the student make connections to previously learned patterns

(30% RE, 29.63% SE, and 32.14% SLP); and (c) teach the spelling pattern (40.00% RE,

37.04% SE, and 35.71% SLP). See Table 13.

Table 13

Ways to Respond to Student Spelling Errors

	Profession		
Response Type	SLP	Regular Educator	Special Educator
Accept Invented Spelling	28.57%	20.00%	18.52%
Cue the Student to "Sound it Out"	78.57%	80.00%	95.29%
Help the Student Make Connections to Previously Learned Patterns	32.14%	30.00%	29.63%
Practice Re-Writing the Word	32.14%	43.33%	44.44%
Provide the Correct Spelling	64.29%	76.67%	59.26%
Teach the Spelling Pattern	39.29%	40.00%	37.04%
Use the Word in a Sentence	35.71%	40.00%	37.04%

D. RQ 4

This final research question examined how often the education professionals collaborated with members of the other two professional groups. Participants were asked to rate the frequency with which they collaborated with members of the other two professional groups on a 5-point Likert scale that ranged from "never" to "always." Table 14 presents these data. Each group collaborated at similar levels with the other two groups (i.e., SLPs-3.07/3.39, SEs- 2.67/2.63, REs- 2.13/2.43). Thus, these data were collapsed to determine a score for interprofessional collaboration. These data are presented in Table 15.

Table 14

Overall Collaboration

Profession	Collaboration with RE (*M, SD*)		Collaboration with SE (*M, SD*)		Collaboration with SLP (*M, SD*)	
SLP	3.07	.94	3.39	1.06	3.18	1.24
Regular Educator	3.73	1.25	2.43	1.25	2.13	1.27
Special Educator	2.67	.961	2.82	1.11	2.63	1.04

Table 15

Means and SDs for Interprofessional Collaboration

Profession	Total Collaboration (M, SD)	
SLP	3.19	.85
Regular Education	2.30	1.19
Special Education	2.64	.84

A one-way ANOVA found a signficant difference among the three groups (F (2, 84)= 6.07, (η^2=.129) p<.001 p<.005). The effect size was in the moderate range. Follow up Tukey HSD ($p < .05$) analyses indicated that the SLPs collaborated significantly more with other professionals than did SEs and REs.

Table 16

Perception of Academic Preparation in the Area of Collaboration

Profession	Positive	Neutral	Negative
SLPs	50.00%	31.28%	18.72%
REs	55.56%	33.33%	11.11%
SEs	57.15%	21.76%	21.09%

Respondents were asked to rate how their academic programs prepared them to collaborate on a 1-5 Likert scale. The two negative options (disagree and strongly disagree) and two positive options (agree and strongly disagree) were collapsed into "negative" and "positive" categories. The one neutral option (neither agree nor disagree) remained as is with a label of "neutral." As can be seen in Table 15, SLPs (50%), REs (55.56%), and SEs (57.15%) positively rated their preparedness at similar levels. SLPs (31.28% and 18.72%), REs (33.33% and 11.11%), and SEs (21.76% and 21.09) ratings were also relatively similar for the neutral and negative ratings.

CHAPTER V

DISCUSSION

The linguistic knowledge of education professionals in the context of reading, has been examined for over 20 years. Overall, these studies have focused either too specifically on one language area, such as phonology (e.g., McCutchen, 2002), or have only viewed phonological, morphological, and orthographic knowledge (e.g., Moats, 1994). The present study compared SLPs', REs', and SEs' linguistic knowledge across three specific aspects of language knowledge (phonology, morphology, and orthography). The study also compared the importance these professionals attribute to phonemic awareness and visual memory for spelling development, their instructional spelling practices, and examined how often they collaborate with one another in spelling assessment and instruction. The discussion of the findings is organized according to the four research questions.

A. Importance of Visual Memory and Phonemic Awareness for Spelling

Although the visual view of spelling was challenged over 50 years ago (Chomsky, 1970), the practice of the "Friday Spelling Test" which is not based on orthographic patterns, continues as part of contemporary spelling instruction. Therefore, the present study aimed to investigate how SLPs, REs, and SEs rate the importance of visual memory in comparison to phonemic awareness in terms of spelling development and instruction. It was predicted that SLPs would not rate visual memory as highly as would REs and

SEs. Conversely, it was predicted that SLPs would rate phonemic awareness as more important to spelling instruction than would REs and SEs.

Although the repeated measures ANOVA did not indicate a main effect for profession, two independent samples *t*-test showed that SLPs (*M*= 4.32) rated phonemic awareness significantly higher than REs (*M*= 3.86), and SEs (*M*= 3.92). REs and SEs rated phonemic awareness on a scale from 1-5 (with 5 being the highest), their ratings were between "neither agree nor disagree" (3) to "agree" (4). Although these ratings are not severely low (e.g., "disagree"), they are fairly neutral, suggesting that REs and SEs mildly recognize the importance phonemic awareness plays in spelling development. Surprisingly, there were no significant differences in how the three groups rated visual memory. Further, SLPs (*M*= 4.03), REs (*M*= 4.33), and SEs (*M*= 4.44) rated visual memory highly. For SLPs, this finding is troubling. Despite highly rating phonemic awareness, SLPs believed visual memory to be an important part of learning to spell. This suggests that for SLPs, the visual view of spelling has not disappeared, but rather has been supplemented with a linguistic perspective of spelling. Further, this finding demonstrates that despite having greater linguistic knowledge of phonology, morphology, and orthography, SLPs still believed that spelling has a strong visual memory component.

Another objective of this study was to determine whether or not the three groups of education professionals rated the two instructional factors of phonemic awareness and visual memory significantly different than one another. The repeated measures ANOVA indicated a significant main effect for the instructional factors. The results of three paired samples *t*-tests revealed that although SLPs rated phonemic awareness slightly higher

than visual memory, that rating was not enough of a discrepancy to designate a significant difference. REs (*M*=4.33) and SEs (*M*=4.44), however, they rated visual memory at significantly higher rates than phonemic awareness. This particular finding is very troubling as spelling is a language-based skill and not a visual one. Arra and Aaron (2001) compared visual and linguistic approaches to spelling almost 20 years ago and found that the students taught in a linguistically focused group significantly outperformed the students who were taught in a visually focused group. Since then, more is known about how children learn to read and write. The literature surrounding this area indicates that a variety of *linguistic* factors such as phonology (Apel & Al Otaiba, 2013; Bahr et al., 2012; Bourassa & Treiman, 2001), morphology (Carlisle, 1987; Carlisle et al., 2001; Quick & Erickson, 2018), orthography (Apel, 2011; Apel et al., 2011; Burt, 2006) as well as other cognitive and linguistic factors uniquely contribute to spelling development. However, the findings of the present study revealed that education professionals favor a visual view of spelling development. This perspective is problematic as linguistic factors, such as phonemic awareness, primarily contribute to spelling development.

B. Phonological, Morphological, and Orthographic Knowledge

The second research question, and a large number of the questionnaire items, examined SLPs', REs', and SEs' phonological, morphological and orthographic knowledge. Previous research examining education professionals' linguistic knowledge indicates that SLPs overall, demonstrate more linguistic knowledge than do REs and SEs (e.g., Moats, 1994; Spencer et al., 2008). Further studies with both REs and SEs (e.g., Moats, 1994; Washburn et al., 2019) report no differences among both groups' linguistic

knowledge abilities. Results from the questionnaire used in the present study corroborated the findings of previous studies examining linguistic knowledge of education professionals and indicate that SLPs' phonological, morphological, and orthographic knowledge is more than that of REs and SEs. Further, the present study found that there were no significant differences among REs and SEs phonological, morphological, and orthographic knowledge. Also similar to previous research (e.g., Spencer et al., 2008) the present finding that although SLPs did perform better on phonological knowledge tasks, than both teacher groups, none of the groups performed above 80% on any of the subtests suggesting below benchmark levels of knowledge to ground their instruction of students' development of phonological knowledge. For example, SLPs' score of 79.2% on the phonology subtest in the present study is similar to Spencer et al.'s (2008) score of SLP's phonemic awareness. In their study, Spencer et al. noted that SLPs' score of 79.44% did not indicate an *expert* level of phonological knowledge. Therefore, it can be concluded that, overall, the participants in the present study demonstrated below-average phonological, morphologic, and orthographic knowledge.

Within the research question regarding differences among SLP's, RE's, and SE's phonological, morphologic, and orthographic knowledge, several sub questions aimed to (a) identify which specific items for the three knowledge types best differentiated the three groups (b) identify which specific items for the three knowledge types were the most similar across all three groups, (c) determine if there were differences across the

three knowledge types, and (d) understand how academic preparation related to phonological, morphological, and linguistic knowledge.

B.1. Phonology

Previous studies that have examined education professionals' phonological knowledge noted that counting phonemes is typically a challenging task (e.g., Bos et al., 2001; Mather et al., 2001; Moats, 1994). The present study confirmed this finding as SLPs scored twice (83.30%) as high as REs and SEs, while REs and SEs scored within 1% of each other (45.9% and 44.03%, respectively). One reason for respondents' poor performance with counting phonemes, in this study and in previous research that have examined phonological knowledge, is that it is a more complex level task that requires an individual to segment the individual sounds within a written word, rather than by analyzing letters in a word.

The other task in the present study that differentiated SLPs from REs and SEs was another phoneme manipulation task in which respondents were given target sounds and were required to identify which words contained the target sound. This matching phoneme task was based on Moats's (1994) questionnaire that examined education professionals' linguistic knowledge. Similar to the participants in Moats's study, the respondents in the present study, particularly REs and SEs, struggled with this task (32.80% and 29.62%, respectively). Although SLPs performed over twice as well (70.23%) as REs and SEs, they scored 13% lower on the matching phonemes task than they did on the counting phonemes task. The only task in the phonology subtest in which all three respondents scored similarly was the counting syllables task. Previous studies

examining education professionals' phonological knowledge have indicated that counting syllables is generally the strongest phonological skill among all groups (e.g., McCutchen, 2002, 2009; Moats, 1994; Puliatte & Ehri, 2017). The findings from the present study were similar to those of previous studies. SLPs, REs, and SEs scored within 9% of each other (88.49%, 88.23% and 79.84%, respectively). Respondents' higher scores on this task may be due to the fact that segmenting large units (i.e. syllables) is easier than segmenting smaller units, as can be evidenced in young children's early phonological development.

The findings from the phonology subtest indicate some moderate strengths (e.g., counting syllables for all groups and counting and matching phonemes for SLPs) and some significant weaknesses in phoneme manipulation (e.g., counting and matching phonemes for REs and SEs). No group, including SLPs, reached a score near 90% accuracy on any of the phoneme manipulation tasks, although the majority of SLPs, REs, and SEs received instruction in the area of phonology (100%, 86.66%, and 88.88%, respectively). This 12-14% difference in academic preparation between SLPs and REs and SEs, may, in part, account for REs' and SEs' poorer performance on the phoneme manipulation tasks.

However, SLPs all of whom received instruction in phonological knowledge during their academic preparation, were neither able to attain 90% or more accuracy on the counting (83.30%) nor matching phoneme (70.23%) tasks. The findings from the phonology subtests, suggest that REs and SEs, and to a lesser level, SLPs did not demonstrate the higher-level phonological skills of phoneme manipulation necessary to

perform well on the phonology subtest. This finding is troubling since phonemes are the building blocks of words and are central in learning to spell. Thus, if education professionals cannot demonstrate expert-level knowledge in these areas, they cannot be expected to provide systematic and explicit instruction their students require in order to learn how to spell.

B.2. Morphology

Previous research in the area of morphology has focused on counting morphemes (e.g. Moats, 1994), explaining morphological rules (e.g., Moats, 1994), and sorting morphologically complex words into their component parts (e.g., Washburn et al., 2011) as they relate to reading. The present study examined morphological knowledge similarly by asking respondents to sort inflected endings based on their sounds, identify morphological rules, and morphologically manipulate a word so that it fit into a target sentence. As with the studies examining phonological knowledge, previous research in the area of morphology suggests that tasks requiring more sophisticated manipulation such as the sorting and manipulating morphemes tasks in the present study are typically challenging. On the sorting task, SLPs scored 20% higher than SEs (48.13%) and over twice as high as REs (32.80%). Similarly, SLPs (71.4%) performed two to three times better than REs (36.65%) and SEs (24.05%) when asked to explain morphological rules such as how a word's part of speech changes based on its inflected ending.

Although SLPs scored higher than REs and SEs on the sorting and morphological rules tasks, SLPs' average score of 70% on both tasks, is still quite low. This may be due to a smaller percentage of SLPs (67.85%) reporting they had academic preparation in

morphology as it relates to spelling instruction in comparison to their academic preparation in phonology (100%). An even smaller percentage of REs (30%) and SEs (11.12%) reported receiving instruction in morphological knowledge as it related to spelling development, potentially accounting for these lower scores. This smaller percentage of academic preparation by REs and SEs in morphology is not surprising as recent research (e.g., Henbest et al., 2019) has shown that teachers' morphological knowledge can benefit from instruction facilitated by a SLP. Although academic preparation in morphology is standard practice in a speech-language pathology curriculum, its application to spelling was clearly not addressed in the academic programs of the SLPs' surveyed as the results of the morphological tasks indicate.

The only task in the morphology subtest in which SLPs scored lower than REs and SEs was the morpheme manipulation task. However, this may be due to their misinterpretation of the question. The question instructed respondents to "change the word so that it fits into the sentence." Upon review of individual responses, it was noted that a number of respondents answered the question by providing a novel word (that would be semantically correct), rather than manipulating the target word morphologically. For example, respondents replaced *weary* with *energy level* so that the sentence was, "the doctor asked him to rate his *energy level* on a scale from 1 to 5.

B.3. Orthography

Although phonology is the most widely researched linguistic aspect in the area of the educator's knowledge of language related to reading, orthography is the least explored. Thus, the orthography subtest was distinct from the phonology and morphology

subtests in that a greater percentage of questions were designed by the author rather than incorporating questions used in previous studies.

Of the studies that have explored educators' orthographic knowledge, their knowledge of orthographic features such as digraphs and consonant blends has been the most frequently assessed (e.g., Bos et al., 2001; Mather et al., 2001; Moats, 1994). The findings from the present study corroborated previous research that indicates that the education professionals surveyed demonstrated little knowledge of orthographic features. For example, Bos et al. (2001) noted that less than 66% of their respondents could define orthographic structures. Similarly, in the present study, less than half of SLPs (42.83%), REs (32.20%), and SEs (22.20%) correctly identified consonant blends and digraphs.

In the orthographic representation tasks, SLPs scored twice as high (63.10%) on the consonant items as REs (33.33%) and SEs (22.20%). However, on the long vowel task, SLPs scored similarly to REs and SEs, with REs demonstrating slightly more knowledge (5%) than SLPs. SLPs may have scored slightly lower than REs on the vowel items because REs spend more time on phonics instruction than do SLPs, as SLPs do not typically address orthography in their intervention services (Fallon & Katz, 2011).

Orthographic knowledge was the lowest scoring area for all three groups of professionals. Orthography was the language aspect in which respondents reported receiving the least amount of academic preparation. Less than a quarter of SLPs (25%), REs (16.67%), and SEs (14.81%) reported that they received instruction on the structure of English orthography. Understanding how oral language is presented orthographically is a foundational skill for spelling. Yet, orthographic knowledge has received the least

amount of attention both in research as well as in the academic preparation of SLPs, REs, and SEs. All education professionals' scores in this subtest were extremely low and would not be considered "passing" on a student examination at the university level. All groups would have earned a grade of F on the orthography subtest on a traditional, ten-point grading scale.

Overall, REs' and SEs' scores on all three subtests would not be considered passing. Although SLPs' phonological and morphological scores were passing, their scores were still well below what is considered *expert* level knowledge (Spencer et al., 2008). Phonology was the highest scoring area for all three groups, followed by morphology, and then orthography. Academic preparation in these three areas followed a similar downward trajectory, suggesting that lack of academic preparation contributed to respondents' poor performance. The results of the present study corroborate a series of studies spanning over 25 years that education professionals' phonological, morphological and particularly, orthographic knowledge is limited.

C. Instructional Practices

The third research question focused on the instructional practices for spelling of SLPs, REs, and SEs. The instructional practices included were the source of spelling words, the presence or absence of spelling words based on orthographic patterns, the frequency of spelling assessments, whether alternative methods of spelling assessment were utilized and how the groups of professionals responded to students' misspellings. Previous research indicates that teachers' spelling words are typically designated from a district curriculum (i.e., a published series) or from thematic units or content areas (i.e.,

teacher-created lists). For example, Johnston (2001) reported that half of her respondents utilized published spelling series and the other half created their own lists based on the academic content students were learning.

Similarly, approximately half of the REs in the present study reported using grade-level lists (56.67%) and thematic units (46.67%) as the sources of their spelling words. Unlike Johnston's findings, less than one-third (32.14%) of REs reported using a district curriculum for their spelling words. This decrease in district implementation of a spelling curriculum may be due to diminished focus on writing instruction as evidenced by increased government funding of specific reading programs in contrast to integrated spelling and writing instruction (Joshi et al., 2008). This is problematic as writing disorders occur at an almost equal rate as do reading disorders (Costa, Edwards, & Hooper, 2016). SLPs and SEs reported lower percentages for district curriculums (32.14% and 37.04%), thematic units (21.43% and 37.04%), and grade-level lists (32.14% and 25.93%), with more SLPs (60.71%) and SEs (37.04%) reporting that they did not know the source of spelling words than REs (20%). This is likely due to SEs, and particularly SLPs, not typically administering spelling tests; therefore, they may not know how the spelling words are determined.

Another component of instructional practices examined in the present study was how often spelling words were based on orthographic patterns. Across all three groups, very few SLPs (7.14%), REs (16.67%), and SEs (7.14%) reported *always* basing their spelling words on orthographic patterns. This finding is lower than Puliatte and Ehri's (2017) findings of a moderate level of teachers reported using spelling words based on

orthographic patterns. The teachers in the Puliatte and Ehri's study had reportedly low levels of linguistic knowledge, similar to the findings of the present study, so their knowledge did not influence their decision to choose words based on orthographic patterns. However, the origin of their spelling words is unknown. They may have been derived from a curriculum that utilized orthographic patterns, which resulted in their higher frequency. Overall, the findings from the present study are consistent with previous literature that spelling words are typically not based on orthographic patterns (e.g., Fresch, 2003; Johnston, 2001).

The present study also questioned SLPs, REs, and SEs about how they responded to students' misspellings. Previous research that has examined how teachers respond to misspellings (e.g., Johnston, 2001) showed that re-writing a misspelled word multiple times was one such method (29%). No other responses were included in the Johnston study, so it is unclear what other strategies the teachers used to address these misspellings. In the present study, the most common way to respond to a student error by SLPs (78.57%), REs (80.00%), and SEs (95.29%) was sounding a word out. This is an appropriate, phonologically based strategy. However, this is successful only for words that are more transparent, with a direct sound-letter correspondence. This is not the case for all English words, particularly as children progress through elementary school.

The ideal method of correction of misspellings is to either teach a child the correct orthographic pattern or help them make connections to previously learned patterns. However, less than half of the SLPs (39.29%), REs (40.00%), and SEs (29.63%) reported teaching students an orthographic pattern in response to an error or helping the child

make connections to a previously learned pattern (32.14%, 30.00%, and 29.63%, respectively). Conversely, nearly two-thirds of the SLPs (64.29%), REs (76.67%), and SEs (37.04%) reported that they directly provided the student with the correct spelling when correcting errors. This contrast in error response type demonstrates how ill-prepared education professionals are to address spelling in their instructional practice. By providing the correct spelling rather than creating an opportunity for students to learn about English orthography, education professionals are essentially discounting the role language plays in spelling.

The final area examined under the topic of instructional practices was assessment of spelling. The present study examined the frequency of formal spelling assessment as well as frequency of alternative methods of assessment such as comprehensive spelling inventories and writing samples. As with previous research (e.g., Fresch, 2003), the majority (76.67%) of REs in this study gave students a weekly spelling test. SLPs and SEs reported doing so less frequently (17.86% and 3.33%, respectively). However, all SLPs, REs, and SEs reported similar amounts of alternative methods of assessing spelling including comprehensive spelling inventories (28.57%, 30.00%, and 22.22%, respectively), word study activities (25%, 46.67%, and 37.04%, respectively), and writing samples (71.43%, 73.33%, and 74.07%, respectively). Although it is promising that all groups used writing samples at relatively high rates, the two other alternative methods based on orthographic patterns and features are fairly low in their usage. The findings that SLPs' assessment practices, as well as their methods of responding to student errors, and a decrease in their use of orthographic patterns are not very different

than those of REs and SEs is noteworthy. Despite having significantly greater knowledge across three language aspects that play an important role in spelling development and instruction, the methods in which SLPs approach spelling is not influenced by their knowledge of language.

<div align="center">

D. Interprofessional Collaboration

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The final research question aimed to determine if SLPs collaborated more than REs and SEs. The results from this study indicated that SLPs participate in interprofessional collaboration at a significantly higher rate than do REs and SEs. No differences were found between the interprofessional collaboration practices of REs and SEs. Previous research has not compared the collaboration levels of SLPs, REs, and SEs so there is no data with which to compare the present findings. However, previous research (e.g., Beck & Dennis, 1997; Paramboukas et al., 1998; Pfeiffer et al., 2019) does suggest that interprofessional collaboration does not occur frequently in the public-school setting. Although SLPs in the present study did report a higher rate of collaboration than REs (M=2.30), and SEs (M=2.64), their average score (M=3.19) was within the average range, as interprofessional collaboration was rated on a 1-5 Likert scale with a 3 indicating collaboration "about half of the time." This is a positive finding in that the 2018 ASHA Schools Survey indicates that SLPs reported spending two hours per week on collaboration. However, it is not possible to ascertain in what ways SLPs are actually collaborating as the questionnaire in the present study did not ask SLPs to report what type of collaboration they engaged in such as co-teaching, inclusion-based lessons, lesson planning, or consultative services.

Although SLPs reported moderate levels of collaboration with REs and SEs, it is surprising that REs and SEs, on average, reported collaborating with other professionals only "some of the time." This finding is more surprising when reviewing how similarly SLPs (57.15%), REs (50%), and SEs (55.56%) positively rated their perceptions of preparedness to collaborate based on their educational experiences. This disconnect between perceptions of preparedness and actual level of education may be due to institutional mechanisms such as time to collaborate and extremely structured curricula that inhibit REs' and SEs' autonomy (Vangrieken, Grosemans, & Kyndt, 2017), thereby decreasing the likelihood of seeking out collaborative opportunities when compared with those of SLPs. However, the present questionnaire did not ask respondents about the barriers (e.g., time or resources) they have experienced that impeded their collaborative opportunities.

E. Educational Implications

E.1. Academic Preparation of Education Professionals

The preparation of education professionals is a complex issue, particularly for elementary-school REs and SEs as they are required to have a high degree of knowledge across a broad curriculum that addresses reading, writing, math, science, and social studies for children in kindergarten through fifth grade. Similarly, SLPs are required to demonstrate high levels of knowledge for speech and language development across the lifespan in both children and adults. All three groups of education professionals are required to gain this knowledge in a relatively short period of time (e.g., 4-6 years) during

their college education where they have other academic requirements to fulfill outside of their major (e.g., general education requirements such as art history).

The findings that education professionals have below expert level linguistic knowledge from the present study clearly corroborate a body of research spanning over 20 years; however, one must ask the question: Why has nothing changed? One reason is that SLPs, REs, and SEs are not receiving the education and preparation they need to provide explicit and systematic spelling and reading instruction with their students. This is true. To become an elementary-school regular or special education teacher in North Carolina, Teacher Candidates must have at least a bachelors' degree in education from a state accredited teacher-education program. Elementary Teacher Candidates have to be experts across multiple disciplines (e.g., science and math) while also addressing literacy. Therefore, REs and SEs are not provided the opportunities to develop higher-level knowledge of the linguistic aspects of spelling and reading development. Although SLPs are speech and language specialists and, by virtue of their profession have more linguistic knowledge than REs and SEs, they are also required to have broad knowledge of language development and spoken language interventions as well as physiological aspects of the speech and hearing mechanisms.

All professional education preparation programs should apply evidence-based research at the forefront of their instruction and address the language aspects measured in the present study. In the best of all words, Teacher Education and Communication Sciences and Disorders programs should also require that students complete at least one course in which students from each profession engage in interdisciplinary collaborative

learning during their undergraduate and/or graduate training. This course should focus on linguistic instruction and detail the roles and responsibilities of SLPs, REs, and SEs in delivering special education services for school-age students. Unfortunately, many Regular Education Teacher Candidates never see an Individualized Education Program before graduating. However, the rigid degree requirements in SLP, RE, and SE programs make this endeavor unlikely to ever occur.

In recent years, the state of North Carolina has made a more concerted effort to ensure that RE and SE teacher-candidates' linguistic knowledge is of an appropriate standard through the Pearson Reading Foundations Exam. This exam focuses on many of the same language areas measures in the present study such as phonology, morphology, and to a lesser degree, orthography. However, since teacher candidates have a very condensed academic curriculum, the focus of instruction may be on acquiring skills necessary to pass the exam, rather than gaining a deep understanding of how these skills are necessary for effective literacy instruction.

The development of reading and spelling may be addressed more extensively in CSD programs, but as with REs and SEs, there is less focus on orthographic knowledge. Students in CSD language development courses are taught the five domains of language including: phonology, morphology, syntax, semantics, and pragmatics (Owens, 2016). Orthography, is not included as a foundational aspect of language development, this perhaps may be due to a focus on spoken more than written language within SLP interventions in school-based setting. As seen in the present study, all three groups received the least amount of academic preparation in the area of orthography. This

information paired with all three groups' extremely low scores on the orthography subtest, indicates a need for this language aspect to be more rigorously addressed in professional preparation programs and considered a sixth domain of language (Apel, 2016).

E.2. K-5 Reading Curriculum Delivery

To fault shortcomings in the academic preparation of educators is only one factor contributing to the lack of progress in improving literacy skills of school-age children. It is necessary to consider the environment in which RE professionals practice. REs' instructional practices are based primarily on the curriculum their district or state requires, which is often not language-based. Many literacy curricula across the country encompass a Whole Language or Balanced Literacy approach (Fofaria, 2019). These approaches are often not supported by systematic, scientifically-based research. Whole Language as well as Balanced Literacy approaches do not systematically teach decoding skills by focusing on the aspects of language that contribute most to literacy development (Fofaria, 2019).

Research in literacy instruction supports a phonics language-based approach focused on teaching sound letter correspondence (Chard & Dickson, 1999; Kim et al., 2013; Majsterek & Ellenwood, 1995; Stahl & Murray, 1994), knowledge of word parts (e.g., morphemes; Carlisle et al., 2001; Quick & Erickson, 2018) and orthography (Cassar & Treiman, 1997; Wagovich et al., 2012), among other factors (e.g., receptive vocabulary knowledge). By focusing on these components, all students, even ones with limited early literacy experiences will learn to read.

Mississippi, a state with large numbers of at-risk children, has recently adopted a phonics language-based approach with positive results. According to the 2019 NAEP report, although most of the students in the US either stayed the same or declined in progress, Mississippi was the only state in the country to note that its students displayed progress on fourth grade reading scores (Skinner, 2019). Historically, Mississippi's students have performed well below the nation's average on reading test scores. A large part of this progress can be attributed to the state of Mississippi adopting a language-based approach to teaching reading and spelling. Teachers in Mississippi were trained to implement a program created by Moats and Tolman (2009), the *Language Essentials for Teaching Reading and Spelling* (LETRS). The LETRS program focuses on phonological awareness, phonics, fluency, vocabulary, comprehension, and language (Voyager Sopris Learning, 2020). In short, it is a language-based program focusing on many of the same language aspects on which the teachers in the present study were assessed.

In North Carolina, where the respondents from the present study work, reading scores have stayed relatively the same across several years. Although North Carolina is not one of the lowest performing states in the country, $150 million have been invested into reading programs that have not yielded any growth (Fofaria, 2019). In contrast to the LETRS program used in Mississippi, these reading programs have emphasized strategies to cue students to read words by utilizing semantic, syntactic, and visual information (rather than utilizing phonological, morphological, and orthographic knowledge) with disappointing results. For example, in 2012 when a new reading law was enacted in NC, slightly over half (60.2%) of third-grade students had passed the end-of-year reading test.

Six years later, in 2018, this number was relatively unchanged (55.9%). For students to begin making growth in reading, it is necessary that policymakers at the state level agree about how to teach reading, how to prepare teachers to teach reading and what should be included in a reading curriculum. Because of the reciprocal nature of reading and spelling (Ehri, 2000), it can be expected that progress in spelling instruction will lead to progress in reading. Thus, a reading program that includes spelling instruction such as the LETRs program, delivered by REs and SEs trained in *all* aspects of language will facilitate students' acquisition of reading skills vital for academic progress.

E.3. Interprofessional Collaboration

Another instructional practice, collaboration, has also been researched extensively for over 20 years (e.g., Ellis et al., 1995; Giess & Serianni, 2018; Throneburg et al., 2000). However, data from national surveys (e.g., ASHA, 2016b) suggest that it is largely not implemented. Again, this too, on the surface level, can be attributed to academic programs not teaching and modeling collaboration for pre-service professional educators and related services personnel such as SLPs. However, institutional mechanisms (e.g., legislation) also impact how much time education professionals have to collaborate given their work responsibilities and time to fulfill those duties during a school day. In 2016, a study by the U.S. Government Accountability Office (GAO) found that up to 35% of a SLPs time is spent on administrative duties such as paperwork, rather than in delivering direct student services (U.S. Government Accountability Office, 2016). Further, according to ASHA (2020), a general theme across multiple school-based surveys is that paperwork is a significant concern among professionals and administrators.

The GAO provided model pilot programs that utilized alternative (i.e., reduced) paperwork models which included options such as having multi-year rather than annual IEPs, with of course, the option to meet sooner based on the child's needs, templates for required documentation (including reduced requirements within the IEP document) and options for parents to attend IEP meetings via alternative methods such as conference or video calls. However, the GAO report indicated that very few states applied to use these models and that document templates were often modified citing that the time saved through these recommendations would be negligible.

Although states reported that these modifications would result in negligible amounts of time saved, this may not be true. In accordance with the Individuals with Disabilities Education Act (IDEA), SLPs and SEs are responsible for case-managing students' IEPs. This includes ensuring that all relevant and required documents are up to date in student files, initiating and leading IEP meetings and monitoring IEP progress within the specialized education setting as well as in the regular education classroom. These responsibilities often require additional amounts of paperwork. Reducing the amount of paperwork requirements could potentially free up time for more opportunities to collaborate as the majority of elementary school-based SLPs reported large amounts of paperwork (81.90%), high caseloads (73.6%) and limited time for collaboration (55.90%) (ASHA, 2018). IDEA only outlines the components of a free and appropriate public education; the details of implementation are determined by the states. Consequently, state government agencies must consider adopting methods that streamline the special education process so SLPs and SEs can spend more time in direct student contact and

consulting and collaborating with other professionals to more efficiently meet students'
academic and literacy development needs.

The educational implications of the present study are multifaceted. Academic
preparation of education professionals in the area of linguistic knowledge has been a
longstanding topic of discussion. Simply providing additional instruction alone, in an
already dense curriculum, will not improve literacy practices in the classroom. The
results of the present study affirm that undergraduate and graduate students seeking to
become REs and SEs must acquire the knowledge and skills necessary to provide
systematic and explicit literacy instruction that highlights phonologic, morphological and
orthographic aspects of language. Further, States should adopt streamlined approaches
their special education process to increase time for SLPs and SEs to collaborate with
other education professionals in order to ensure appropriate and knowledgeable supports
for special education students in regular and special education classrooms.

F. Limitations of the Study

The present study presents several limitations. Although the results from the
present study corroborate previous research findings, the generalizability of the results
are limited to SLPs, REs, and SEs working in North Carolina. Furthermore, it is unknown
where within the state the participants live and practice. North Carolina is a diverse state
with both rural, urban, and suburban cities. This geographic diversity is important as
there are documented differences between urban and rural school districts (e.g., Ab
Dollah & Shah, 2016; McCracken & Barcinas, 1991) with respect to finances, resources
and opportunities for students and faculty.

Another limitation was that the present study only aimed to understand how important SLPs, REs, and SEs rated phonemic awareness and visual memory regarding spelling development. The purpose of focusing on these two aspects was to contrast the visual and linguistic views of spelling development from one another. However, to fully understand how these education professionals viewed the linguistic approach, items addressing the importance of morphological and orthographic knowledge should have also been included in the questionnaire.

A final limitation was the length of the questionnaire. There were 135 education professionals who responded to the questionnaire, but only 85 who fully completed it. On average, respondents took approximately 15 minutes to complete the questionnaire. The length of the questionnaire in terms of items and time spent may have resulted in the 63% completion rate. Fourth, the morpheme manipulation task in the morphology subtest, was not transparent to facilitate respondents' accurate understanding of the task. As previously mentioned, this was the only item in which SLPs scored much lower than REs and SEs. Moreover, as indicated in the Results section many SLPs, as well as REs and SEs (to a lesser degree), correctly changed the word semantically, rather than morphologically.

G. Directions for Future Research

It has been 20 years since Moats's (1994) seminal study examining education professionals' linguistic knowledge. There has also been a wealth of literature reviewing the collaborative practices of education professionals (e.g., Beck & Dennis, 1997; Paramboukas et al., 1998; Pfeiffer et al., 2019). Yet, the results of the present study

reveal that knowledge and practices of education professionals remain unchanged. Multiple areas of inquiry in addition to those focusing on academic curricula and policies of federal and state agencies provide opportunities for ongoing research in understanding and improving education professionals' linguistic knowledge and their instructional and collaborative practices.

Future research should address educators' perceptions of the importance of morphological and orthographic knowledge. Gaining more knowledge about how education professionals view these other components of the linguistic approach in addition to phonology is needed as the majority of the research within this area focuses on phonology. Because collaboration was an important aspect of the present study, questions should be added asking SLPs, REs, and SEs about the barriers that impeded them from collaborating (e.g., lack of time or support from administration, lack of personal or peer interest in collaboration, or increased workloads, etc.).

Future studies should also investigate ways to prepare pre-service regular and special education teachers as well as SLP students about the central role of language, specifically, phonology, morphology and orthography in spelling development. It does not appear that current practices are contributing to significant, positive change (Clark, Helfrich, & Hatch, 2017). Current syllabi should be reviewed to identify additional and alternative methods of assessment that should include putting language at the forefront of instruction through experiential learning using structured tutoring practicums as described by Spear-Swerling and Brucker (2003, 2004, 2006). Studies could also

examine the efficacy of instruction that uses hands-on activities such as practicing writing

IEPs and specific learning goals that address phonology, morphology and orthography.

Pre-service student knowledge at the university level should be examined both

short-term (e.g., at the end of the semester) as well as long term (e.g., one-year post

graduation). Assessing pre-service students' post-training spelling abilities should also be

accomplished to ensure that the knowledge they gained in their preparation are positively

influencing the students they serve. Similarly, workshops for practicing SLPs, REs, and

SEs, should follow up with participants to examine if that knowledge has been retained.

However, addressing SLPs,' REs,' and SEs,' linguistic knowledge is only part of the

issue. Instructional practices also play a critical role in how students learn. In addition to

experiential learning activities, skilled observation of how aspects of language are

addressed in instruction must occur to identify actual gaps in practice vs. reported

practices. By utilizing multiple data collection points (e.g., questionnaires, observations,

and simulations), rich information about education professionals' knowledge and

instructional practices can be collected and analyzed in order to indicate strengths and

identify areas of improvement that can be implemented in professional preparation

programs.

With the recent implementation of the Pearson Reading Foundations Assessment

for RE and SEs, which covers many of the same aspects measured in the present study, a

comparison of in-service teaching professionals' linguistic knowledge in terms of years

of experience is necessary to determine if recent efforts to improve professionals'

linguistic knowledge have been successful. Further, an investigation into how Teacher

Education and CSD Programs implement and document interdisciplinary collaboration must be completed to not only learn more about how students are learning about interprofessional collaboration, but to also create an opportunity for interdisciplinary research in interprofessional practice (IPP) and interprofessional education IPE.

The present study utilized quantitative data to investigate education professionals' views on spelling development, linguistic knowledge as well as instructional and collaborative practices. To fully understand these areas, qualitative data through interviews, focus groups, and/or written free response formats must also be obtained to understand why professionals have their specific views on spelling development as well as to understand their experiences during their academic preparation, and to understand the barriers they perceive that influence instructional and collaborative practices regarding reading and literacy instruction within the public school setting.

H. Summary and Conclusions

Spelling is a language-based skill. Good spellers require strong phonological, morphological, and orthographic skills. Research demonstrates that the best way to ensure that students are strong spellers is through systematic and explicit language instruction that addresses these aspects of language (Apel et al., 2012). However, research has also shown that education professionals frequently lack the knowledge required to implement such instruction (e.g., Bos et al., 2001; Mather et al., 2001). Moreover, research findings indicate a positive correlation between teacher's linguistic knowledge and their spelling and writing abilities (e.g., Daffern & Critten, 2019).

The present study examined education professionals' views of spelling, their linguistic knowledge as well as their instructional and collaborative practices through an online questionnaire, the SKPQ. The SKPQ consisted of questions based on previous research as well as novel questions created to address the gaps in previous literature (e.g., expanding orthographic knowledge and instructional practices). The findings from this study indicate that SLPs, REs, and SEs, do not exhibit expert level knowledge of the phonological, morphological, and orthographic aspects of the English language. Further, the findings show that spelling is still viewed as a visually-based skill and that instructional practices favor the visual view of spelling in taking precedence over the linguistic view of spelling. This study examined the collaborative practices of all three groups of education professionals. Although SLPs reported engaging in interprofessional collaboration more than do REs and SEs, the extent of the collaborative practices of SLPs was disappointing.

Previous studies have reported similar findings and have recommended that Teacher Education and Communication Sciences and Disorders programs make more concerted efforts to prepare future education professionals with knowledge of the linguistic aspects of spelling, so they understand that spelling is a language-based skill, not a visual one. They have also recommended that programs should focus on strengthening their instruction of phonology, morphology, and orthography so that education professionals possess the knowledge and skills necessary to provide systematic and explicit language instruction that are in accordance with a language-based approach to spelling. However, the evidence from the present study suggests these

recommendations have neither worked, nor have they been implemented effectively in the last 20 years. In order to implement meaningful change in the status of foundational literacy knowledge in education professionals, comprehensive reform at the federal, state/local, and university levels must be considered. The present study demonstrated the critical need for this change to occur.

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APPENDIX A

THE SPELLING KNOWLEDGE AND PRACTICES QUESTIONNAIRE

Spelling Survey

Start of Block: Consent

Q1 By clicking "YES," you are indicating consent to participate in this study. The University of North Carolina at Greensboro's Institutional Review Board has approved this study. All responses are completely anonymous; none of your responses can be identified to your name, school, or email.

○ Yes, I give my consent (1)

○ No, I do not give my consent (2)

Skip To: End of Survey If By clicking "YES," you are indicating consent to participate in this study. The University of Nor... = No, I do not give my consent
End of Block: Consent

Start of Block: Demographic Information

Q2 I am a

○ Regular education teacher (1)

○ Special education teacher (2)

○ Speech-language pathologist (3)

Q3 I work with

○ K-2 (1)

○ 3-5 (2)

○ Both (3)

Q4 I am

○ 22-29 years old (1)

○ 30-39 years old (2)

○ 40-49 years old (3)

○ Over 50 years old (4)

Q5 I have

○ 1-5 year(s) of experience (1)

○ 6-10 years of experience (2)

○ 11 or more years of experience (3)

Q6 I am multilingual

○ Yes (1)

○ No (3)

Q7 My highest level of education is

○ Bachelor's degree in Education (1)

○ Bachelor's degree – Lateral Entry (4)

○ Master's degree (2)

○ Doctoral degree (3)

○ Other: (5) _____

Q8 During the course of my college education, I received instruction in the following (check all that apply)

- ☐ phonological awareness (1)

- ☐ phonemic awareness (2)

- ☐ morphology as it relates to reading and spelling development (3)

- ☐ structure of English orthography (4)

- ☐ the relationship between reading and spelling (5)

Q9 My college education prepared me to teach spelling

- ○ Strongly Agree (1)

- ○ Agree (2)

- ○ Neither agree nor disagree (4)

- ○ Disagree (6)

- ○ Strongly disagree (7)

End of Block: Demographic Information

Start of Block: Collaborative Experiences

Q10 What is the nature of your collaboration with other education professionals? (check all that apply)

☐ Assessment (1)

☐ Instruction (2)

☐ Consultation (e.g., planning for assessment and instruction) (3)

☐ Providing resources/materials (4)

☐ Other (please explain) (5)

_____

☐ None (6)

Q11 I collaborate with the following education professionals:

	Never (1)	Sometimes (2)	About half the time (3)	Most of the time (4)	Always (5)
Regular Educator (1)	○	○	○	○	○
Special Educator (2)	○	○	○	○	○
SLP (3)	○	○	○	○	○

Q12 My college education prepared me to collaborate with other education professionals

○ Strongly agree (1)

○ Agree (2)

○ Neither agree nor disagree (4)

○ Disagree (6)

○ Strongly disagree (7)

End of Block: Collaborative Experiences

Start of Block: Practices Related to Spelling Instruction

Q13 Spelling words come from (check all that apply)

☐   district curriculum (1)

☐   thematic unit (e.g., a lesson about snowmen) (2)

☐   grade-level lists (3)

☐   I'm not sure (4)

Q14 Spelling words come from a district curriculum

○ Always (100%) (1)

○ Often (80%) (2)

○ Sometimes (60%) (3)

○ Seldom (40% or less) (4)

○ Never (0%) (5)

Q15 Spelling words come from a thematic unit (e.g., a lesson about snowmen)

○ Always (100%) (1)

○ Often (80%) (2)

○ Sometimes (60%) (3)

○ Seldom (40% or less) (4)

○ Never (0%) (5)

Q16 Spelling words come from grade-level lists

○ Always (100%) (1)

○ Often (80%) (2)

○ Sometimes (60%) (3)

○ Seldom (40% or less) (4)

○ Never (0%) (5)

Q17 Spelling words are based on sound patterns

○ Always (100%) (1)

○ Often (80%) (2)

○ Sometimes (60%) (3)

○ Seldom (40% or less) (4)

○ Never (0%) (5)

Q18 How do you measure spelling proficiency? (check all that apply)

☐ Weekly spelling test (1)

☐ Spelling test more than once a week (2)

☐ Spelling test less than once a week (e.g., every two weeks) (3)

☐ Writing samples (4)

☐ Word study activities (e.g., word sorts) (5)

☐ Comprehensive spelling inventories (6)

☐ None (7)

Q19 What do you consider a **passing** spelling grade?

○ 100% (1)

○ 90% (2)

○ 80% (3)

○ 70% (4)

○ 65% or less (5)

Q20 What are other ways, besides a spelling test, that you assess spelling proficiency? (check all that apply)

- ☐ Writing samples (1)

- ☐ Word study activities (e.g., word sorts) (2)

- ☐ Comprehensive spelling inventories (3)

- ☐ None (4)

Q21 What do you do when students spell a word incorrectly? (check all that apply)

- ☐ Cue the student to "sound it out" (1)

- ☐ Practice re-writing the word (2)

- ☐ Use the word in a sentence (3)

- ☐ Provide the correct spelling (4)

- ☐ Teach the spelling pattern (5)

- ☐ Help the student make connections to previously studied patterns (6)

- ☐ Accept the invented spelling (7)

End of Block: Practices Related to Spelling Instruction

Start of Block: Knowledge Beliefs Related to Spelling Instruction

Q22 Spelling words based on how they sound (e.g., spelling pizza as *peetza*) should be encouraged

○ Strongly Agree (1)

○ Agree (2)

○ Neither agree nor disagree (3)

○ Disagree (4)

○ Strongly disagree (5)

Q23 Phoneme awareness is a crucial skill for learning how to spell

○ Strongly Agree (1)

○ Agree (2)

○ Neither agree nor disagree (3)

○ Disagree (4)

○ Strongly disagree (5)

Q24 Visual memory is important for accurate spelling

○ Strongly Agree (1)

○ Agree (2)

○ Neither agree nor disagree (3)

○ Disagree (4)

○ Strongly disagree (5)

Q25 Knowing what a word means is important for spelling

○ Strongly Agree (1)

○ Agree (2)

○ Neither agree nor disagree (3)

○ Disagree (4)

○ Strongly disagree (5)

Q26 Knowing how to read a word is important for spelling a word

○ Strongly Agree (1)

○ Agree (2)

○ Neither agree nor disagree (3)

○ Disagree (4)

○ Strongly disagree (5)

End of Block: Knowledge Beliefs Related to Spelling Instruction

Start of Block: Phonology

Q27 A phoneme refers to:

○ A single letter (1)

○ A single speech sound (2)

○ A single unit of meaning (3)

○ A grapheme (4)

Q28 How many speech sounds are in the following words?

	2 (1)	3 (2)	4 (3)	5 (4)
Thrill (1)	○	○	○	○
Does (2)	○	○	○	○
Sawed (3)	○	○	○	○
Ring (4)	○	○	○	○
Fix (5)	○	○	○	○
Quack (6)	○	○	○	○
Shook (7)	○	○	○	○
Shrimp (8)	○	○	○	○
Know (9)	○	○	○	○

Q29 How many syllables are in the following words?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
Lightening (1)	○	○	○	○	○
Spoil (2)	○	○	○	○	○
Walked (3)	○	○	○	○	○
Capital (4)	○	○	○	○	○
Decidedly (5)	○	○	○	○	○
Recreational (6)	○	○	○	○	○
Shirt (7)	○	○	○	○	○
Banana (8)	○	○	○	○	○
Lawyer (9)	○	○	○	○	○

Q30 Choose the word or words that have the same sound as the sound in parentheses in the first word

Push (u) (1)	☐ although (1)	☐ duty (2)	☐ pump (3)	☐ took (4)
Weigh (eigh) (2)	☐ pie (1)	☐ height (2)	☐ raid (3)	☐ friend (4)
Was (s) (3)	☐ miss (1)	☐ maze (2)	☐ votes (3)	☐ rice (4)
Intend (t) (4)	☐ this (1)	☐ whistle (2)	☐ baked (3)	☐ parliament (4)
Brush (sh) (5)	☐ wistful (1)	☐ intention (2)	☐ wash (3)	☐ closet (4)
George (G) (6)	☐ juice (1)	☐ phone (2)	☐ leisure (3)	☐ pungent (4)

End of Block: Phonology

Start of Block: Morphology

Q31 The spelling of a root word is usually affected by adding a prefix

○ True (1)

○ Neither true nor false (2)

○ False (3)

Q32 Group the following words based on how they sound:

Group 1	Group 2	Group 3
_____ spilled (1)	_____ spilled (1)	_____ spilled (1)
_____ linked (2)	_____ linked (2)	_____ linked (2)
_____ hinted (3)	_____ hinted (3)	_____ hinted (3)
_____ planted (4)	_____ planted (4)	_____ planted (4)
_____ landed (5)	_____ landed (5)	_____ landed (5)
_____ panicked (6)	_____ panicked (6)	_____ panicked (6)
_____ blocked (7)	_____ blocked (7)	_____ blocked (7)
_____ buzzed (8)	_____ buzzed (8)	_____ buzzed (8)
_____ jammed (9)	_____ jammed (9)	_____ jammed (9)

Q33 The *ly* ending in *sadly* and *unfairly* changes the base word's

○ Part of speech (1)

○ Tense (2)

○ Meaning (3)

○ Plurality (4)

Q34 Change the word so that it fits in the sentence:

Weary. The doctor asked the patient to rate his _____ on a scale from 1 to 5.

_____

End of Block: Morphology

Start of Block: Orthography

Q35 From the list of words below, identify which ones contain a consonant blend (check all that apply)

☐ Doubt (1)

☐ Known (2)

☐ First (3)

☐ Pumpkin (4)

☐ Squawk (5)

☐ Scratch (6)

Q36 From the list of words below, identify which ones contain a consonant digraph (check all that apply)

- ☐ Wholesale (1)

- ☐ Psychic (2)

- ☐ Doubt (3)

- ☐ Wrap (4)

- ☐ Daughter (5)

- ☐ Think (6)

Q37 A _____ is two combined letters that represent one single speech sound

- ○ schwa (1)

- ○ consonant blend (2)

- ○ phonetic (3)

- ○ digraph (4)

- ○ diphthong (5)

Q38 Which word below does **not** have the short u sound

- ○ put (1)

- ○ hook (2)

- ○ use (3)

- ○ pudding (4)

- ○ rural (5)

Q39 Which word below does **not** have the /s/ sound?

○ hearts (1)

○ slips (2)

○ piece (3)

○ boys (4)

○ circle (5)

Q40 Here are two ways to spell the /f/ sound: **f**unny and lau**gh**. What is a third way? (if you do not know, type in n/a).

_____

Q41 Here are two ways to spell the /sh/ sound: **sh**ell and **s**ugar. What is a third way? (if you do not know, type in n/a)

_____

Q42 Which is not a way that English spells the "long u" sound?

○ eu (1)

○ ew (2)

○ ui (3)

○ ue (4)

○ u (5)

Q43 Which is not a way that English spells the "long a" sound?

○ ai (1)

○ ay (2)

○ ia (4)

○ a (6)

○ ei (7)

Q44 Which is not a way that English spells the "long e" sound?

○ ee (1)

○ ei (2)

○ ea (3)

○ ie (4)

○ eu (5)

End of Block: Orthography