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TEACHER ORTHOGRAPHIC KNOWLEDGE

A Dissertation Presented to the faculty of

Bellarmine University

in Partial fulfillment of the degree

Doctor of Philosophy Education and Social Change

by

Mary Leslie

Louisville, Kentucky

March 31, 2026

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Abstract

When reading is no longer taught as a separate subject, adolescent students with weak reading skills have limited opportunities to catch up to their peers and are unlikely to improve without targeted support (Wigfield et al., 2008). This descriptive case study intended to increase teacher knowledge by presenting a professional development intervention focused on orthographic knowledge using effective professional development components. This study was conducted with six teachers of adolescent students (4^{th}-8^{th}) from a private preparatory school. Analysis found that teachers increased their understanding of the role orthography plays in the reading process and increased their ability to identify features associated with orthography. Analysis further revealed classroom practices were influenced through the analysis of orthographic assessments where teachers discovered the needs and strengths of the students. Tailored instruction was then based on the new knowledge instead of perceived understanding. Analysis also noted coaching and expert support, content focus, and active learning as influential elements leading to change in classroom practices. Collectively, these outcomes demonstrate the potential of targeted, conceptually grounded professional development to enhance teachers' orthographic knowledge and inform more responsive literacy instruction for adolescent readers.

Keywords: orthography, teacher knowledge, effective professional development elements, adolescent readers

Problem Statement

Middle school marks a significant change in the educational landscape for the adolescent reader. The change in schools, learning environments, and social comparisons can affect all students but particularly the struggling adolescent reader (Midgley et al., 1995). Adolescent students are becoming more aware of the perceptions of others as it relates to their own academic ability. Readers who view themselves as less competent than peers are becoming painfully aware of the difference between effort that is given and ability to produce results (O'Brien et al., 2022). In 2008, Wigfield et al., noted students who have inadequate reading skills have fewer opportunities to catch up with their peers when reading is no longer taught as a separate subject. Students who enter middle school with low self-efficacy for reading will potentially have great difficulty improving reading skills without targeted instruction.

During middle school years, many classes are content driven (Swanson et al., 2016). Students are expected to be able to decode multisyllabic words, use Greek and Latin roots, read a text fluently, and comprehend critically all while navigating through increasingly complex texts and text structures. The type of reading encountered in content areas during middle school brings about a new set of challenges. Content related text features are frequently helpful for skilled readers but may be problematic for struggling readers who are still trying to just decode the text (Lee & Spratley, 2010).

According to the National Center for Educational Statistics (2022), students scoring at the proficient level have demonstrated competency over challenging subject matter including the ability to apply said knowledge to real world situations. This skill set would also include appropriate analytical skills associated with the subject matter. Students scoring at the basic level are considered to have only partial mastery of the prerequisite knowledge and skills that are

fundamental for performance at the proficient level (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2024). The National Assessment of Educational Progress (NAEP) reports that 31% of fourth grade and 30% of eighth grade students score at or above proficient (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2024). This indicates that about two-thirds of the tested intermediate and middle school students do not have adequate reading comprehension abilities to access the content presented. If a student is expected to be able to read to successfully learn content, then students who cannot read are at a disadvantage.

Students who fail to master reading cannot understand textbooks or read for enjoyment. al.,2019). Students not engaged in learning tend to become disenfranchised as the reading level and course load rises. According to O'Brien et al., (2022) "We cannot allow students to think that some people have the ability to read, and others do not. As teachers, our goal is to recognize and mitigate these beliefs and behaviors" (p.44). Teachers can play a crucial role in helping students learn. Effective teachers with good content and pedagogical skills can deliver high-quality classroom instruction which can help students overcome barriers to literacy achievement (Denton et al., 2003, Fahle & Reardon, 2018). Teacher knowledge is a crucial part of developing strong readers in the classroom today.

Hudson (2022) surmised the less knowledgeable teacher possibly provides inaccurate content examples and is less able to respond correctly to student errors during instruction. The role of effective instruction is crucial. Studies comparing the level of early literacy skill self-reported by primary and preservice teachers noted discrepancies in that the actual level of teacher knowledge. Participants' perceived knowledge was below their actual assessed knowledge indicating that they had overestimated their knowledge (Cunningham et al., 2004; Meeks &

Kemp, 2017). Teachers need to have the knowledge to effectively educate students. Ineffective classroom instruction at the early primary grades could be a contributing factor to high incidences of reading concerns (Bos et al., 2001). Spear-Swerling and Brucker (2004), attributed poor classroom instruction to the lack of teacher's basic understanding of concepts related to the English language that are necessary to teach reading skills. Cunningham et al., (2004) created an assessment to measure the actual knowledge teachers had and the perceived participant knowledge of reading-related concepts among kindergarten through third grade teachers. This study was conducted in a large urban school in northern California from 48 elementary schools using 722 kindergarten through third grade teachers (Cunningham et al.,2004). The results of the knowledge assessment showed that the teachers assessed knew very little about children's literature, phonemic awareness, and phonics but overestimated their knowledge of reading and were unaware of what they do and do not know (Cunningham et al., 2004).

During a study on the etiology of teacher knowledge and the factors that influenced the implementation of evidence-based interventions for upper elementary students, Wijekumar et al., (2019) found that low teacher knowledge was connected to low student knowledge. Wijekumar et al., (2019) reported discrepancies in the teacher's perceived understanding of text structures and their actual ability to report text structures accurately. Beerwinkle et al., (2018) pointed out that teachers may not be able to adequately model necessary skills due to lack of knowledge. Anderson et al., (1985) reported research indicates that teaching quality significantly impacts the learning quality of students. If teacher quality plays a critical role in student learning and teacher knowledge informs teacher quality student performance is hinged on high quality instruction from well-qualified teachers. This study aims to make meaningful contributions to the current

field by focusing on intermediate and middle school teacher orthographic knowledge to shape teacher practice in the classroom of adolescent students.

Purpose of Study

Myhill and Newman, (2016) noted when teachers have limited opportunities for professional development that builds substantial content and pedagogical knowledge, teachers will in turn lack expertise needed to facilitate logical and supportive lessons that generate increasingly sophisticated understandings for students. Mantei and Kervin, (2020) noted that without support to build considerable expertise in content and pedagogy, teacher knowledge and teaching skills are limited. A lack of opportunities for substantial and focused professional development could leave teachers unprepared to adequately help students sort through confusions and extend content related knowledge. This study intends to increase middle school and intermediate teacher understanding of orthographic knowledge through participation in prolonged active professional development with the goal of supporting improved classroom practice and orthographic understanding. This study centered on the following research questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?
2. In what ways does participation influence these teachers' classroom practice?
3. What aspect of this professional development influences changes in practice for these teacher participants?

Significance of Study

The findings of this study will add to the current body of literature in adolescent reading, teachers' orthographic knowledge, and effective professional development through active learning. At the level of classroom practice, this study seeks to expand the orthographic knowledge of teachers of adolescent readers in multiple content areas. Finally, evidence from this study will provide insight into aspects of professional development that influence teacher practice and orthographic instruction for adolescent readers.

Summary of Conceptual Framework

This study focuses on two main components. One component reflects orthographic knowledge as essential to the reading process, the other component focuses on the way teacher knowledge can be expanded. The first component addresses the role of orthography in relevant reading theories such as the Simple View of Reading (Gough & Tunmer, 1986), Cognitive Foundations Framework (Tunmer & Hoover, 2019), Reading Rope (Scarborough, 2001), and the Verbal Efficiency Theory (Perfetti, 1985). The second entails components of effective professional development (Darling-Hammond, et al., 2017; Desimone, 2011). These components are combined to establish the knowledge and the means for this study.

This study is designed to present orthography as an essential component of reading (Share, 1995; Ehri, 2014; Conrad & Deacon, 2022) in a professional learning format for teachers of adolescent readers. Using key features of effective professional development (Darling-Hammond et al., 2017), participants will engage in an embedded workshop designed to develop their knowledge of orthography and its role in the reading processes of adolescent students. Collaborative work activities and experiences will be planned, implemented, and analyzed among the participants. The design of this professional development is aligned with the

understanding that teachers with deeper understanding of content knowledge, pedagogical knowledge, and specialized knowledge appear to make the most difference in students' reading outcomes (Piasta et al., 2009).

Limitations

This study has a few limitations. One such limitation is the relatively small sample size. This qualitative study will have a small number of teachers selected by convenience sampling. Smaller sample sizes can limit the ability to extrapolate data for generalization. Data will be presented as a descriptive case study. Like most case studies, data gathered for this case is not intended to be generalizable to a larger population. Another limitation with this study is the complexity of reading. This study focuses on orthographic knowledge, which is an aspect of reading development. Orthography alone will not guarantee reading success (Ganske & Heller, 2022). During the research, there will be a chance of attrition. Because current classroom teachers will be used in this study, participants may not complete the entire study. Reported changes in practice or implementation will be based on teacher self-reporting Classroom observations have not been included in this study.. This study does not include a follow up component to document fidelity of implementation.

Definition of Terms

This study is centered on building the orthographic knowledge of teachers of adolescent readers. Teachers will be exposed to intricate aspects of the reading process. The intent is to deepen the understanding of current teacher knowledge leading to changes in practice that will impact adolescent readers. The following definitions have been presented to establish a common understanding of terms for this study's purposes.

Adolescent struggling reader: Adolescence is the phase of life between childhood and adulthood, from ages 10 to 19 (World Health Organization: WHO, 2019). An adolescent struggling reader is one who counts on others to give them meaning from the text they are reading (Beers, 2003). This adolescent student is unable to effectively create text meaning on their own.

Decoding: The ability to recognize printed words accurately and quickly to efficiently gain access to the appropriate word meanings contained in the internal mental lexicon. (Hoover & Tunmer, 2018)

Grapheme: A written or printed representation of a phoneme. In English, a grapheme can be a single letter or a group of letters. (Harris & Hodges, 1995)

Language comprehension: The ability to extract and construct literal and inferred meaning from linguistic discourse represented in speech (Hoover & Tunmer, 2018)

Lexical orthographic knowledge: Involves the stored mental representations of known words or word parts. (Apel et al., 2018)

Lexicon: A store of phonological word forms that are separate from but heavily connected to, semantic representations. (Nation & Cocksey, 2009)

Morphology: The study of morphemes which are the smallest unit of meaning of words (Lyster et al., 2021) including the study of the structure and forms of words including derivations, inflections, and compounding. (Harris & Hodges, 1995)

Orthography: Correct writing or correct and proper spelling. (Apel et al., 2018)

Phoneme: A minimal sound unit of speech that when contrasted with another phoneme affects the meaning of words in a language. (Harris & Hodges, 1995)

Phonemic awareness: Is the awareness of sounds that make up spoken words. Such awareness does not appear when young children learn to talk; the ability is not necessary for speaking and understanding spoken language. Phonemic awareness is important for learning to read. (Harris & Hodges, 1995)

***Phonics*:** A way of teaching reading and spelling that stresses symbol-sound relationships, used especially in beginning instruction. (Harris & Hodges, 1995)

Professional Development/ Professional Learning: Teacher development has been traditionally referred to as professional development; the term professional learning has become increasingly common. Professional development implies passive learning while professional learning is more active in nature (Labone & Long, 2016). In the case of this study professional development will be used to reflect the language used in the literature with the understanding of the alignment with active learning.

Simple View of Reading (SVR): Posits that variation in reading comprehension performance can be attributed to two component skills: decoding and linguistic comprehension (Gough & Tunmer, 1986).

Sublexical orthographic knowledge: Includes knowledge of the rules or patterns for representing a sound or affix with a letter(s) that governs where certain letter(s) can or cannot be combined with another. (Apel et al., 2018)

Verbal efficiency: States that word recognition accuracy is not sufficient to enable fluent reading comprehension (Perfetti & Lesgold,1979). Instead, word-coding skills must be increased to a high level of efficiency and automaticity for the reader to be able to devote attention to meaning and comprehension (*Glossary of Reading Terms - the Cognitive Foundations of Learning to Read: A Framework*, 2021).

Conclusion

This study aims to engage participating teachers in prolonged professional development (learning) designed to develop their knowledge of orthography and enhance classroom practice of reading instruction different across content areas. In addition to building teacher knowledge of orthography, this study hopes to empower teachers to effectively employ orthography to enhance their content curriculum. This study is intended to add meaningful contributions to the current literature on adolescent reading and teacher professional development.

Chapter 2

The act of reading can be very complex and quite simple at the same time; reading can be viewed as both cognitively trivial and so difficult that failure to read becomes commonplace (Huey, 1908). Many readers find success through purposeful efforts and targeted skills provided by dedicated teachers focusing on reading efficiency (Hoover & Tunmer, 2020). The past few decades have provided evidence that answers critical questions related to the acquisition of skilled reading, causes of reading difficulties, early indicators of risk, and evidenced-based practices (Hennessey, 2021); yet, it is not uncommon for some educators to trust that learning to read is a natural process or that struggling readers just need more time to catch up with their peers.

This study plans to implement an embedded active professional development to build teacher knowledge and skills in orthography and its role in reading, thus impacting classroom practices fostering success for struggling adolescent readers. Reading is a complex process and teachers of adolescent students have not been adequately supported to aid struggling adolescent readers (Lewis, 2009; Dilgard & Hodges, 2022). This literature review provides an overview of key knowledge in the fields of reading development with specific attention to the role of word knowledge, academic reading needs of adolescent readers, the characteristics of struggling readers, and an outline of the approaches to effective professional development of teachers. The literature reviewed in this chapter provides key background knowledge used to support the following research questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?

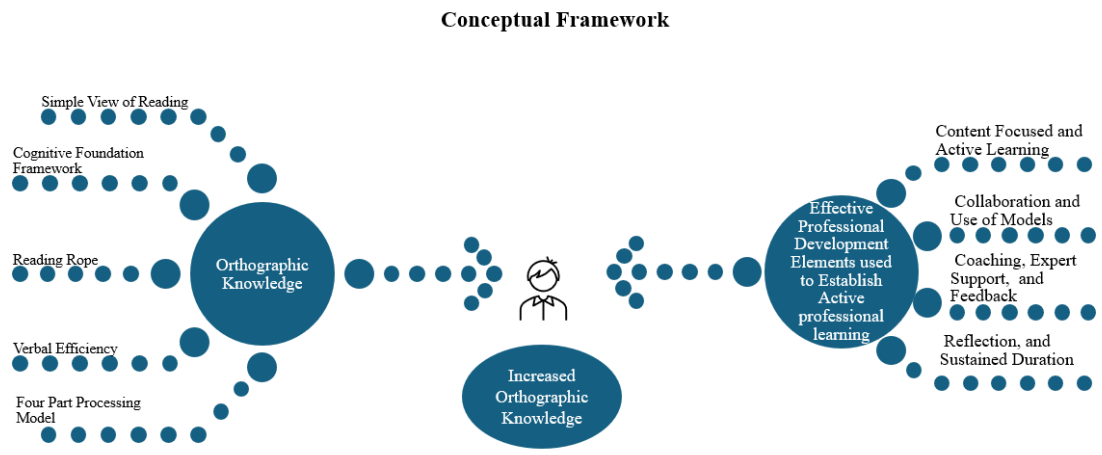
2. In what ways does participation influence these teachers' classroom practice?
3. What aspect of this professional development influences changes in practice for these teacher participants?

Conceptual Framework

The conceptual framework driving this study consists of two components. One component reflects the essential aspects of orthographic knowledge in the reading process, the other component focuses on the way teacher knowledge can be built. Orthographic knowledge, the content of the study, and the way teachers develop knowledge, the design of the study, work in conjunction with prominent theoretical model and frameworks of reading to form the conceptual framework used in this study (see Figure 1).

Figure 1

Conceptual Framework



Orthographic knowledge is the knowledge of the underlying sound (alphabetic), pattern, and meaning relationships in the English spelling system that enables children to become more

fluent readers and even writers (Carlisle, 2010; Ehri, 2000; Graham & Hebert, 2010; Moats, 2005; Snow et al., 2005). In the Simple View of Reading (Gough & Tunmer, 1986), orthographic knowledge is first noted in the decoding component of the reading equation (decoding x linguistic comprehension = reading comprehension). When viewing the Cognitive Foundations Framework (Hoover & Tunmer, 2019), aspects of orthographic knowledge is found in both language comprehension and word recognition. The decoding/word recognition strand of the Reading Rope (Scarborough, 2001) carries the orthographic load. Verbal Efficiency Theory (Perfetti, 1985) notes more cognitive resources are allocated to comprehension when word recognition (aspects of orthography) is efficient. The Four-Part Processing Model for Word Recognition is a simplified representation of the cognitive processing work in the brain associated with word decoding (Seidenberg & McClelland, 1989). When considering the holistic picture of each individual theory, they all begin with decoding and word recognition, which is a function of orthographic knowledge. The understanding gained from these four reading theories will provide common language, research based focal point and background knowledge about the foundational skills and building blocks for reading comprehension.

The other prominent aspect of the study is the delivery method of professional development. Desimone, (2011) noted teacher professional development is one of the keys to improving the quality of U.S. schools. This study will closely adhere to the recommended elements that positively influenced academic change (Darling-Hammond et al., 2017). Each session will include one or more of the noted seven elements set forth by (Darling-Hammond et al., (2017): (1) content focus, (2) active learning, (3) collaboration, (4) use of models, (5) coaching and expert support, (6) feedback and reflection, and (7) sustained duration. Session

correlation and element are noted in table 2. This design is intended to promote active-situated learning for teachers of adolescent readers.

Reading Process

Research identifies five key reading models relevant to this study to establish a common understanding. The Simple View of Reading is a well-established model designed to show the basic elements of reading comprehension (Gough & Tunmer, 1986). The Cognitive Foundation Framework was established to bring coherence to teacher practice by developing an understanding of the cognitive requirements underlying reading comprehension (Hoover & Tunmer, 2020). The Scarborough's Reading Rope (Scarborough, 2011), a visual representation of the decoding/word recognition strand and the language comprehension strand representing reading skills, is included to further support the intertwining skills of reading. Charles Perfetti's (1985) proposed the Verbal Efficiency Theory stresses the importance of accurate and rapid word recognition, working memory processes, general symbol activation, lexical access, retrieval, learning, and practice, as crucial factors to reading comprehension (Perfetti, 1985). The Four-part Processing Model outlines the view of the cognitive processes involved in skilled reading. Stemming from the work of Seidenburg and McClelland (1989), this model helps educators and researchers understand the complex cognitive processes involved in reading. Together these models develop a common understanding of the reading process and point to the role of orthography. Each key model will be discussed in the sections that follow.

Simple View of Reading

The Simple View of Reading distinguishes reading as a response to graphic signals derived from the printed text verses the acoustic signals common in speech (Hoover & Gough, 1990). This act requires the reader to decode the graphic shape of a word or letter into a

linguistic form to achieve linguistic comprehension (Hoover & Gough, 1990). Gough and Tunmer (1986), who initially proposed the Simple View of Reading, emphasize the importance of decoding in conjunction with linguistic comprehension. In contemporary work, when people have cited the Simple View of Reading, they have often done so to emphasize the contribution of decoding, language, or both to the reading process, reading development, or reading instruction (Duke & Cartwright, 2021). Additional researchers have indicated that word recognition and language comprehension are each very important contributors to reading comprehension (e.g., Byrne & Fielding-Barnsley,1995; García & Cain, 2014; Georgiou et al., 2009; Hogan et al., 2014).

The Simple View of Reading purported reading comprehension is determined by two cognitive capacities, the ability to decode words and language comprehension (Gough & Tunmer, 1986). Decoding can be described as the ability to recognize printed words accurately and quickly to efficiently gain access to the appropriate word meanings contained in the internal mental lexicon of the reader (Hoover & Tunmer, 2020). Language comprehension is the ability to extract and construct literal and inferred meanings from linguistic discourse represented in speech (Hoover & Tunmer, 2020). Gough and Tunmer (1986) posited the fundamental idea of reading comprehension is expressed in the simple equation where reading comprehension equals decoding multiplied by language comprehension. Further noting that if either component, decoding or language comprehension is equal to zero reading comprehension is zero. Indicating that both decoding and language comprehension are considered necessary and of equal importance (Tunmer & Chapman, 2012). Language comprehension involves locating individual words in lexical memory, determining the intended meaning of the words, assigning appropriate syntactic structures to sentences, deriving meaning from individually structured sentences, and

building meaningful discourse based on sentential meaning (Tunmer & Chapman, 2012). Once the reader has successfully identified what the word is they still need to determine the meaning conveyed in the text.

Studies involving child, adolescent, and adult readers, noted the components of decoding and linguistic comprehension have explained substantial variance in reading comprehension (Chen & Vellutino, 1997; Kendeou et al., 2009; Lonigan et al., 2018; Savage & Wolforth, 2007), even after controlling for other reading-related skills (Kershaw & Schatschneider, 2012; Silverman et al., 2013; Tilstra et al., 2009). Proficient readers will rely on both components of the Simple View of Reading (Gough & Tunmer,1986). Struggling with decoding and/or language comprehension will inevitably impact reading comprehension (Hoover, 2023). A student who cannot decode the words may still be able to demonstrate language comprehension when the text is read aloud (Tunmer & Greaney, 2010). Likewise, a student who can successfully decode the words is not automatically able to construct meaning. The ability to construct linguistically based meaning from a given text will be impacted for any reader who has difficulty recognizing the words of the text or one having trouble understanding the language being read or both (Hoover & Tunmer, 2021).

The Simple View of Reading (Gough & Tunmer, 1986) has garnered much support since its introduction nearly four decades ago (Catts, 2018). Many investigations have confirmed that much of the variance in reading comprehension can be accounted for by individual differences in decoding and language comprehension (Catts et al., 2005; de Jong & van der Leij, 2002; Hoover & Gough, 1990). The Simple View of Reading (Gough & Tunmer, 1986) has also been used as a model in other languages that have alphabetic orthographies like English such as Greek (Protopapas et al., 2012), Hebrew (Joshi et al., 2015), and Italian (Tobia & Bonifacci, 2015). The

Simple View of Reading (Gough & Tunmer, 1986) has been noted to hold true in nonalphabetic writing systems like Chinese (Ho et al., 2012; Florit & Cain, 2011) and has been used to account for individual differences in reading comprehension of second language learners (Hoover & Gough, 1990; Verhoeven & Van Leeuwe, 2012) and dual-language users (Bonifacci & Tobia, 2017).

While seemingly sturdy, the Simple View of Reading has also been scrutinized (Adlof, et al., 2006; Braze et al., 2016; Lonigan et al., 2018). It is not a model for reading development nor does the Simple View of Reading state how reading develops over time (Hoover & Tunmer, 2020). Further research is needed to determine whether skill in word recognition is completely independent of language comprehension (in consideration of the role of vocabulary), the extent of the need for independent fluency, and whether the model can be extended to provide appropriate descriptions of classroom performance is still being investigated (Hoover & Tunmer, 2020). Nevertheless, there is little evidence that counters the substantial roles of word recognition and language comprehension.

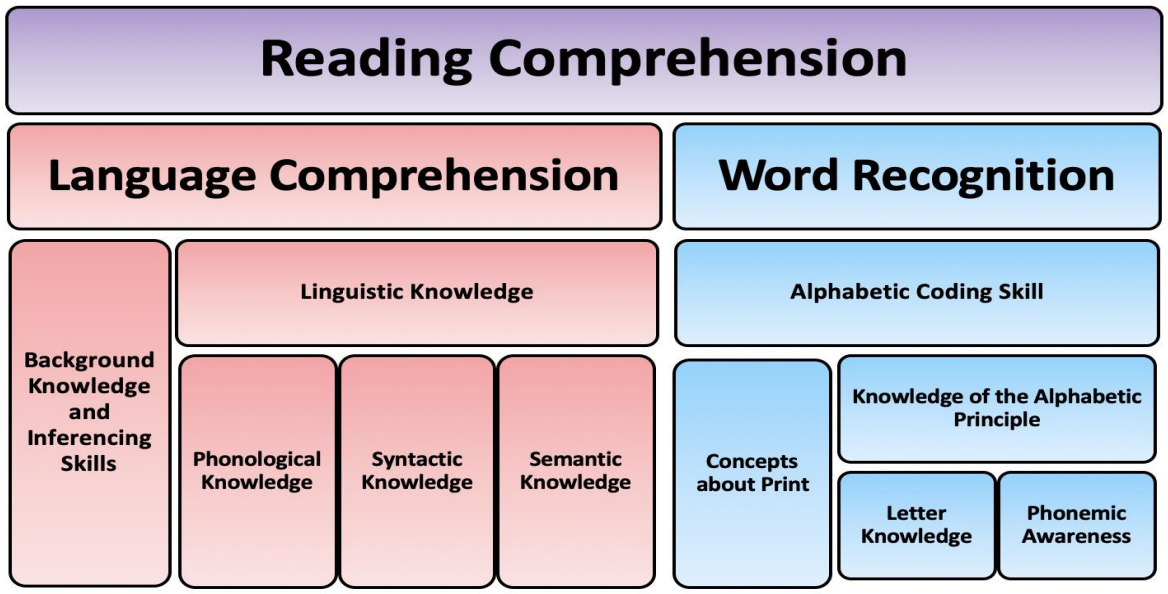
Cognitive Foundations Framework

The Cognitive Foundation Framework is designed to help conceptualize the synergistic nature of the reading process (Hoover & Tunmer, 2018). While the framework is structured hierarchically, the structure does not suggest lower order cognitive elements need to be fully mastered before higher order elements (Tunmer & Hoover, 2019). Cognitive elements can develop concurrently and in a reciprocally facilitating manner. As depicted in Tumner and Hoover's model (2019), reading comprehension is supported by language comprehension and word recognition (see Figure 2). Two cognitive capacities underpin language comprehension: linguistic knowledge and background knowledge and inferencing skills. Linguistic knowledge is

supported by phonological, syntactic, and semantic knowledge. Word recognition is supported by alphabetic coding skill, which is supported by concepts about print and the knowledge of the alphabetic principle. Knowledge of the alphabetic principle is supported by letter knowledge and phonemic awareness. The Cognitive Foundations Framework has broad implications for educational practices and assumes that learning to read follows developmental progressions from pre-reader to skilled reader.

Figure 2

The Cognitive Foundation Framework



Note. The Cognitive Foundations Framework. Source. Graphic from Hoover and Tunmer (2019).

Language Comprehension

Linguistic or language comprehension, has been defined as the ability to derive meaning from spoken words, sentences, and discourses (Hoover & Gough, 1990). When considering linguistic comprehension, it is more than just identifying written words; it is about gaining

meaning from sequences of printed words that allow the reader to formulate a mental model of what is being portrayed in the text (Hoover & Tunmer, 2020). Linguistic knowledge is based on the articulated knowledge from three distinct domains: Phonological knowledge (phonology), semantic knowledge (semantics), and syntactic knowledge (syntax).

Reading comprehension is more than literally understanding the sentences being read. Readers must incorporate literal comprehension with inferred understanding by applying background knowledge gained from the world around them (Tunmer & Hoover, 2019). Background knowledge is comprised of the world knowledge the reader brings to reading. This can include episodic (events), declarative (facts) and procedural (how-to) knowledge and related vocabulary (Kintsch, 1998). A subset of background knowledge, domain knowledge, refers to knowledge of a specific and defined field (Alexander & Jetton, 2000). Students use relevant background knowledge to understand the topics related to the passage they are reading (Tunmer & Hoover, 2019). Background knowledge coupled with inferencing skills helps foster reading comprehension. Inferring is the process readers use to integrate information from the text with background knowledge to fill in details and links not explicitly stated in a text (McNamara & Magliano, 2009). The ability to infer meaning from text has been recognized as a predictor of reading comprehension at a range of developmental stages and is one of the drivers of sophisticated reading ability (Cain & Oakhill, 1999; Oakhill & Cain, 2007). Differences in a child's exposure to language, vocabulary and syntactic development, and knowledge of the world can be a sizable gap (Hart & Risley, 1995).

Phonological knowledge starts with the recognition of the distinctive sound of a particular phoneme (unit of sound). Phonological knowledge also entails the definitions, organization, and combination of speech sounds in a language. Without this knowledge for a

given language, the words contained in the language would defy both recognition and production (Hoover & Tunmer, 2020). This confusion would be comparable to listening to a conversation in an unfamiliar language. Syntactic knowledge is linguistic knowledge about the definition and combination of phrases, clauses, and sentences (Hoover & Tunmer, 2021). Syntactic knowledge allows the reader to identify the subject-verb-object elements of the sentence, which lets them determine its topic and general meaning. Syntactic knowledge also allows the reader to relate ideas within a sentence or across sentences (Gottardo et al., 2017).

Semantic knowledge is linguistic knowledge about the meaning bearing units of language at the word and sub-word level and their use in building meaning at the sentence and discourse levels (Hoover & Tunmer, 2021). In the context of language related reading comprehension semantics word knowledge refers to the process of comprehending the meanings of words retrieved from reading-related experience storage (Patterson et al., 2007; Tulving & Markowitsch, 1998). Semantic associations are built over time (Moats, 2010). The initial process of learning a new word requires linking the word's phonology and semantic meaning and, when reading, also its orthography (Adlof & Patten, 2017; Gupta & Tisdale, 2009). These readers need to apply the knowledge used to understand the target word's meaning in different sentences (Nelson & Stage, 2007; Patterson et al., 2007; Taylor et al., 2015). Taken together, phonology, semantics, and syntax represent the linguistic knowledge basis for determining the literal meaning of the sentences and passages (Tunmer & Hoover, 2019). Linguistic knowledge defines the formal system that provides the literal meaning of the text being read which is needed for comprehension (Hoover & Tunmer, 2020).

Word Recognition

Equally represented in the Cognitive Foundations Framework is word recognition. Word recognition is defined as the ability to automatically derive a representation from printed input that allows access to the appropriate entry in the mental lexicon (Tunmer & Hoover, 2019). Students must be able to recognize words in print to gain accurate meaning from the text; thus, word identification is viewed as the recognition of a string of letters to produce a word stored in long-term memory (Perfetti, 1985). Word recognition processes that are inefficient or capacity draining hinder comprehension by reducing the cognitive resources available for sentence comprehension (Tunmer & Hoover, 2019). This inefficiency can be seen when children laboriously sound out and or when using context clues to guess the unknown word (Tunmer & Hoover, 2019).

Word recognition is supported by alphabetic coding skills in the Cognitive Foundations Framework (Hoover & Tunmer, 2021). Alphabetic coding skills are the ability to map letters and letter patterns onto phonological forms at the phoneme level. These skills include the knowledge of correspondences between single letters, diagraph, single phonemes, groups of letters, groups of phonemes, and polyphonic spelling patterns. Alphabetic coding skills also include the knowledge of more complex conditional rules that govern positional specific constraints and the presence of marker letters (Tunmer & Hoover, 2019).

Concepts about print helps support alphabetic coding skills (Hoover & Tunmer, 2021). Readers need to understand that the printed text carries a linguistic meaning and that there is a correlation between the printed word and the spoken word. Readers also must understand the boundaries of words are marked by the spaces and the directionality. In the English language,

words are printed from left-to-right, top-to-bottom, successive pages are ordered left-to-right and, pages turn from right-to-left (Tunmer & Hoover, 2019).

Alphabetic coding skills are also supported by knowledge of the alphabetic principle, which is the consciousness that letters and letter combinations in alphabetic writing systems are used to represent the phonemes underlying the spoken words (Hoover & Tunmer, 2021). This knowledge is crucial for helping students understand the relationship between units of print and speech which in turn is supported by phonics instruction (Tunmer & Hoover, 2019).
The alphabetic principle is supported by letter knowledge and phonemic awareness.
Letter knowledge is the ability to recognize and manipulate the letters used in print.
Phonemic awareness is the ability to consciously recognize and manipulate the phonemic units used in spoken words (Hoover & Tunmer, 2021). Learning these concepts early is critical for advancing word recognition skills thus allowing students to learn the connections between phonology and orthography (Tunmer & Hoover, 2019). The Cognitive Foundation Framework is an extension of the Simple View of Reading (Gough & Tunmer, 1986) and continues to focus on the needed components of reading comprehension.

Scarborough's Reading Rope

American psychologist and literacy expert, Dr. Hollis Scarborough, (2001), developed a rope model to demonstrate the interconnectedness of decoding and language comprehension in the pursuit of reading comprehension. Scarborough's Reading Rope creates a researched-based metaphor that expands on the Simple View of Reading by providing a window into understanding the complexities of skilled reading (Hennessy, 2021). Similar in fashion to the Simple View of Reading (Gough & Tunmer, 1986) and the Cognitive Foundations Framework

(Hoover & Tunmer, 2021), the rope is divided into two major strands that are comprised of individual threads the help define the complex components of reading. The first strand is represented as language comprehension. This strand is comprised of individual threads representing a reader's background knowledge, vocabulary, language structures, verbal reasoning, and literacy knowledge. The second strand focuses on word recognition with supporting threads of phonological awareness, decoding, and sight recognition. This representation reveals that all the strands of the rope are essential and need to be tightly woven or braided to achieve skilled reading (Hennessey, 2021). Scarborough defines skilled reading as the fluent execution and coordination of word recognition and text comprehension while conveying the interrelationships that develop over time through instruction and experience.

According to Gough and Tunmer's (1986) influential simple model, reading comprehension is hypothesized to be the product of just two necessary factors: decoding and listening comprehension. Successful understanding of text requires accurate bottom-up identification of the printed words and linguistically proficient top-down analyses of the semantic and syntactic relationships among the words to attain an understanding of the text's meaning (Cutting & Scarborough, 2009). When bottom-up skills are weak and effortful, comprehension will likely be impeded because words are misidentified and because fewer cognitive resources can be devoted to the processing of meaning (Adams, 1990; LaBerge & Samuels, 1974; Lyon, 1995; Perfetti, 1985; Perfetti & Hogaboam, 1975; Perfetti et al., 1996; Shankweiler, 1999; Torgesen, 2000). When top-down skill is lacking, even if all words can be correctly decoded, an understanding of the text may not be attained because the meanings of the words are unknown or the logical and structural relationships among them are not appreciated, as would presumably occur even if the text were to be read aloud for oral comprehension (e.g.,

Catts, et al., 1999; Catts & Hogan, 2002; Gough & Tunmer, 1986; McCardle et al., 2001; Nation, 2005; Nation & Snowling, 1998, 2000; Scarborough, 1990). Slowly recognizing each word by sounding out each letter or just by guessing will not likely result in successful comprehension even if all the words are correctly identified (Hoover, 2023). Fluent reading execution and coordination of word recognition and text comprehension is achieved when the processes are tightly woven together working as a well-constructed rope (Scarborough, 2001).

Verbal Efficiency Theory

Verbal Efficiency Theory is a model of skill in reading that focuses on the efficiency of linguistic processing provided by knowledge-rich and quickly executing lower-level processes (Perfetti, 1985). Verbal Efficiency accounts for the individual differences in reading comprehension that are produced by the variance in efficient operation of local processes in which temporary representations of a text are established. Verbal efficiency assumes that constructing an effective text model depends on the assembly and integration of propositions in working memory (Perfetti, 1985). Therefore, any processing factor that contributes to the encoding of these propositions will affect overall reading comprehension.

The core proposal of Verbal Efficiency Theory is that the outcome of reading of what is read is limited by how efficient the local processes operate (Perfetti, 1985). This theory assumes that (1) the working memory of a reader is limited in capacity (Baddeley & Hitch, 1974) and (2) some processes can occur without attention while others will require attention. The competing elements cause more processing resources to be allocated to the most attention demanding process (Kahneman, 1973). Another way to conceptualize Verbal Efficiency is using the concept of product and cost (Perfetti, 1985). The product, comprehension, hinges upon the degree to which the processing resources are spent while reading the text.

Research suggests that working memory is involved in reading comprehension (Carretti et al., 2009; Titz & Karbach, 2014; Swanson & Alloway, 2012). However, studies differed in the way working memory was assessed and the aspect of reading ability that was assessed which makes the results hardly comparable (Johann et al., 2019). Peng et al. (2018) conducted a meta-analysis to shed light on the association between working memory and reading and factors which may modulate the relation. Regardless of working memory domain and reading type there was a significant, but moderate relation between reading and working memory. Different types of reading performance (phonological coding, decoding, vocabulary, and comprehension) were associated with working memory to a similar degree.

One way to further explain verbal efficiency is to recognize the importance of efficient lexical access. When lexical access is rapid and low in resource cost, it enables working memory to fulfill the propositional text work creating meaning (Perfetti, 1985). When lexical access is inefficient, slow and effortful, it makes it more difficult for working memory to effectively locate stored meaning. Reading starts with lexical access, which is the process of finding a written word in long-term memory. In an alphabetic system the graphic signs (graphemes) correspond to abstract speech sound units (phonemes). Lexical access initiates the critical process of semantic encoding. Semantic encoding is the process of attaching a contextually relevant meaning for the word to the ongoing text process. Once the reader recognizes the word, the meaning can be drawn from the text.

Lexical access interference resulting from inefficient code retrieval places verbal memory at risk. Low quality codes can occur when inefficient linguistic coding operations fails to activate all the needed semantic and phonetic codes (Perfetti, 1985). A high-quality code is at risk because of competing memory demands, results in incomplete proposition encoding when

functional memory working memory is limited. This interference can predict processing glitches that cost the reader valuable resources, due to verbal inefficiency, and can impact reading comprehension. As orthographic knowledge advances, word recognition becomes automatic, enabling readers to focus their attention on the goal of reading-comprehending text.

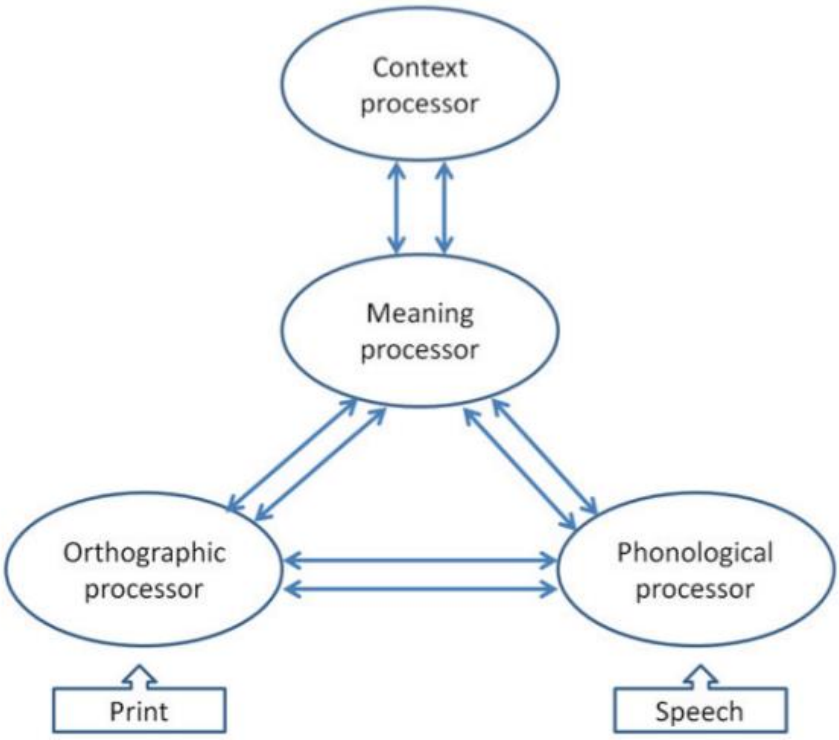
Verbal efficiency theory does not imply that the reader is limited only to the power of the lower-level processes. Nor does it imply that students need only master lower-level processes to read. It does, however, assume the component processes of reading are interactive and that there are procedures that can be applied to compensate for inefficiencies in the lower-level processes (Perfetti,1985). Teaching reading is complex in nature and should include high levels of skill at lexical access, including decoding. Lexical access, decoding differences, and differences in memory favor a lexically based explanation of efficiency.

Four Part Processing Model for Word Recognition

The Four-Part Processing Model is a summation and synthesis of experiments on the nature of reading for the skilled and unskilled (Moats, 2005). This model stems from research conducted by Seidenburg and McClelland (1989) which looked at the cognitive processing in the brain associated with fluent reading. This model is a diagram of the interactive and parallel work in the brain around cues and clues that aid in word recognition through orthographic, phonological, meaning, and context processors. These processors are interconnected with bidirectional arrows to note an interactive nature of the processors (see figure 3).

Figure 3

Four-Part Processing Model for Word Recognition



The orthographic processor receives information directly from the text (Adams, 1994). The orthographic processor system stores information about print that is needed for word recognition and spelling (Moats, 2005). This processor is responsible for recognizing words as whole units and remembering letter sequences in spelling. Print features are filtered, identified, and matched (or stored if new) with information already in orthographic memory. The recognized information is associated with sound and meaning. This information is sent to the phonological processor and meaning processor respectively.

The phonological processing system is responsible for the perception, memorization, and production of speech. Phonological processing helps to recognize, remember, interpret and produce speech sounds in languages (Moats, 2005). This processor is responsible for phoneme awareness functioning to identify and categorize phonemes, produce the speech sounds and syllable sequences in words, compare and distinguish words that sound similar, taking apart the sounds to for alphabetic matching, and being able to retrieve words for memory, and holding

these sounds so that they may be written or spoken. Information from the work in the phonological processor is sent to the orthographic and meaning processors.

The basic mechanics of the meaning processor are similar to those of the orthographic processor. The orthographic processor holds units of letters the meaning processor hold units of meaning. This processor is responsible for the mental dictionary that is stored in the brain (Adams, 2011). The role of the meaning (semantic) processor is to recognize words as meaningful entities in and out of context. The meaning processor stores the inventory of words, organizes the mental dictionary, and constructs the meaning of new words (Moats, 2005). Information from the orthographic and phonological processors are connected to the work of the meaning processor. Once a word is identified, this information is sent to the context processor.

The context processor develops meaning that is consistent with the text being read (Adams, 1994). This processor is responsible for selecting the appropriate aspects of the words meaning that are most important to accurate interpretation of the text. The primary role of the context processor is to support the meaning processor to help identify the intended meaning in the context the word is being used (Moats, 2005). This is accomplished by noting how the word is used, the location of the word in the sentence, and the other ideas and events surrounding the word (Adams, 2011). This processor helps identify and prioritize the most applicable context to make meaning.

The work of the four processors starts when the reader fixates on a word, the visual percepts of the letters directly stimulate corresponding letter units in the reader's memory (Adams, 1990). For the skilled reader, as the letters of a word in fixation are recognized, they activate the spelling patterns (orthographic processor), pronunciations (phonological processor) and meanings (meaning processor) with which they are compatible. At the same time, using its

larger knowledge of the text, the context processor swings its own bias among the rival candidates to maintain the coherence of the message. Meanwhile as each processor narrows in on the word's identity, they relay it's progress back to the others such that wherever hypothesis agree among the processors, their resolution is speeded and strengthened (Adams, 1994).

A Comparative Analysis

When considering the premises and assumptions set forth by the Simple View of Reading (Gough & Tunmer, 1986), Cognitive Foundations Framework (Hoover & Tunmer, 2019), Reading Rope (Scarborough, 2001), the Verbal Efficiency Theory (Perfetti, 1985), and the Four-Part Model of Word Recognition (Seidenberg & McClelland, 1989), it is clear all rely on decoding/word recognition as an essential component of reading comprehension. These theories posit a clear association between word reading fluency and reading comprehension, noting the former is necessary for the latter (Hoover & Gough, 1990; Kim et al., 2012; Schwanenflugel et al., 2006).

The Simple View of Reading was not intended to suggest that only decoding and linguistic comprehension are the sole contributors of reading. Reading is a synergistic process that also includes the cognitive, psychological, and ecological factors that contribute to reading comprehension (Tunmer & Greaney, 2010). The original Simple View of Reading formulation used the term decoding to represent the ability to recognize words (Gough & Tunmer, 1986). Hoover and Tunmer (2021) noted a better representation of word recognition, instead of decoding, to retain neutrality about how word recognition is achieved. This would include indirectly through grapheme-phoneme correspondences or more directly through orthographic mapping (Hoover & Tunmer, 2021). Orthographic mapping involves the formation of letter-sound connections to bond the spellings, pronunciations, and meanings of specific words in

memory. It explains how children learn to read words by sight, to spell words from memory, and to acquire vocabulary words from print (Ehri, 2013).

For skilled readers, word recognition seems effortless and somewhat automated. Words that are familiar to the reader are automatically recognized whereas unfamiliar words can be decoded (Adlof et al., 2022). The development of skilled word reading is associated with phonological, orthographic, and morphological skills. Automaticity is the recognition of words accurately and quickly (Logan, 1988). Accuracy in word recognition is important because the meaning of the text is dependent on the meaning of the words. Failure to accurately identify words interferes with comprehension (Adlof et al., 2022). The ability to recognize words quickly is essential because inefficient, capacity-draining processes reduce the cognitive resources available for comprehension.

Reading is heavily dependent on word recognition. Words are the elements used to construct expression and meaning whether written, spoken, or signed. Words are the hubs that index the many types of information used in comprehending and producing language (Seidenberg, 2017). Words encode information about meaning and senses, their internal structure (supported through syllables, morphemes, and phonemes), grammatical function (nouns and verbs), and linguistic context (MacDonald et al., 1994). Knowledge of words gives insight into how the language functions as a form of communication (Clark, 2015). This encoding allows people to acquire and use language (Seidenberg & MacDonald, 2018). Gaining the ability to read and understand words quickly and accurately is the great leap into literacy, that can be a huge challenge for many students (Seidenberg et al., 2022). This study posits deepening intermediate/middle school teachers' understanding of orthography as a means of supporting classroom practice.

Orthography

Orthography is the knowledge of underlying sound (alphabetic), pattern, and meaning relationships in the English spelling system (Ganske, 2014). Understanding the alphabetic nature of the English writing system sets the stage for word reading by allowing the mapping of orthographic units onto their corresponding sounds (Byrne, 2005). Orthographic knowledge is considered by many to play an important role in literacy acquisition (Apel et al., 2006; Berninger et al., 2006; Castles & Coltheart, 2004; Roman et al., 2009). Dominant models also point to orthographic processing as a prominent force in reading acquisition (Ehri, 2014; Share, 1995). Print learning is the process through which individuals acquire an understanding of how the visual orthographic features of print work including the constraints and regularities as to how print appears on the page (Conrad & Deacon, 2022).

Conrad and Deacon (2022) noted three tenets used to support orthographic learning in developing reading skills. The first tenet was learning about the orthographic components of print begins prior to independent decoding with learning about the properties of print, such as where to start reading, and continues to learn about letter patterns and whole word forms, including their lexicalization. Secondly the conceptual scope of print learning, uniting three quite separate constructs: concepts about print, sub-lexical orthographic regularities, and orthographic learning. The final noted tenet supported the bidirectional nature of the relation between print learning and word reading, with print learning supporting word reading development, just as learning to read words enables children's learning about print. This research asserts a framework that encompasses and expands traditional views on the role of learning about orthography in reading development.

As children learn to read, graphic images of words and their phonological, semantic, and syntactic identities are stored in memory in a mental dictionary or lexicon. Included in each word's stored identity are links that connect graphemes to phonemes, letters to sounds (Ehri, 1998). The more a child knows about letter–sound relations, the easier it is to read words; and the more words a child knows by sight, the stronger the child's orthographic knowledge. With additional experiences with print and increased knowledge of the spelling system, readers can form complete letter–sound connections and use blending to decode unfamiliar words. Repeated encounters with a particular word help to strengthen it in memory until finally the spelling itself is sufficient to elicit the word's pronunciation (Ganske, 1999).

Orthographic processing is defined as the process of letter identification and letter positions and is based on the premise that written words are primarily recognized via their component letters together letter identity and letter position comprised orthographic information (Grainger, 2022). Orthographic processing allows generic visual processing mechanisms to contact the linguistic processes specific to the word presented. This connection between visual processes and the linguistic process is established by way of orthographic processing across three types of mapping: (1) orthographic to semantic by way of whole-word orthographic representation, (2) orthography to morpho semantic via morpho-orthographic representation, and (3) orthographic to phonology by way of sub-lexical spelling sound correspondences.

Orthographic facilitation can be explained by the word reading theory (Ehri, 2005) and the lexical quality hypothesis (Perfetti, 2007). The presence of orthography increases the bonding of orthography to phonology and orthography to semantic connections in memory. This can, in turn, enhance the quality of the representations over words lacking orthographic representations and improve the accuracy and efficiency of their retrieval from memory (Ehri, 2005; Ehri &

Rosenthal, 2007; Perfetti, 2007). Empirical studies have provided evidence of orthographic facilitation in learning pronunciations (Chambré et al., 2017; Ehri & Rosenthal, 2007; Hu, 2008; O'Leary & Ehri, 2020), spellings (Ehri & Rosenthal, 2007; Miles et al., 2016; Ricketts et al., 2009), and meanings (Ehri & Rosenthal, 2007; Ricketts et al., 2009) of new vocabulary words among English-speaking children and adults (Zhang et al., 2023).

Orthographic knowledge is at the core of word study (Ganske, 2014). When readers understand the underlying sounds (alphabetic) patterns and meaning relationships in the English language spelling system more fluent reading and writing is possible. Word study refers to an instructional approach aimed at developing children's spelling, vocabulary, phonetic-word recognition knowledge and phonological skills. Through hands on learning, that build on what students already know, word study fosters word consciousness, namely appreciation and interest in word learning. Students discover consistency that enable them to generalize understanding and apply such knowledge to other words thereby learning to read spell and write more efficiently (Carlise, 2010; Ehri, 2000; Graham & Herbert, 2010; Moats, 2005; Snow et al., 2005).

Research has shown that the understanding students have about words can be revealed with a simple dictated spelling inventory (Perfetti, 1992; Bear, 1992). The Developmental Spelling Assessment (DSA) helps teachers identify a student's stage of development and aids in distinguishing the orthographic features students have mastered (Ganske, 2014). Orthographic knowledge helps with learning the spelling of new words and predicts student's gains in word reading over time (Deacon et al., 2019). Increased understanding about the developmental nature of learning to spell and the importance of orthographic knowledge in reading and writing have led to implications for more child-centered instruction (Bear et al., 1996; Bloodgood, 1991). To carry out more developmentally appropriate instruction, teachers must first know what

understandings their students have about words (Ganske, 1999). Child-centered instruction depends on informed teachers, but the means for teachers to learn about their students' orthographic understandings are limited. Research has revealed that many teachers feel insecure in their knowledge of the spelling system and in how to teach spelling (Gill & Scharer, 1996; Moats, 1995; Johnston, 2000; Pitman et al.,2022; and Pitman et al., 2023). This study hopes to provide the knowledge and skills needed to help build teacher's knowledge of orthography and its role in improving reading, thus impacting classroom practices fostering success for adolescent struggling readers.

The Adolescent Reader

A student's secondary years of education are devoted to deepening and expanding their knowledge base (Fisher et al., 2022). Reading for adolescent readers focuses more on making sense of the content within text verses identifying every word on the page. A significant portion of knowledge building is acquired while interacting with informational text (Fisher et al., 2022). A greater emphasis on the instruction and assessment of academic literacies typically begins during the middle school grades (Comperatore & Hall, 2022). During middle school grades, the content, discourse, and texts increase in rigor as students experience departmentalized instruction. Proficient adolescent readers can read text on grade level orally with expressions appropriate for the type and purpose of the text. Students who are on grade level should be able to read fluently 75%-95% of the time (Ho & Guthrie, 2013).

Adolescent readers are spending less time on learning how to read and more time reading to learn new content. In middle school, more time is devoted to contextualizing information from a variety of sources. Students are using their ability to read, evaluate, critique, and classify information to make sound claims and arguments (Moje, 2015). According to the Common Core

Reading Standards, students are expected to be able comprehend and evaluate complex text that encompasses a wide variety of types and disciplines, without the significant teacher given scaffolding provided for students. Proficient readers, considered college or career ready, should be able to use comprehended information to construct effective arguments and convey intricate or multifaceted information to various audiences. In addition, students are expected to be able to establish a base of general knowledge across a wide range of subject matter by engaging with works of high quality and substance. Knowledge is obtained by reading purposefully and listening attentively. The pinnacle would be the refinement and sharing of such knowledge through writing and speaking (Common Core State Standards, 2010). Mastery of Common Core State Standards have become increasingly crucial for college-bound students (Comperatore & Hall, 2022).

The Struggling Adolescent Reader

The Common Core State Standards (CCSS) intensified the expectations of students by requiring reading of longer, more complex texts (Hiebert & Messer, 2013). Although changes in academic literacy expectations impact all students, Comperatore and Hall (2022) noted the change exacerbated the challenges of students already experiencing academic literacy difficulties. Nonproficient readers do not read the same volume of text as their proficient counterparts. They do not have equal access to the core content (Coggins, 2023). Reading less, failing to comprehend the curriculum, and subsequently not building content vocabulary, may cause students to fall behind each year (Silverman et al., 2013). Moats (2020) indicated that adolescent readers with moderate word level reading deficits struggle to understand the increasingly complex text common in middle school. These difficulties become compounded

when students continue to struggle with reading comprehension; they often stop participating in class (Comperatore & Hall, 2022).

The difference between a struggling adolescent reader and a fluent reader is not considered to be their intellectual ability; the determining factor is connected to the reader's ability to effectively implement skills related to phonological awareness (Shankweiler et al., 1995). Students who are disfluent struggle with decoding words with accuracy. Disfluent students frequently lose the meaning of the text because of long pauses in their reading. Reading becomes laborious and exhausting (Paige & Magpuri-Lavell, 2014). Students nearing the end of eighth grade should be reading about 156 words per minute (Ming, 2018). Struggling adolescent readers are performing below this average. Fluent reading has a positive effect on silent reading (Paige et al., 2012). Fluent readers are better able to overcome the challenges of increasing text complexity faced during middle school (Schwanenflugel & Kuhn, 2016). Deficiencies in phonological knowledge will hinder fluent reading. Many middle school and secondary teachers will have students who will continue to struggle unless this underlying concern is addressed (Paige & Magpuri-Lavell, 2014). Teachers of struggling readers will need support to help students progress in reading.

Proficient readers must draw on solid word identification skills coupled with language processing skills. Language processing skills are used in understanding spoken language. (Hurwitz et al., 2022). The ability to identify words develops using word attack skills effectively. Students break down unfamiliar words into segments and apply letter-sound mapping to identify words quickly and accurately in print (Snow et al., 1998). As word identification becomes more efficient and fluent, more cognitive resources can be devoted to language processing skills tied to comprehension. Language processing skills include accessing vocabulary knowledge and

applying grammatical rules to process complex words and sentences (Carlisle, 2007; Nippold, 2017). Since reading comprehension draws on both word identification and other elements of language processing, grammatical skills, stored background knowledge, verbal reasoning, and the ability to infer, struggling students will continue to perform below their peers (Perfetti et al., 2008).

In addition to reading fluently, adolescent students need to navigate through academic language. Students often need significant bridging from the way they describe their thinking outside of school to conform to the expectations and conventions in an academic setting (Zwiers, 2014). Zwiers (2014), noted the linguistic capital, being the quality and quantity of language used by parents and peers, helps students build abilities with abstract languages they may encounter in various subject matters. Much like financial capital, students will enter classrooms with varying amounts. If students have a great deal of linguistic capital, they are less likely to fail (Zwiers, 2014). Too often teachers assume that students know the symbols and the complex ways symbols are organized in school (Filmore & Snow, 2000). Diverse students must work harder to fill in ideas and construct meaning. One of the tasks as an educator is to help students demonstrate their understanding of school-based words and terms (Zwires, 2014). This can be a continued challenge for students who are not efficient in navigating language. Struggling adolescent students must be able to effectively read complex materials. Deficiencies in word identification and language processing skills that impede proficient reading need to be addressed to promote academic success (Nippold, 2017).

Teacher Knowledge

Moats (1994) reported the results of a language awareness survey that indicated literate and experienced teachers had an insufficient grasp of spoken and written language structure and

would be unable to teach explicitly. Research that establishes the importance of the role teacher's knowledge of literacy concepts plays in reading achievement for students, is continuing to grow (Brownell et al., 2016; Lane et al., 2008; McCutchen et al., 2002, 2009; Piasta et al., 2009; Spear-Swerling & Brucker, 2004). Teachers with deep knowledge will be better equipped to make sound instructional decisions based on the needs of the students (Reutzel et al., 2016). Explicit instruction is contingent on having a knowledgeable teacher who can apply their knowledge to plan and manage instructional activities. Peltier et al, (2020) and Spear-Swerling and Brucker, (2004) both noted a statistically significant, positive correlation between preservice teacher's knowledge of foundational literacy skills and tutored students' growth in foundational reading abilities. Spear-Swerling and Brucker (2004) reported that as preservice teachers' knowledge increased, they became more aware of selecting appropriate examples and targeting specific skills during instruction. Piasta et al., (2009) posited results that support explicit phonics instruction provided by more knowledgeable teachers had statistically significantly higher student gains in word reading skills than students who had been taught by less knowledgeable teachers. Not all teachers have the knowledge needed to teach reading (Otaiba et al.,2019; Lyon, 1998; Pittman et al., 2019) Research supporting evidence-based reading practices may not be included in teacher preparation programs, school curricula, or even professional development (Moats, 2020; Solari et al., 2020). Teachers may lack the knowledge of teaching reading, instructional practices to support reading, or may hold beliefs about students' reading failure that compromises their ability to instruct students with reading difficulties (Otaiba et al., 2019; Lyon, 1998; Pittman et al., 2019).

The Role of Professional Development

Higher quality instruction should be the result of any professional development offered to teachers (Gess-Newsome et al., 2019). Ravhuhali et al., (2015) indicated that professional development should be geared not only for self-professional growth and lifelong learning but should be aimed at improving learners' performance. Kostina (2015) noted effective professional development aimed at lifelong quality teacher development is a vital component for academic improvement. Smith and Gillespie, (2007) noted traditional professional development trainings are often criticized as typical multi-day workshops on effective teaching that end up leaving teachers able to apply only a few of the strategies covered.

Myhill and Newman, (2016) noted when teachers have limited opportunities for professional development that builds substantial content and pedagogical knowledge, they lack expertise to facilitate logical and supportive lessons that generate increasingly sophisticated understandings. Mantei and Kervin (2020) noted without support that develops considerable expertise required in both content and pedagogy, the teacher's knowledge and teaching skills are limited. The lack of opportunities for substantial professional development can potentially lead to an inability to help students sort through confusions and extend content related knowledge. In this study, participants engaged in multi-session professional development opportunity designed to increase teacher knowledge of orthography to improve classroom practices that supports fostering greater student orthographic understanding. Teacher development has traditionally been referred to as professional development. In recent years the nomenclature associated with teacher development has shifting to professional learning (Labone & Long, 2016). Learning implies a more internal focus or constructive approach in which the teacher is an active participant in charge of their learning. Moving away from a deficit connotation implied by the term development which can also invoke a sense of passiveness, has resulted in changes in the

structure to long-term, contextually embedded situated learning approach (Ingvarson et al., 2005; Webster-Wright, 2009). The professional development/learning presented in this study is designed to promote active participation.

Effective Professional Development

Wexler et al., (2022) conducted a study examining the impact of professional development using an instructional framework for literacy. Findings indicated an improvement in the teacher's ability to identify targeted literacy skills. Wexler et al. (2022) reported the professional development coupled with a coaching model improved teacher's knowledge and skills and facilitated their implementation of the instructional framework which included providing students with explicit instruction.

When considering the role of high-quality teachers in the pursuit of greater student achievement, effective professional development should be offered to improve practice. Desimone, (2011) posited teacher professional development is one of the keys to improving the quality of U.S. schools. Desimone, (2011)further noted that many education reforms rely on teacher learning-and the improved instruction that ideally follows-to increase student learning. Using a nationally representative sample of teachers, Desimone et al., (2002) noted results that identified substantive features of professional development programs for attempting to enhance teacher knowledge, skills and classroom practices. Desimone, (2011) noted five features for effective professional development: (1) content focus, (2) active learning, (3) coherence, (4) duration, and (5) collective participation.

Effective professional development is necessary to help teachers prepare students for deep mastery of challenging content, complex problem-solving skills, critical thinking, and effective communication (Darling-Hammond, et al., 2017). With the intent to identify features of

effective professional development, Darling-Hammond, et al., (2017) reviewed empirical literature on models that reported benefits for student learning to demonstrate a positive link between teacher professional development and student outcomes. After coding each study Darling-Hammond, et al., (2017), generated a list of seven elements of effective professional development models: (1) content focus, (2) active learning, (3) collaboration, (4) use of models, (5) coaching and expert support, (6) feedback and reflection, and (7) sustained duration. Both suggest that effective professional development be content focused, contain elements of active learning, provide collaborative opportunities, and consider time duration. For this study, seven effective elements as noted by Darling-Hammond et al., (2017): content focus, active learning, collaboration, use of models, coaching and expert support, feedback and reflection, and sustained duration, will be used to develop a more robust orthographic knowledge teacher intervention.

Content Focused

Professional development needs to be content focused to increase effectiveness (Darling-Hammond et al., 2017). Content focused professional development frequently centers on discipline-specific curriculum. This type of professional development is linked to the teachers' classroom allowing analysis of student work. Teachers are given opportunities to study a particular element of pedagogy or student learning in the content area (Doppelt et al., 2009). Content focused professional development also includes training on how students learn the targeted content being presented (Desimone, 2011). Teacher professional development that is context specific, job embedded, and content based is particularly important for addressing the diverse needs of students (and thus teachers) in differing settings (Darling-Hammond et al., 2017).

Active Learning

Another element of effective professional development is active learning. The design of professional development needs to consider how teachers learn (Trotter, 2006). Teachers participating in professional development will have varying experiences that should be used as resources for new learning (Darling-Hammond et al., 2017). Teachers should also have opportunities to focus on their discipline's needs through inquiry and reflective experiences. Active learning experiences help teachers synthesize the new learning. Darling-Hammond et al., (2017, pg 7), noted opportunities for "sense-making" involve modeling the sought after practices and constructing opportunities for teachers to analyze, try out, and reflect on new strategies are needed for transformation. Park and Xu (2022) reported an increase in the variety of activities in classroom practices after being exposed to courses classified as active learning as opposed to a lecture intensive.

Collaboration and Collective Participation

Collaboration and collective participation have similar descriptive characteristics. Darling-Hammond et al., (2017) views this element fitting in with the collaborative nature of professional learning groups. Desimone (2011) noted collective participation as groups of teachers from the same grade, subject, or school being able to participate together to build an interactive learning community. Darling-Hammond et al., (2017) noted that when whole grade levels, departments, or schools are involved they provide a broader base of understanding and support at the school level serving as a collective force and support group for each other. This would allow an environment for risk taking and problem solving.

Use of Models and Modeling

The use of models is included in the elements of effective professional development (Darling-Hammond et al., 2017). Ramos-Rodriguez et al., (2021) conducted a case study on

mathematical modeling discovered there were misconceptions or confusions among the teachers about what mathematical model and its practices. Wijekumar et al., (2019) reported 99% of the teachers in their study reported using text structure but when asked to list the text structures 54% listed only one text structure and less than 30% correctly listed more than one text structure. Curricular and instructional models and modeling of instruction help teachers to have a vision of practice on which to anchor their own learning and growth (Darling-Hammond et al., 2017).

Coaching and Expert Support

Coaching and the use of experts directly connects modeling. Coaches or experts can provide scaffolding to support the effective implementation of new curriculum, pedagogy, practice, or skill (Darling-Hammond et al., 2017). According to the International Literacy Association (2017), a literacy coach is defined as a reading specialist who focuses on providing professional development for teachers by giving additional instructional support needed to implement various instructional programs and practices. Research supports literacy coaching effectiveness in helping teachers implement instructional practices and meet the needs of their students (Glover, 2017; Vernon-Feagans et al., 2018; Di Domenico et al., 2018).

Feedback and Reflection

Feedback and reflection are additional elements found in effective professional development initiatives. Darling-Hammond, et al., (2017) regarded feedback and reflection as critical components of adult learning theory. Further noting professional development models associated with gains in student learning frequently provide built-in time for teachers to think about, receive input on and make changes to their practices by providing intentional time for feedback and reflection (Darling-Hammond et al., 2017). Cutrer-Párraga et al. (2020), reported teachers feeling a sense of encouragement and support from the feedback given by the coach.

Low implementing, initially resistant teachers commented on the praise being authentic, helping build trust and professional growth.

Sustained Duration

Duration of time should be considered when implementing professional development for the purpose of change (Desimone, 2011). Traditional episodic and fragmented approach to professional development does not afford time necessary for learning that is rigorous and cumulative. (Darling-Hammond et al., 2017). Teachers need time to engage in learning. Simply providing workshops that present classroom teachers with the latest research about reading instruction has been ineffective in changing teacher practice (Desimone & Pak, 2017). Practices consistent with other professional development, school reforms, and district policies help make learning coherent and more effective (Desmone, 2011).

Re-conceptualizing professional development to align with the needs of adult learners allows the shift from a 'one shot', 'sit and get' model to one where teacher learning becomes part of the daily routine (Hunzicker 2010). Effective professional development is anything that engages teachers in learning activities that are supportive, job-embedded, instructionally focused, collaborative, and ongoing. With these characteristics in place, teachers are more likely to consider professional development relevant and authentic, which makes teacher learning and improved teaching practice more likely (Hunzicker, 2011). Professional development is an important strategy for ensuring that educators are equipped to support deep and complex student learning in their classrooms (Darling-Hammond et al., 2017). The improvement of teacher practices and student learning begins by incorporating identified features of professional development for teachers (Desimone, 2011). This intentional consideration is necessary to ensure resources are allocated to professional development sessions that will enhance teacher

knowledge (Sims & Fletcher-Woods 2020). Elements of effective professional development are needed in fostering teacher knowledge. Teachers with deeper understanding of content knowledge, pedagogical knowledge, and specialized knowledge appear to make the most difference in students' reading outcomes (Piasta et al., 2009). This study is designed to increase teacher knowledge about orthography to improve instructional practices in the adolescent classroom setting.

Summary

This chapter presented a common foundation for understanding orthography in the synergistic process of reading and the characteristics of effective professional development. The Simple View of Reading (Gough & Tunmer, 1986), Cognitive Foundations Framework (Hoover & Tunmer, 2019), Reading Rope (Scarborough, 2001), and the Verbal Efficiency Theory (Perfetti, 1985) all rely on decoding/word recognition as an essential component of reading comprehension. The essence of reading depends on word recognition (Seidenberg, 2017). Reading is a visual and a linguistic skill with orthographic processing occupying the key interface between vision and language (Grainger, 2018). Language Arts teachers have not been adequately prepared to help struggling adolescent readers develop needed literacy skills that help them in all content areas (Lewis, 2009). This study intends to increase teacher knowledge of orthographic knowledge to provide deeper content knowledge to aid in fostering greater student orthographic understanding. Fostering professional development is key to reforms in teaching and learning making it essential to use best practices (Desimone, 2009). With this grounding foundation, this study will address the following questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?

2. In what ways does participation influence these teachers' classroom practice?
3. What aspect of this professional development influences changes in practice for these teacher participants?

Chapter 3

Adolescent readers entering middle school are faced with complex, disciplinary texts that are notably different from everyday conversational language requiring more cognitively demanding efforts (Opatz & Kocherhans, 2024). Comprehension at the middle school level relies primarily on integration of linguistic and cognitive processes (Oakhill & Cain, 2012). Adolescent readers are spending less time on learning how to read and more time reading to learn new content. In middle school, more time is devoted to contextualizing information from a variety of sources (Moje, 2015). Very little time is devoted to teaching for refining these skills even though these skills are often used regularly in social studies, sciences, and mathematics courses (Comperatore & Hall, 2022). Wijekumar et al., (2019) found that low teacher knowledge was connected to low student knowledge. While content courses in secondary schools place high expectations on students' reading comprehension, foundational skills may impede student achievement (Opatz & Kocherhans, 2024).

This study proposed a professional development intervention to build intermediate/middle school teachers' knowledge of orthography, and the role orthography plays in reading, with the goal of influencing classroom practices for adolescent struggling readers. Literature reviewed in the previous chapter provided key background knowledge used to support the following research questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?
2. In what ways does participation influence these teachers' classroom practice?

3. What aspect of this professional development influences changes in practice for these teacher participants?

This chapter focuses on the rational for selecting a descriptive case study, methods used to select participants, the role of the researcher, and data collection and processes.

Rationale for Qualitative Design

The qualitative paradigm is rooted in the philosophy of naturalism, which assumes that people are best studied in their natural settings and rejects the idea that individuals and human societies can be understood as a single, objective reality (Beaudry & Miller, 2016). The qualitative paradigm assumes that reality is best understood by uncovering how people make meaning of their situations. Qualitative studies emphasize researcher engagement; it describes phenomena from the point of view of those who live and experience them; and it depends on interpretive processes for analysis. This study is rooted in understanding ways participation in professional development increase middle school and intermediate teacher orthographic knowledge, ways in which participation influence these teachers' classroom practice, and what aspect of this professional development influences changes in practice for these teacher participants.

The natural environment for education is the classroom. It would not be possible, or ethical, to gather participants in a laboratory setting and expect to gain meaningful insight for change in knowledge, influence and practice.

Rationale for Case Study

Case study methodology is the in-depth examination of a social phenomenon carried out within the boundaries of one social system in the case's natural content (Denzin & Lincoln, 2018). A case within the study is monitored during certain periods of the phenomenon by

collecting information from several data sources such as documents, interviews, and participatory observations (Swanborn, 2010, page 13). This case study is designed to take place in a school setting among teachers of adolescent students. Throughout the study, data will be gathered and analyzed with each session resulting in multiple data points.

A descriptive case study was selected for this study. Case study lends to the discovery of contemporary phenomena in a real-world context (Yin, 2018). Traditional methods of pre- and post-assessments can demonstrate the degree of change yet may not reveal contextual conditions that could be deemed relevant to change in practice. This study is intended to increase teacher knowledge by presenting an intervention focused on orthographic knowledge using effective professional development components. Using a descriptive case study will highlight patterns that indicate an increase in teacher orthographic knowledge, changes in current practices, as well as elements that may have precipitated a change in knowledge and classroom practice. Historically quantitative research, by comparison, does not deal with the entangled situation between phenomenon and the context (Yin, 2018) thus making qualitative research more appropriate for this study.

This study used multiple sources of evidence to support a convergence of data (Yin. 2018). This descriptive case study will be used to develop an understanding of potential factors that precipitate change in participants in a real-world intervention that are too complex for survey or experimental methods. Yin (2018) noted two purposes targeted in a descriptive case study which are: 1) to describe an intervention in the real-world context in which it occurred, 2) to illustrate certain topics within an evaluation in a descriptive mode with hopes that this case study research may be used to enlighten those situations in which the intervention being evaluated has no clear single set of outcomes. This study is aligned with Yin's (2018) noted purposes. The

case will be bound by time and place, focused on one local middle school located in proximity to a large metropolitan area over a 13-week period in the current school year. The professional development can be modified to meet the needs of the teacher participants and the school.

Participants and Sampling Approach

Desimone (2011) noted collective participation as groups of teachers from the same grade, subject, or school being able to participate together to build an interactive learning community. Darling-Hammond et al., (2017) noted this type of collaboration and collective participation helps foster a strong driving force for support and risk taking. According to Creswell and Creswell (2023), purposeful sampling allows the researcher to select participants based on their understanding of the research problem and their ability to inform the study. Teachers who worked with adolescent students were sought for this study. The research suggests that greater emphasis on the instruction and assessment of academic literacies typically begins during the middle school grades (Comperatore & Hall, 2022). Adolescent readers are spending less time on learning how to read and more time reading to learn new content. In middle school, more time is devoted to contextualizing information from a variety of sources (Torgesen, 2017).

Participants were recruited with permission from the school administrator. Upon consent, participants were given a pseudonym for the purposes of this study. The professional development intervention was offered free of charge to the participating school. Participants received a copy of all course materials, including a shared text, *Word Journeys* (Ganske, 2014), as well as needed materials for implementing word sorts assessments in their classrooms. *Word Journeys* was selected for this study to be a resource for participants. *Word Journeys* is a detailed practical guide for teachers working with students in grades K-8, to assess and enhance

orthographic knowledge. It emphasizes a developmental approach to orthography and word study.

The research was conducted at a private school in Louisville, Kentucky that is adjacent to a large urban public school district, The school is accredited through the Independent Schools Association of the Central States (ISACS), which supports the pursuit of educational excellence and equity. The tuition-based school is funded by community partners, corporate sponsors and families to provide scholarships to all students attending.

The founders of the school were deeply impacted by the significant achievement gap between low-income students and their higher income peers. The school was started as an educational experiment grounded in the belief that all children can achieve their highest potential if they are provided with an education embedded with high expectations, rigorous academics, and a supportive community. Founded in 2005 serving only three middle school boys, the school has grown to serve nearly 150 male students in pre-K through 8th grade at the time of this study.

The middle school portion of the school operates as a boarding school, housing up to 45 students, during the week allowing students to leave campus on the weekend. The elementary portion of the school resembles a more traditional school format. The classes are capped at 15 students. The goal of the school is to provide a safe and structured environment for scholars in grades Pre-Kindergarten through 8th in which academic rigor, character development, and responsible action establish the foundation for a purposeful life. This school setting was selected partly because of the range of students served. The school serves both intermediate and middle school students covering the adolescent age range in this study. The school reported a 75% middle school staff retention rate with a 100% student graduation rate. Approximately 60% of the students were considered at or above grade level in math and reading.

The head of school selected six faculty/staff members to participate in this study based on the school needs and the assigned roles. Each person selected worked directly with adolescent students. Three participants were current classroom teachers. One person was assigned to be the athletic director but was daily assigned to work with small groups in reading and mathematics. The newly appointed school counselor was included in this group. The final participant was the school instructional coach.

Allen

Allen was hired as the athletic director for the school. He also serves as an interventionist for small groups of intermediate students in reading and mathematics. Allen works with students during the school day and as part of the extended school hours. His educational background has focused on students with learning behavior disabilities. He has worked at designated state agency schools as an ECE teacher with a large urban school district for about 10 years.

Beth

Beth is currently a fourth-grade teacher. She has a diverse and extensive background focusing on after-school services. In 2006 she started as an instructional assistant working with small groups of students in kindergarten through third grade in reading and mathematics. Later in her career becoming a computer lab teacher and a 21st century community learning center director serving about 170 at risk students.

Cathy

Cathy is the middle school English Language Arts teacher and the middle school instructional lead. She began her teaching career in 1995 in an elementary setting for about 15

years. She pursued a certification as a literacy specialist. She has been at the school for the past 10 years.

David

This was David's first year teaching at this school. He is a fifth-grade teacher. He brings with him 18 years of teaching experience from a local school district. Starting out as a behavior disability teacher, later moving to ECE resource, he spent the last 12 years as a fourth-grade general education teacher.

Ellen

Ellen currently serves as the instructional coach for the entire school. She is responsible for the planning and implementation of professional development as well as teacher support. She has served in this capacity for the past three years. Previously she taught out of state and within a neighboring county in the state.

Fran

Fran has been at the school nearly ten years. She has served as an early primary (1st and 2nd) and pre-K teacher. This is her first year serving as the school counselor. This role allows her to work with students and families in a different capacity. She also helps with making decisions about planning professional developments and selecting classroom resources. Fran has a background of working in early childhood education for 26 years in a local public school system.

Each participant works with adolescent students. Due to the size of the school, there is a family community climate apparent in the building. Every professional in the building seems to believe that they are responsible for all the students. There is a sense of shared responsibility and accountability. Each morning all classes start their day in a schoolwide meeting where they review affirmations, share in celebrations, and set goals for success.

Positionality

I am an African American woman with 27 years of teaching students in a large urban school district and four years of experience as an adjunct professor at a local university, created for teachers from a single school district. Twenty-one years were spent working with elementary school-aged students with sixteen of those years were spent working with early adolescent readers. Three years were spent coaching teachers to implement literacy strategies and providing interventions for struggling students from 2nd to 5th grade. The past six years I have worked with 6th grade students teaching reading and writing.

During my years of teaching, I seemed to gravitate towards those students who were struggling to read. Remembering my own insecurities of being the student who could not read drives my compassion. I wanted to teach children to read. During my teacher's preparation courses we only received cursory training on reading theories and strategies. When I became a first-grade teacher I relied on my own experience and the teacher's manual provided by the school. Students learned to read, but not all of them. The first few years of teaching led to a journey of reading acquisition.

Throughout this journey two pivotal experiences helped shape my view of the importance of reading ability. I was able to participate in two university sponsored intensive reading instruction programs, both of which allowed for a deeper understanding of the reading process. While each program had a unique skill set, both emphasized reading fundamentals. The first experience helped me better understand how people learn to read with a heavy focus on foundational skills. The other program helped shape me as a practitioner and coach by systematically introducing research, assessments, data analysis, culturally responsive practices,

and reflection to impact sustained change. These experiences have been instrumental in the way I approach students who struggle with reading.

My time spent as a literacy coach and interventionist allowed me to see readers struggling at different grade levels. This was an eye-opening experience and enabled me to see school-wide struggles. My role was to help individual students as well as influence teacher practices. When considering the strengths and weaknesses of a struggling student I sought to find a root cause instead of addressing their needs from a symptomatic lens. Starting with reading fundamentals helped me discover causes for limited comprehension. Through research and specialized course work, my knowledge about reading, research-based practices, and intervention strategies developed. These experiences provide me with a level of expertise and awareness that will support me in helping develop participating teachers' knowledge.

When coaching teachers in intermediate grades, I heard few teachers express knowledge of foundational reading skills. Teachers had evidence of the lack of student comprehension yet repeated focus on comprehension yielded few results. The teachers did not have a clear understanding of foundational skills. There seemed to be a heavy reliance on interventionist or support staff to work with students who were struggling with reading as opposed to an in-class approach. The only information or evidence provided about struggling students indicated an inability to comprehend. Therefore, additional comprehension interventions were recommended with no substantial improvement.

Throughout my teaching career I have witnessed firsthand reading difficulties among students and the subsequent manifestation of disengaged behavior. Oftentimes, I have witnessed the manifestation of behavioral issues as a way of avoiding a reading task that was too difficult for the student. I have also witnessed teachers who seemingly give up on students because of the

negative impact of their challenging behaviors. My time spent working with disengaged or struggling readers has fueled my desire to seek answers to help support struggling readers and their teachers. The feeling of accomplishment watching students reengage with reading after being disenfranchised is what fuels my passion to help students and teachers. Teachers need the skills and the understanding to give rise to change.

Role as a Researcher

Cresswell and Creswell (2023) notes that the researcher is a key instrument who designs open ended questions and does not tend to rely on instruments designed by other researchers. During this study the intervention will be facilitated by me as the research instrument. As a research instrument, I have developed the intervention based on extant research about adolescent readers, the reading process, and the role of orthography. I will also be responsible for corresponding data collection methods. Careful consideration will be needed to identify and address biases that may be caused by my instruction. I used presentation slides to create a more consistent presentation. This framework helps balance content delivery, interactivity, and reflection within a 60-minute session, maximizing impact while maintaining engagement. Sessions can be adjusted based on the needs of the participants and the school. Each session was audio recorded and reviewed after the session to check for consistency in delivery of the intervention strategies.

My previous role as a literacy coach can be helpful in viewing the big picture of implementation. Previous work training received through specialized university sponsored professional developments courses has greatly influenced the way I approach adult learning as well as reading instruction. One influence on approaching adult learning and reading has been understanding that learners are not blank slates. The knowledge and skills they bring to the table

should be honored and enhanced. I was also influenced by a capacity building model. Of course, we would want to learn a wide range of information as soon as possible, however learning content deeply can be just as effective. My final take away from the university sponsored professional development centered on pre and post assessments. Preassessment results were used to develop more effective lessons by revealing strengths and weaknesses for the learner. Post assessments provide an evaluation of instructional practices, a demonstration of learning, and guidance for next steps. Each of these practices have been reflected in the design of this study.

Assumptions and Biases

I am a firm believer that all students can learn to read. I am also aware that not all students will reach the same level of competency as every other student. Each student is unique and may require additional time, effort, and support. In my years of experience, I have noticed that most teachers feel a similar way yet, I have seen issues and concerns when the teacher's ideology and the student's ideology clash. This clash can be a result of several contributing factors (e.g., culture, experiences, values, motivation, background, rapport, perception, history, and the like). In these cases, I try to promote an asset mindset. I lean into data analysis to note strengths and build upon those skills. This shift can be promoted through critical conversations focused more on skills that are mastered according to data instead of viewing data with a deficit mindset.

I also firmly believe that all teachers are teachers of reading. I understand that not all teachers have been trained in the foundations of reading. I only received cursory training in my undergraduate program. My pursuit of a greater understanding of reading foundations led me to the understanding that I have today. I want to make sure that I am being transparent about my lack of understanding before graduate school. I want to reassure teachers that not having the

understanding at their level is not a personal deficit but more of a circumstantial oversight. Reinforcing the purposes of this study and its goals will help mitigate any gaps created by my assumption.

My role as the facilitator was that of an outsider entering an established school community. While I am an experienced teacher, I understanded that I needed to make efforts to become acclimated to their professional learning community. I established trust and collegiality early in the process by being open and honest about my experience with orthography. Each session began with a reflection of the prior session. During this time feedback was shared to help build upon the common learning community. Research-based practices focusing on culturally relevant delivery methods were incorporated to help participants connect the information shared. Models and coaching were included to reinforce collaboration and collectiveness. While the setting and participants were unfamiliar, the work of a teacher was not. Understanding the big picture of the real classroom world was leveraged in helping teachers embrace change even when there were participants who are reluctant or had drastically opposing viewpoints. When possible, the researcher actively participated in the session work to reinforce the collective bond.

The purpose of this descriptive case study is to understand the level of orthographic knowledge teachers of adolescent readers currently have and determine how the increase of such knowledge plays a role in classroom practice. During this case study, information will be gathered to explore ways classroom practices are impacted by learning more about orthographic knowledge and the significance this knowledge has on a student's ability to read and comprehend text. This study will also explore what aspects of this intervention were valued by the participants. The data collection process is designed to honor and value teachers' current knowledge and build upon their current understanding.

Throughout the process it will be necessary to be open, honest, and transparent. The goal of qualitative research is to gain meaning from the perspective of the participants. A researcher needs to reflect on their role in the study. Care must be taken to identify how the researcher's background, culture, and experiences potentially shape interpretations, such as the themes advanced and meaning ascribe to data (Creswell & Creswell, 2023). A journal will be kept to explicitly identify reflexively the biases, values, and personal background that shape interpretations formed during the study. (Creswell & Creswell, 2023).

Professional Development Intervention

This professional development intervention consisted of ten sessions meeting weekly for about one hour. Teachers were exposed to the definition of orthographic knowledge, the function of orthography in reading, and the relationship of orthographic knowledge to prominent reading theories. Teachers were then asked to assess a students' current level of orthographic knowledge using the Developmental Spelling Assessment (DSA). The DSA was used as a starting point for planning the next steps in instructional planning. Teachers were then involved in planning activities aimed at supporting struggling adolescent readers based on the acquired data. Teachers were given opportunities to share data and receive feedback. Throughout the professional development intervention research on effective practices will be highlighted to optimize teacher learning and engagement (see Table 1).

Table 1

Scope of Effective Professional Development Elements

Effective PD Element	Sessions Prominent	Activity
Content Focus	4,5,6,7,8,9	Connecting learning to specific content taught
Active Learning	1,2,3,4,5,6,7,8,9	Being engaged in activities around new learning

Collaboration	1,2,4,5,6,7,8	Working with colleagues
Use of Models	3,4,5,6,7,8	Presenter modeled examples
Coaching & Expert Support	2,3,4,5,6,7,8	Addressing misconceptions, questions, and concerns
Feedback & Reflection	2,3,4,5,6,7,8,9,10	Reflecting on learning and receiving feedback on products and questions
Sustained Duration	4,5,6,7,8	Major concepts are revisited multiple times for deeper understanding

Note. The Sessions listed are intended to be examples of intentional inclusion of the elements. Elements may be included in other sessions.

This professional development is designed to take place over ten one-hour sessions (see Table 2). The needs of the school and participants were considered whenever possible. If necessary, the timeframe could be adjusted. Sessions are designed to prioritize key points, promote active learning, and encourage peer interactions. Participants will be offered opportunities to explore practical applications of learning.

Each session is planned to have objectives and goals that will aid in learning orthographic knowledge (see Appendix A). Participants will be asked to participate in a variety of activities intended to set the purpose and objectives for the sessions. These opportunities are designed to activate prior knowledge and give room for reflections or feedback. Teachers will be asked to keep a reflection journal consisting of regular reflections and responses to guiding questions based on the sessions or readings. Teachers will have opportunities to explore the research behind the learning in a collective manner to help with creating common language and understanding among the participants. During this portion of the session teachers will be able to center their focus on the pedagogical content element of the session.

Table 2

Session Summary

Session	Summary of Session
1	• Establish a baseline of teacher orthographic knowledge • Develop a working understanding of orthography, its role and function • Establish implications for adolescent readers • Making connections to prominent reading theories related to orthography and reading comprehension
2	• Learn the five developmental stages of spelling • Highlight the unique features of each stage • Create a word sort focusing on words associated with each stage of development
3	• Teachers will be introduced to the Developmental Spelling Assessment (DSA) • Learn how to administer the screener and subsequent features • Teachers will practice administering the screener and assessments
4	• Learn about scoring the DSA • Creating individual and class profiles • Teachers will explore activities and strategies to help students learn orthographic features at and below their current level. • Teachers will use a resource to intentionally address the needs of their students
5-8	• Dive deeper into the features of letter name, within word pattern, syllable juncture, and derivational constancy word study respectfully • Developing word sorts to support students and content learning • Teachers will have opportunities to give and receive feedback about their lesson • Revisit data gathered and results from the lesson. Discrepancies will be addressed • Teachers will be provided with needs-based (data supported) lessons on orthography
9	• Teachers will be reassessed on their orthographic knowledge • Schedule an individual interview • Value voting activity based on aspects of this professional development
10	• The final three sessions will be reserved for individual interviews • Teachers will use the time to reflect on what they have learned so far • These sessions will be used for member checking and exit interviews.

- At this time participants will be allowed to express their thoughts and ideas about participation in this professional development intervention

Note. Outline noting activities by session.

Research has noted that teachers need opportunities to connect the content being taught with their own classroom setting (Doppelt et al., 2009). Content focused professional development frequently centers on discipline-specific curriculum. During the grounding activity teachers will participate in reflections, knowledge checks, share activities, and question sessions. Teachers will have opportunities to engage in effective professional development strategies to increase effectiveness (Darling-Hammond et al., 2017).

Data Collection

Data collection from multiple sources is a major strength of case study data (Yin, 2018). Multiple points of data collection have been considered for each research question in this study (see table 3). According to Yin (2009) and Creswell and Creswell (2023) multiple forms of data are imperative sources of information for case studies to provide a rich picture of the case. Each session will be recorded and transcribed using Microsoft Teams and Otter AI respectively. The sessions are planned for in-person delivery, however if circumstances warrant, they can be conducted online. Data collected is designed to inform the following questions:

(1) In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?

(2) In what ways does participation influence these teachers' classroom practice?

(3) What aspect of this professional development influences changes in practice for these teacher participants?

A preassessment at the start of the first session will be given in order to establish a baseline of orthographic knowledge. Data will be gathered from session recording and field notes, teacher work products, and reflections throughout each session. The posttest will be conducted during the final group session. The individual interviews will be conducted in the weeks following the professional development. The focus group session will occur several weeks after the professional development. Data points have been selected to correspond with the research questions session (see Table 3).

Table 3

Data Collection Type By Research Question

Data Collection	Research Question 1 In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?	Research Question 2 In what ways does participation influence these teachers' classroom practice?	Research Question 3 What aspect of this professional development influences changes in practice for these teacher participants?
Session recordings and field notes	X	X	X
Teacher session work products	X	X	
Teacher reflections	X	X	X
Individual interviews	X	X	X
Pretest	X		
Posttest	X		
Value voting			X

Session Recordings and Field Notes

Sessions were recorded for the purpose of capturing shared knowledge and understanding. Recording the sessions will allow for more accurate data collection and allow for

greater attention to details. Building trust and collegiality were an important part of this process. recording the sessions allowed for greater attention to be placed on the needs of the participants. Otter.ai (https://otter.ai/) was used in conjunction with Microsoft Teams to aid in the transcription process. Transcripts were available to share with the participants during the interview sessions to ensure accurate recording of information. The purpose of recording is twofold. First, it allowed me to actively participate in the professional development sessions without fear of missing valuable information. Second, it allowed for more effective note taking. The transcriptions were used to capture the voice of the participants that will help document changes in knowledge, evidence of practice change, and/or elements of the professional development that influences change in practice.

Teacher Session Work Products

During work sessions teachers were expected to be actively involved in the learning. Teachers were asked to create work products during selected learning sessions that serve as a demonstration of learning. This included an infographic poster displaying the components of the developmental stages of spelling, anchor charts of the components of orthographic features, and a word sort that could be used in their classroom. This presentation of knowledge is intended to showcase new knowledge, document understanding, and provide an additional data point addressing question one and possibly two. Yin, (2018) noted that documentation can help corroborate evidence from other sources. Participants will be offered a variety of forms to demonstrate their learning. Session work products from sessions were collected and analyzed for patterns and themes throughout professional development.

Teacher Reflections

The teachers were encouraged to keep a digital journal for written responses during most of the sessions (Creswell & Creswell, 2023) (see Table 4). The teachers, however, elected to keep a physical journal instead of a digital journal. The journals were collected during session nine. The journal enabled the capture of participant's words and thinking about orthographic knowledge. Data gathered noted changes in understanding, shifts in classroom practice, new understanding and information about valued aspects of the professional development. Using a journal was less obtrusive than requiring verbal responses on the spot. The journals also aided in accurate documentation of responses. At the end of each session teachers were prompted to write about their thinking and learning throughout this interventions process. Feedback was offered and selected responses were noted in the data collection process. Using a journal allowed for the gathering of evidence for each research question including teacher orthographic knowledge, possible insight of a change in practice and potentially evidence of aspects of the intervention that caused said change.

Table 4

Reflection Questions by Session

Session number	Reflection questions
2	What was something from the reading that confirmed, challenged, or changed your thinking?
	What do you currently do to teach words in your content area?
3	What is orthography?
	How has your thinking changed about how orthography impacts reading ability?
4	What are the stages of spelling development?

	What if anything shocked you while reading? Has your thinking about adolescent readers changed? If so, how?
5	What process will you use to select words for your word sorts?
	What support will you need to give your students before introducing and completing word sorts in your class?
6	How does data influence your choice of words for upcoming word sorts?
	What aspects of the professional development have been helpful so far?
7	What was something from the reading that confirmed, challenged, or changed your thinking?
	What changes, if any have you made in lesson planning or classroom routines and practices?
8	What support might you want to help you implement word sorts?
	What support or advice can you offer your colleagues about word sorts?

Pre- and Posttest

Participants were given a preassessment to establish a current level of orthographic knowledge (see Appendix B). This assessment was adapted from the assessment in the appendix of *Word Journeys* (Ganske, 2014). The assessment featured linguistic terminology focused on the basic understanding of orthography. The assessment is correlated to the content covered in the sessions and the shared text. Upon conclusion of the professional development lessons,

participants were reassessed using the same assessment during session nine. This assessment was designed to measure change in orthographic knowledge. The results of the assessments were shared with participants during the individual interviews. Also, during the individual interviews, participants will have the opportunity to elaborate on the noted change in their orthographic knowledge.

Individual Interviews

Individual interviews were scheduled to occur during session ten of the professional development. Individual interviews served to collect the individual voices of the participants. Yin (2018) highlights that interviews are vital in qualitative research because they provide direct insights into participants' subjective experiences (see Appendix C). This method helps provide evidence for all three research questions and aids in triangulating data collected from other sources. During this session teachers were asked to provide additional information as needed, reflect on their experience, and consider perceived impact of the professional development. The individual interviews allowed for a deeper understanding of participants' perspectives, thoughts, and feelings related to orthography.

Value Voting (Polling)

Instructors at Cornell (https://teaching.cornell.edu/classroom-polling-ideas) are using classroom polling in many creative ways to help students become active critical thinkers. At the same time, polling gives the ability to check in with participants, gauge interest, collect feedback, and assess understanding. The participants in the study were given an opportunity to rank the activities in the professional development from least to greatest in terms of value and given an opportunity to elaborate on their response (see Appendix D). Data gathered from the value voting activity was designed to provide a more in-depth look into what aspect of the professional

development is most valued. Results highlighted particular elements of professional development, and the activities associated with each element. This data was also used to triangulate data in this study. Results were shared to allow for member checking during the individual interview.

Data Analysis

Creswell and Creswell (2023) noted a seven-step process for analyzing qualitative data; (1) Organizing and Preparing Data for Analysis, (2) Reading through All the data, (3) Coding the Data, (4) Identifying Themes, (5) Developing a Story Line Interpretation, (6) Adding an Analytic Framework, and (7) Representing/Interpreting the Data. These steps provide the framework that will be used for data analysis.

Organizing and Preparing Data for Analysis

Participant journals and work session products were scanned, Pre and post assessments were collected and filed by participants. Interviews, work sessions and field notes were recorded, transcribed and sorted by sessions and participants. Data was first organized by session to help note any change in orthographic knowledge, changes in teacher practice, and allude to a particular aspect of the professional development that was valued. Within the session data will be sorted by the participant to help note change for the individual. Finally, the date was aligned with the research questions noting a change in teacher orthographic knowledge, their classroom practice, and aspects of the professional development that each participant valued. All information was saved on a secure hard drive and backed up on a secure external drive.

Reading through All the Data

Transcription software was used to develop accurate transcripts from the audio recordings. Once the transcript had been checked for accuracy data was read as a whole

document. Once organized, data was read multiple times to get a general sense of the information gathered. This provided an opportunity to reflect on the overall meaning presented in all collected data (Creswell & Creswell, 2023). Items, such as, general ideas of the participants, tone of the ideas, perception of the depth of responses, and the usefulness of the information were noted in this big picture reading (Creswell & Creswell, 2023).

Coding Data

Coding data is a core component of qualitative data analysis (Creswell & Creswell, 2023). Data for this study will be analyzed using an iterative process. Data from each session was organized and analyzed as an ongoing process in a timely manner after the completion of the session. The transcripts were compiled first as a whole for each session and then sorted by the individual and date. Coding is a cyclical act. Rarely is the first cycle of coding data perfectly attempted. The second cycle and subsequent cycles further manage filters, highlights, and focus on the salient features of the qualitative data recorded for generating categories, themes and concepts for grasping meaning (Saldana, 2021).

The first round of coding was In Vivo coding. In Vivo coding was conducted during the second and third overall reading. In Vivo coding allowed opportunities to capture the voices of the participants. Charmaz (2014), noted In Vivo codes aid in checking and noting what is significant to the participant. In Vivo coding uses words or short phrases from the participant's responses (Saldana, 2021). During this process data that reveals teacher orthographic knowledge, current practices in the classroom, and feelings about the professional development will be noted and coded.

Process coding was also used to draw attention to actions taken by participants (Saldana, 2021). Process coding was useful in establishing routines and patterns in addition to changes in

patterns and actions (Saldana, 2021). Processes also imply actions intertwined with the dynamics of time such as those things that emerge change or occur in sequences or become strategically implemented through time (Hennink et al., 2020). During this process data that denotes how a teacher's orthographic knowledge or classroom practice changed was analyzed.

Causation coding extracts attributes or causal beliefs from participant data about how and why particular outcomes were derived (Saldana. 2021). Causation coding attempts to label the mental models used to understand what participants believe and the causes for such belief (Munton et al., 1999). This process was conducted in three parts: (1) the antecedent or starting condition, (2) mediating variables, and (3) outcomes (Miles et al., 2018). During this process data that indicated what causes the change in a teacher's orthographic knowledge and classroom practice were analyzed. This data was tied to the activities or aspects of the professional development.

The final cycle of coding involves values coding. Values coding reflects a participant's values, attitudes, and beliefs, representing their perspectives (Saldana, 2021). A value is the importance we attribute to oneself, another person, a thing, or an idea. An attitude is the way we think and feel about ourselves, another person, a thing, or an idea. A belief is part of a system that includes values and attitudes, plus personal knowledge, experiences, opinions, assumptions, biases, prejudices, morals, and other interpretative perceptions of the social world (Saldana, 2021). This process allowed for a closer examination of opinions, assumptions, and values that the participants hold related to orthographic knowledge, classroom practices, and the professional development itself. Participants may note changes in attitudes, confidence, challenging situations, knowledge that was confirmed, and even empowerment. Once the coding

cycles are completed data will be reanalyzed to identify repeating and concurrent themes and ideas. Data was then compared to each research question.

Identifying Themes

The process used in this case study was inductive in nature. Reading data as a whole and taking notes and looking for themes allowed for the discovery of emerging themes.

Pre and post tests were scored and compiled into single and combined charts. The data was compared based on the results first by participant, whole group, and then by item assessed. Comparisons were made and reported. Data was examined considering correct and incorrect, number of blank items, items with multiple responses.

Teacher reflection journals were scanned/photographed and transcribed by session questions and participants. Once compiled the information was read and highlighted based on the three research questions.

Field notes were kept in conjunction with researcher memos. These memos were organized by date. Notes taken during data analysis were also included in the researcher's memos.

Session recordings were organized by date. Speakers were identified in the transcripts and compiled by participant. Once compiled the transcripts were read several times to gain familiarity. The transcripts were read again for each question and reviewed multiple times to help identify needed findings.

Value voting responses were averaged based on participant responses and sorted by question and then by participant. Written responses were gathered by question and sorted by participant. After the initial compiling, the data was compared considering the professional development elements and activities. Data was read compared to research questions.

During the initial reading I highlighted phrases that were associated with orthography, research, the professional development and phrases that seemed to indicate change, repeated phrases and items that seemed intriguing. This process eliminated non-essential conversation. The second round the highlighted portions were group into nine categories.

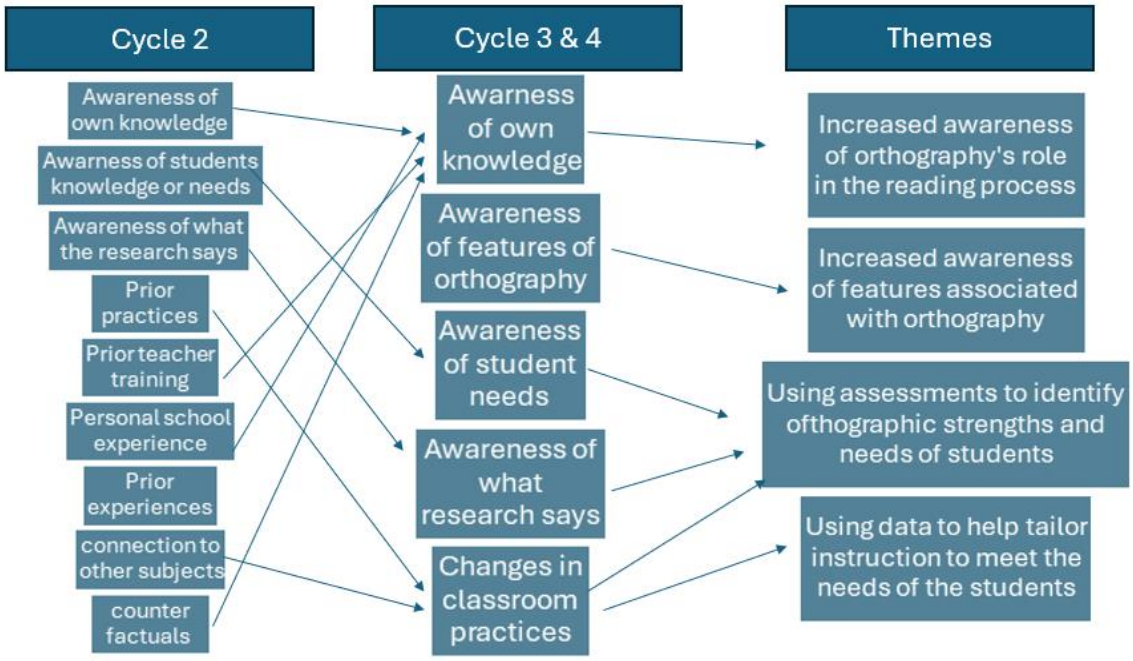
- Awareness of own knowledge- This category consists of phrases that indicated new learning, connections to things the participants were learning, and items that participants did not know.
- Awareness of students' knowledge or needs- This category included phrases that made comparisons, notations, and understandings about the students. It included characteristics about reading behaviors and writing habits or lack thereof.
- Awareness of what the research says- In this category phrases that repeated, echoed, or noted information that was presented in the text, research articles, presentations, and group discussions.
- Prior practices-This category included statements about current or previous practices. This category was included to help note a change in practice.
- Prior teacher training-This category included phrases associated with previous training that was confirmed or reiterated knowledge covered in the professional development.
- Personal school experience- this category was included to note incidences of connections to the participants' knowledge and understanding as a student considering the professional development.
- Prior experiences-Prior experiences focused on phrases that indicated teaching experiences related to orthography.

- Connection to other subjects-This category was included to capture another level of understanding by noting analogies that accurately connected to the reading process.
- Counter factual- This category included comments that noted a perceived possible change in actual conditions. This category included phrases that predicted possible changes in an if/then manner. These phrases note a hypothetical situation based on learning from the professional development.

Data was sorted into each category as it applied. This sorted by participant and then compiled and reread as a whole. After reviewing data, it was noted that all participants did not have entries that fit all the categories. Categories were reduced down to five categories (see Figure 4). Awareness of own knowledge, Awareness of features of orthography, Awareness of student needs, Awareness of what research says and Changes in classroom practices.

Figure 4

Analysis Organization and Reduction



Data was again sorted into the five categories. Items were again considered the same as before. Repetitive data was combined. Then the data was compared to the research question. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge? Teachers spoke about their own understanding (or lack of knowledge) about orthography and understanding the features of orthography. This process narrowed the five categories into two themes. Data was again sorted into ways that indicated a change in knowledge. Two themes emerged understanding the role orthography plays in reading and being able to identify features associated with orthography.

Data was reread again as a whole document. Reading back through all data, including the sorting of the nine categories and the reduction down to the five categories. This round was done with question two in mind (In what ways does participation influence these teachers' classroom practice?). Through this process two themes emerged. Awareness of students needs brought

about by giving the developmental spelling assessment and tailoring instruction based on the results of the assessment.

Question three was a little different. (What aspect of this professional development influences changes in practice for these teacher participants?) This round started with rereading through all of the data and marking phrases that mentioned the research design, one of the elements of effective development, activity, material or event. Phrases were then coded related to the seven elements of effective professional development. Elements mentioned the most were coaching and expert support, content focused, and active learning.

The design of the professional development was intended to incorporate seven elements. Each element was mentioned and evidence was collected for each element. However, not all of the elements were directly tied to the change in classroom practice. If a phrase included more than one element, then it was listed under more than one element. Then elements and statements were then compared to the actual change in practice (the use of assessments to understand student strengths and weaknesses and tailoring instruction for students).

This sorting resulted in three elements being mentioned or noted most frequently. Data from the value voting activity, session recordings, and individual interviews noted similar results. Coaching and expert support, content focus, and active learning consistently surfaced more frequently than the other elements.

Developing Interpretation

To build layers of complex analysis, the themes were interconnected with the types of data collected, the research questions, and the activities and aspects of effective professional development. This process aids in creating a descriptive detailed analysis of the data. This approach is helpful in using rich, thick description to convey findings (Creswell & Creswell,

2023). In this study the interpretation began with developing a narrative about the initial level of teacher orthographic knowledge. Data per session, participant and activity were described in chronological order ending with the final level of orthographic understanding. Data throughout this process wase correlated to the aspects of effective professional development and associated activities that may have precipitated a change in their classroom practice. Aspects of the professional development that had greater value were noted in this process. The narrative was presented along with possible implications for future studies and limitations noted in the process.

Adding an Analytic Framework

After checking for accuracy, the theoretical framework noted in this study was used to add another layer of analysis of the data. Themes, patterns, and notations were viewed in light of the conceptional framework of the premises and assumptions set forth by the Simple View of Reading (Gough & Tunmer, 1986), Cognitive Foundations Framework (Hoover & Tunmer, 2019), Reading Rope (Scarborough, 2001), and the Verbal Efficiency Theory (Perfetti, 1985) and effective professional development elements noted by Desimone, (2011) and Darling-Hammond, et al., (2017). Thus, focusing on the essential aspects of orthographic knowledge and the way in which teacher knowledge is built.

Representing/Interpreting the Data

Data were summarized and presented with noted overall findings and supporting evidence. The findings were compared to the findings in the literature. Confirming and extending data were discussed along with personal findings. Limitations and future research are included in the discussion section.

Trustworthiness

Trustworthiness has been addressed in multiple ways in the design of this case study. Construct validity is identifying correct operational measures for studying orthographic knowledge (Yin, 2018). In this study teacher knowledge was measured using a pre and posttest that assessed the ability to identify orthographic features (Ganske, 2014). The teachers were asked to produce work session products to document understanding. Microsoft Teams and Otter AI were used to help record the sessions. The recordings and transcripts were reviewed several times to ensure accurate documentation of the findings. This study has identified multiple sources of evidence to address each research question. Data focused on change in teacher orthographic knowledge, influences in changing classroom practices, and valued aspects of the professional development. Multiple sources of evidence allowed for triangulation of the data. This triangulation helped strengthen the construct validity of this study and render the participants perspective accurately (Yin, 2018). Data were read as a whole document and sorted by participants, activities, and date. As findings surfaced other data points were examined to corroborate that findings were present in more than one area. This convergence of evidence from multiple sources pointed to findings noted in this study.

Another way trustworthiness was addressed was through member checking. Opportunities for member checking will be presented during individual interviews. Member checking was used to determine accuracy of the participant's statements noted by the researcher (Creswell & Creswell, 2023). Session transcriptions and assessment results were available to participants during the interview process.

Reflexivity was helpful in clarifying bias on the part of the researcher. Self-reflection creates an open and honest narrative (Creswell & Creswell, 2023). This allowed the researcher to

make comments about how their interpretation of the findings was shaped by their background (Creswell & Creswell, 2023). These memos were collected and stored by date.

Conclusion

This chapter outlines the rationale for employing a descriptive case study. Teachers of adolescent students were selected to participate in an extended professional development designed to explore the impact of a professional development intervention with intermediate and middle school teachers' understanding of orthography its influence on classroom practices and valued aspects of the study. Grounded by reading development research this study design used effective professional development elements to increase teacher orthography knowledge and impact classroom practices to further support adolescent readers withing content classrooms.

Chapter 4

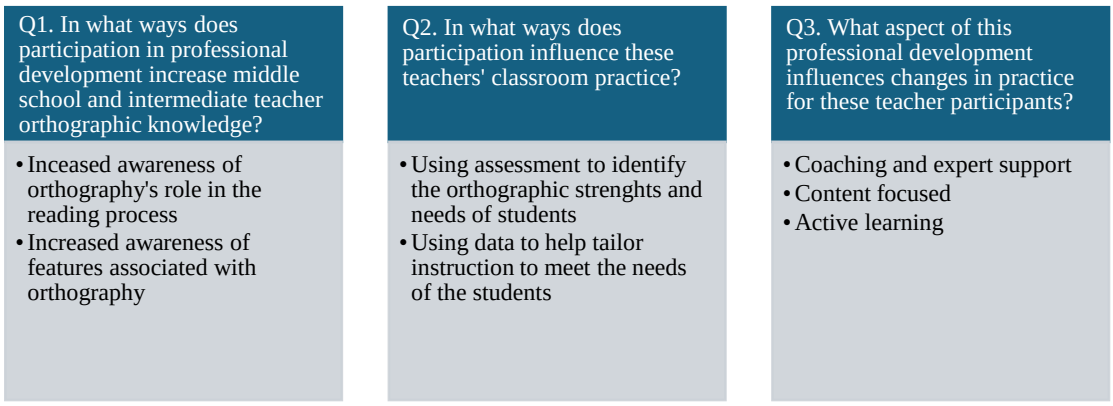
The purpose of this study aimed to deepen middle school and intermediate teachers' understanding of orthographic knowledge by engaging them in sustained, active professional development designed to enhance both their instructional practice and their grasp of orthographic concepts. The investigation was guided by the following research questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?
2. In what ways does participation influence these teachers' classroom practice?
3. What aspect of this professional development influences changes in practice for these teacher participants?

In this chapter, findings are discussed by research questions focusing on themes derived through data analysis. After analyzing the data, seven themes were noted in the findings. Research question one has two themes, research question two has two themes, and research question three has three themes. Figure 5 is a display of these themes by research question.

Figure 5

Research Findings and Themes



Change in Knowledge

The professional development significantly strengthened middle school and intermediate teachers' understanding of orthography and its essential role in the reading process. Through multiple interactive work sessions, teachers deepened their ability to identify orthographic features and recognized how orthographic knowledge supports students' reading development.

Participation in the professional development increased middle school and intermediate teacher orthographic knowledge in two ways: 1) by increasing awareness of orthography's role in the reading process, and 2) increased awareness of features associated with orthography. This increase in awareness is documented in session recordings, field notes, pre and posttest results, teacher reflection journals, and teacher work products.

Awareness of Orthography's Role in Reading

Becoming aware of orthography's role in the reading process is one way participation in this professional development positively increased the knowledge for middle school and intermediate teachers. Four of the six participants (Allen, Beth, David, and Fran) expressed limited or no knowledge of orthography at the beginning of the professional development. The other two participants (Cathy and Ellen) recalled having had experience with orthography in college coursework after the sessions for this professional development began. All six participants demonstrated an increase in the awareness of orthography's role in the reading process. Participants shared their thoughts during the sessions, individual interviews, and even in the teacher reflection journal, noting an increase in knowing that orthography is a concept that is part of the reading process.

Allen. At the start of the professional development, Allen noted, "I know very little based on the pretest you gave." During session three Allen recorded in his journal, "It's [orthography] a

system, must go through the process cannot skip a stage." Allen is referring to the role orthography plays in the reading process and the importance of navigating through each stage. During session four, Allen asked, "So when you say short and long vowel, I never think like that, I think of hard and soft." Allen was unfamiliar with the terms used to categorize vowel sounds. While covering the features of the Developmental Spelling Assessment (DSA) this concept was explained and he later concluded that, "The long [vowel]says its name." Allen was able to identify a pattern to distinguish the long and short vowel sounds. Allen spoke about attending a meeting about speech goals for a student and not quite understanding what the speech pathologist was explaining. He shared, "Her speech goal was r-controlled vowels and I was like what the hell is this." Allen made a connection while working on features including sorting r-controlled vowels from long and short vowels to a prior experience in the goal setting meeting. Allen was asked to reflect on his learning during the professional development. He recorded, "The realization that English is hard. Many rules, many contradictions/exceptions to the rule. If this is hard for me then what do I expect from my students?" Allen continued to share, "I'm learning them [rules] now because you are teaching them to me, but this is the first time." Allen's comments reflect examples of change in his awareness of orthography's role in the reading process. Allen is demonstration an understanding of ways speech sounds are impacted based on the location of the letter or combination.

Beth. During session one, Beth was recorded saying, "Obviously, not knowing anything about orthography kind of was like dropping the ball somewhere." Beth had been reading an article that discussed orthography as part of a continuum outlined by grade levels. During the first session Beth participated in a decoding activity that helped to demonstrate the role of orthography in reading. The participants had to decode the message using a partial letter symbol

key. Afterwards in a discussion the activity was equated to solving a word puzzle on a game show. At the beginning of session two Beth reported about how she had shared her understanding about orthography with an acquaintance over the weekend:

> I was like you know that's something to really think about. I said because there are only certain combinations [letter combinations] that will work. And I said once you know this like sitting there looking at it is a whole different world, because you know based on what's up there [letters present in a word puzzle] it can't be this, it can't be that. And I said just imagine the possibilities when you automatically know that there are only certain combinations that will work.

Beth shared her understanding of how orthography plays a role in reading. Understanding orthography helps readers predict and decode unknown words as they learn more about patterns in words. Beth shared, "So it [orthography] was like the little missing piece that I felt like I had all these years." Beth views orthography as the missing piece needed to help her students. Learning about orthography was equated to the needed piece to help her students' progress in reading.

David. While starting session two participants were encouraged to share their thinking about orthography so far. David shared during session two, "I don't know a lot of the background stuff [about orthography] to then be able to teach it confidently to kids. So that was kind of my not teaching this." In his reflection journal, David shared what shocked him in the reading. David recorded, "I don't think anything has shocked me more, made me realize the importance of the foundation early on. They continually reinforce those [orthographic skills] and build on those as the get older." He also recorded, "Everything in this book challenges me and my thinking. It's totally new and something I wish I would have had as a young student." David

expressed an awareness of how students continue to build on their reading skills as they grow. David expressed how orthography is helpful to students. David' s knowledge had increased compared to previous thinking.

David started the professional development with the awareness that there was some type of connection between fluent reading and comprehension. He could not express the terms or the science behind this phenomenon, but the concept was there:

> I feel like some kids are putting so much effort into sounding out words just to say the words by the time they get to the end of that sentence it didn't flow like they are used to hearing words. It is so choppy the whole time they read it just doesn't click in their mind.

David is making the connection between fluency and reading comprehension. David went on to add when it came to writing, "The spelling was so terrible it doesn't make sense." Orthographic knowledge aids in decoding, fluency, and the ability to correctly spell. David is making connections that highlight the role orthography plays in the reading process.

Fran. Fran's awareness of orthography stems from working in early childhood education for nearly 30 years. She reported, "My thinking about the ability for students to read has been enlightened with the introduction of orthographic reading, and the sequence and processes of how students obtain knowledge of letter sounds and patterns to be successful readers." Fran's experience in early childhood focused on building the reading foundation more so than explicit reading instruction. Fran wrote in the teacher's reflection journal her thoughts about the reading from the second session. Fran noted, "I was challenged with the relationship of reading, writing, and spelling connections and how orthographic knowledge is a game changer that I wish I was aware of as a first-grade teacher." Fran acknowledges that understanding the role of orthography in reading is valuable.

Fran went on to share, “I came from a teaching program that we hadn’t got to that piece yet. It was all about sight words decoding, phonics, and phonemic awareness.” Fran’s experience is limited to building the foundation for reading. During this professional development she was exposed to the reading process that builds on the foundation. She also added, “But the awakening was to see why a fourth grader should be reading here at this stage of reading when it correlates to orthographic learning and knowledge.” Fran was shocked to see the level some of the fourth graders readers. Fran also shares her learning experience during the individual interview. She shared, “I felt like an expert in early childhood. But you give me anything else it means I gotta reteach my brain and all that and that’s what this was. It’s not hard it’s just a different mindset.” Fran was learning a different perspective going from the reading foundation she was most familiar with to seeing the progression in intermediate and middle school grades.

Cathy. Cathy’s awareness of the role of orthography was evidenced in the activation of prior knowledge. During session one Cathy noted that only one of the terms on the pretest was unfamiliar while others she had just forgotten, “I’ve never heard of this word.” Cathy, expressed having been trained as a literacy specialist as noted in the teacher reflection journal, concluded, “I did all of this before and we talked about it but I don’t remember.” Participation in this professional development helped Cathy remember previous training. When asked how her thinking changed about orthography’s impact on reading ability she wrote, “Knowing the sounds made by letters and combos letter decode and comprehend.” Cathy seemed to be connecting components of the reading process covered during the professional development sessions. Even though Cathy recalled her training as a literacy specialist she noted not using the skills recently.

Cathy shared in the teacher reflection journal and again during the individual interviews that she was reminded about the elements discussed during the professional development

sessions. Cathy reflected, “This professional development had been helpful in reminding me that the old way works. I learned all of this many years ago in my literacy specialist master’s program.” Because of the training, Cathy values her previous training that still seems applicable at the time of this study. While reflecting on prior teaching experiences Cathy noted, “I got my specialist licenses, so that is why I was familiar with a lot of what you were talking about.” Cathy made connections to the work in the professional development to the training associated with her specialist degree.

Ellen. Ellen had a similar response to Cathy. Ellen recalled a case study presented in her teacher preparation course. While reading in the *Word Journeys* (Ganske, 2014) text she shared, “We did a whole case study on this in college.” She remembered when covering the administration of the developmental spelling assessment during the third session. While the experiences were not brand-new knowledge, the professional development reminded her of a previous experience related to orthography. During session two participants were asked to examine an error progression chart. This chart was comprised of a set of eight words that spanned over the developmental spelling stages, Ellen noted:

> It is really helpful to look at this [the chart displays the same word at different stages of development] like this because we’ve all seen mistakes like this. But as a teacher, you don’t necessarily know where to start, where they are in the order of spelling word patterns or word work foundational skills.

Ellen is noting the way a student spells a word as they progress across the developmental stages. The chart showed as the student moves towards mastery the ability to spell looks more conventional. Ellen wrote in the teacher reflection journal, “Eyes are open to how important this piece of data is. Having intentional ‘spelling’ tests, activities, practices, consistency w/progress

monitoring this guides interventions and small group work." Ellen is noting an instructional practice that are supportive of orthographic development across grade levels.

Orthography plays a crucial role in the reading process. Participation in this professional development increased the teachers' awareness of orthography's role in the reading process. Participants noted orthography's connection to decoding, fluency, reading and writing in addition to the importance of the progression through the developmental spelling stages.

Features of Orthography

An increased awareness of orthographic features was evidenced in the difference between preassessment and post-assessment scores. During the first session the preassessment was administered. Participants received one point for each correct identification of the orthographic feature with a total possible score of 38. Preassessment scores ranged from 10 points (26%) to 21 points (55%). The same assessment was given in session nine. The post assessment scores ranged from 19 points (50%) to 30 points (79%). The average score increased by 8 points (21.5%). Before the professional development, only two participants were able to identify at least 50% of the orthographic features. After the professional development sessions all six participants were able to identify at least 50% of the orthographic features (see Table 1). Table one provides an overview of the scores of the pre and post scores by participants. A detailed table of results is included in Appendix E.

Table 5

Pretest and Post Test Scores

Name	Pretest score/38 (%)	Posttest score/38 (%)	Amount of change
Allen	19 (50%)	21(55%)	+5%

Beth	21(55%)	26 (68%)	+13%
Cathy	18 (47%)	30 (79%)	+32%
David	14 (37%)	25 (66%)	+29%
Ellen	16 (42%)	19 (50%)	+8%
Fran	10 (26%)	26 (68%)	+42%

A positive change was noted in the overall scores of 17 (45%) items. Four items decreased by one point. The pretest showed eight items that all participants were able to identify correctly, while the post test showed 13 features identified by all participants. On the pretest there were 12 features that no one was able to identify. On the posttest there were only three features that no one was able to identify.

After completing the professional development, the post assessment results noted each participant was able to correctly identify words representing rime, an r-controlled vowel, and a compound word. Five of the participants were able to correctly identify a consonant diagraph, a vowel team, a prefix, and schwa in the second syllable. Five of the participants were also able to correctly identify at least 80% of the short vowels listed. Three of the five participants were able to identify 100% of the short vowels. At least half of the long vowels were correctly identified by five of the participants. Four of the participants were able to identify at least 2/3 of the words classified as other vowel sound category.

At least half of the participants were able to identify a diphthong, a homophone, inflectional ending, and a possessive. Increases were also seen in bound roots, suffix, words with three morphemes, vowel alternation, and eponym. A decrease was seen around phonemes (-1),

prefix identification (-1), and long vowel identification (-1). The comparison between pre-assessment and post-assessment scores revealed a marked improvement in identifying orthographic features.

Allen. Allen's pretest score was 19 items correct (50%). His post test score increased to 21 items correct (55%). Allen showed growth in the areas of identifying vowel teams, open syllables, r-controlled vowel, a word with three morphemes, a stressed (accented) second syllable, short vowel sound, and other vowel sounds. His score decreased by one point, in the areas of consonant diagraph, prefix, suffix, and long vowel sounds.

Beth. Beth scored the highest score on the pretest 21 points (55%). Her score increased to 26 points (68%) on the posttest. Beth was able to correctly identify rime, consonant diagraph, possessive, schwa in the second syllable and stressed (accented) second syllable. When Beth took the pretest she left 11 items blank. On the posttest she left 9 items blank. She did not decrease in any of the features assessed.

Cathy. Cathy scored 18 points (47%) on the pretest and 30 points (79%) on the post test. Her score increased by 32%. Cathy increased in nine areas which included being able to identify rime, inflectional ending, possessive, compound word, bound root, vowel alternation, long vowel, short vowel, and other vowel sounds. Her score decreased in the areas of words with two phonemes, vowel teams, and stressed (accented) second syllable. Cathy left four questions blank on the pretest and only one question was left blank on the post test.

David. David's score was 14 points (37%) on the pretest and increased by 11 points (29%) on the post test for a score of 25 points (66%). David increased in ten areas which included being able to identify a rime, consonant diagraph, diphthong, vowel team, homograph, homophone, schwa in the second syllable, eponym, short vowel sounds, and other vowel sounds.

His score went down in stressed (accented) second syllable. David left 15 of the questions on the pretest blank and only one question was left blank on the post test.

Ellen. Ellen scored 16 points (42%) on the pretest and 19 points (50%) on the post test. She gained points in three areas which included being able to identify a possessive, bound root, and schwa in the second syllable. She went down a point in identifying an open syllable. On the pretest Ellen left nine of the questions blank and only one was left blank on the post test.

Fran. Fran scored 10 points (26%) on the pretest and increased her score by 42% on the posttest, giving her a score of 26 points (68%). Fran had largest amount of gain. She went up in 11 areas which included rime, consonant diagraph, diphthong, vowel team, homophone, inflectional ending, schwa in the second syllable, vowel alternation, long vowel sounds, short vowel sounds, and other vowel sounds. Fran left ten questions blank on the pretest and only one on the post test.

The professional development was designed to cover the features associated with orthographic knowledge. Teachers were engaged in active learning experiences to provide multiple opportunities to learn about the features of each developmental stage. Data analysis examining pretest and post test scores support a positive change in identifying features associated with understanding orthographic knowledge.

Participation in the professional development significantly enhanced middle school and intermediate teachers' orthographic knowledge. It heightened their awareness of orthography's critical role in the reading process and expanded their ability to identify features of orthography.

Classroom Practice

The design of the professional development influenced classroom practice. Research question 2: In what ways does participation influence these teachers' classroom practice? focused on how the professional development influences the classroom. Teacher participation

influenced classroom practice in two ways: (1) using assessment to identify the orthographic strengths and needs of students and (2) using data to help tailor instruction to meet student needs. These themes were evidenced in session recordings, fieldnotes, teacher reflection journals, and individual interviews.

Assessing Student's Orthographic Needs

During this professional development the teachers assessed students' orthographic knowledge through the administration of the developmental spelling assessment (DSA). The teachers were somewhat surprised at their students' scores. Teachers expressed a variety of responses in the teacher reflection journal, session recordings, and the individual interviews.

Allen. When reviewing the results of the DSA, Allen stated, "They were a lot lower level than anticipated. I would have considered all of these kids middle of the road readers." Allen assessed the students he had in an intervention group. Allen went on to say, "They were horrendous with the spelling." Giving the DSA helped Allen understand more about the orthographic skills of the students and how they record letter-sound combinations at different developmental stages. During the individual interview Allen spoke about the impact of the assessment, "When we did the assessment the fifth graders most were at the beginning stage of decoding. I was like oh my goodness. I wouldn't know. I had no idea." Administering and scoring the assessment allowed Allen to accurately identify the strengths and needs of students.

Beth. Beth learned how to administer the DSA and immediately returned to her classroom and gave the assessment to her students. During her lunch break that very day, shortly after leaving her session, she joined the second session of the day to ask clarifying questions. She noted, "I think this is the first time that small groups actually make sense to me, and I understand what I'm supposed to do." Beth sorted the paper based on the results of the assessment. She

grouped the students and then referred to the developmental spelling stage associated with the students' score. "It is crazy like when they tell us to do small groups. I am like what the hell am I supposed to do with them when I get them in small groups because I don't know exactly depending on specifically where they are." The results of the DSA helped Beth understand which features the students needed to work on during small group instructions.

When looking at the results Beth commented, while holding a stack of papers, "I feel like I have not been teaching to the maximum, I'm saying the most effective way because there were things that I didn't know I needed to be doing for specific student's needs." Beth views orthography as a tool to strengthen her teaching. She then held up one paper, "This explains a lot of behavior." Beth was pointing to the student's score on the DSA, she added, "This is the one [student] that I've been concerned about. He actually did better than I expected him to do," making a connection to the behaviors of one of her students with the ability level noted by the DSA. Beth reflected, "Like I said that this missing puzzle piece can be something that will help their foundation." This information seemed to add the answers Beth was seeking.

Cathy. When considering the data gathered from the DSA Cathy noted that her students did better than she thought they would have done on the assessment, she reported, "I did notice that one of my kids that I thought would not do well actually did very well on this. A couple of my kids spelled words that I probably misspelled." The results of the assessment highlights strengths of her students. Cathy commented, "It was interesting to me that over all they did better than I thought. The kids that I was most concerned about did better than I thought." This shows that Cathy is noting her students may have more skills than she previously knew. This understanding was further expressed when she tried the Making Words activity (Cunningham & Cunningham, 1992) demonstrated in session seven. Cathy reported, "It blew my mind the group

that actually got it was not my high group. I was like I knew who was gonna get this. They didn't. The ones that did were average and the other one is like my lowest reader in seventh grade." The Making Words (Cunningham & Cunningham, 1992) activity is designed to provide practice for those who are approaching mastery of orthographic features. The premise of making words (Cunningham & Cunningham, 1992) is using what you know to build on smaller words until you are able to figure out the mystery word. This activity allows students to refine their strengths and progressively work on more challenging words.

David. As the professional development progressed, David started to make connections with the learning and the performance of his students. The teachers were participating in a jigsaw activity (Aronson et al., 1978) focusing on features of the developmental spelling stages. David shared from the section he was reading, "Then it [the ability to accurately spell words] becomes more about what looks right because you are going to hear it [sound patterns in words]." David was noting that, as attention is given to the sounds and patterns in words, students are becoming more aware of their predictability. David compared the description given in the book with the characteristics observed in one of his students: "He has got big words. It's always just those little words. So it reminds me of the letter name [stage]." David was referring to a student who is struggling with the different combinations of vowels sounds (vowel teams). When students are in the letter name stage, they will write the literal sounds in a word until they are more familiar with the correct patterns.

During the individual interview David recounted his experience related to the professional development. David reflected, "Like I said when I gave the assessment it was pretty eye-opening. Some of the kids I thought were lower in reading spelled higher. Some of the kids that are higher in reading spelled lower." While orthography can support both reading and

writing they do not develop at the same rate. David seems to have a better understanding of his students' abilities after giving the assessment.

Ellen. This professional development targeted middle school and intermediate teachers. Ellen, being the instructional coach, shared the information with the primary school teachers and elected to assess the elementary classes. Based on the results she grouped the students and developed a recommendation on what skills the classroom teacher should focus on next. Ellen reported, "I actually gave two assessments. I wouldn't normally but since this is the end of the year I went ahead. First, I just gave the KIDS [Kindergarten Inventory of Developmental Spelling] and the majority of the class got 30 out of 30." The administration of the Kindergarten Inventory of Developmental Spelling (KIDS) is recommended for students below first grade. The students assessed were nearing the end of their kindergarten school year. The results showed most students had mastered the skills covered on the KIDS test. Ellen elected to give the next level which was the letter name stage of the DSA.

Ellen reported, "Moving on to first grade and of course several of these kids that scored in the stage letter name are in reading interventions." Towards the end of the first-grade students should be testing out of the letter name stage and moving into the within words stage. Ellen noted the students that were already receiving interventions at the time of this study were still scoring in the letter name stage. Ellen began to consider the primary program for the school and how the students were performing. Through the assessments, the data demonstrated the spelling development of the students.

Fran. This was Fran's first year as the school counselor after working for years in the early childhood classroom. Fran's focus has been on developing foundational skills in reading for her preschool students. During the first session she shared, "One thing I do know is what

influences how early literacy development plays a huge portion of upper elementary. Because when they don't get those elementary skills, it comes out in the middle school." Fran noted the connection between the foundational reading skills and future success in later years.

Even though she was not directly involved in a single classroom she works closely with Ellen. She wrote about what was shocking in her teacher reflection journal, "I was shocked to learn how many students in intermediate grades fell in the beginning reading with orthographic skills. This had changed my thoughts and understanding of adolescent students, particularly those who struggle with reading." The assessment results shared highlighted the needs of students in the intermediate and middle school grades. Fran understood how early learning impacts reading success in later grades. Before the DSA was administered, she was not aware of the number of adolescent students who were struggling.

The DSA helped teachers identify the spelling stage of their students and increased the awareness of the needs of their students, giving teachers clarity about strengths and weaknesses and insight into some observed behaviors. Assessing student orthographic needs is one way participation influences teacher practice.

Data Tailored Instruction

Another way participation influenced changes in classroom practice was the need for tailored instruction based on the data gained through the DSA. Assessing the students highlighted the need to strengthen orthographic instruction. Teacher participants seemed to gravitate to activities to make changes to better meet the needs of the students they served.

Allen. During session seven teachers were engaged in learning about different activities that could be used to help promote word consciousness and skill transfer. While working on a Guess the Covered Word activity (Kohfeldt & Collier, 2000) Allen noted, "I think it would be

really good for our restless kiddos and our ADDs [students with an attention deficit disorder]." This activity involved interactions and quick thinking to check and recheck responses. Students are given context clues and must provide logical answers to guess the words. As they are guessing letters are revealed that will confirm or dispel their guess. Allen went on to say, "I see the value in it [orthography], and I feel like I'm confident enough to be able to use it to assist my kids next year." Allen works with intervention groups and is expressing being able to help students who need support in orthographic skills were in the past he relied on computer-based programs for remedial reading instruction.

Beth. Beth started this professional development with the desire to help her students. Beth shared, "Three individuals that I would like to assess. One in particular just because he works hard but he's frustrated. Just to get him to where he needs to be is something I really liked when I heard about it." Beth was ready to participate in this professional development in hopes of providing help and support for her students.

Beth spoke passionately about supporting her students in the upcoming school year: "It's like now going into next year I'm ready. Starting from day one to know that I need to pull these kids and this is what they need to be working on, so it makes sense." Beth is already planning to use assessment to plan instruction from the start of the school year: "I can see where I can have certain things [activities] for them and then the ones that need me more one on one can get that." Sessions four and five focused on activities that helped promote word consciousness. These activities could be used in small groups, independent centers or even with the entire class. For Beth, these sessions were clarifying: "It makes sense as to how to incorporate it into my classroom now. So yeah, I'm definitely going to use these strategies and different things and the

knowledge that I have for my kids moving forward." Several times Beth referred to orthography as the missing puzzle piece needed to help her students.

Cathy. Cathy acknowledged that the material covered in this professional development was indeed helpful to adolescent students. Cathy explained, "Well, I had a lot of background knowledge and had used a lot of this stuff in the past, but I haven't been using it as I've been teaching middle school." Cathy seems to associate the activities presented in the professional development with younger children. She went on to share, "So, it was nice to be reminded of some of the things that could help my middle schoolers, especially the sixth graders. Our sixth-grade scholars are the lowest that have ever come across at the school." This comment supports the research noting orthography continues to develop. Skill development is not bound by the age of the students. Cathy shared, "I did use several things [activities] there wasn't much of the school year left but I did use some things." Cathy reported giving the assessment screener and the feature assessment associated with the DSA. She also used the Making Words activity (Cunningham & Cunningham, 1992) with two of her classes. Participation in this professional development has influenced Cathy by reminding her how orthographic activities that could help her more struggling students.

David. David, thinking about activities that volunteers could use with students shared, "They can use things [activities/strategies] like word sorts that are beneficial to kids." This plan will help support the orthographic work being taught in the classroom and provide extra support for students. David even thought about his role as a support person conducting interventions with students in the upcoming school year noting, "Even if I'm working with a group of three, and I can put one on word sorts and I'm working with two, or I can put two on different word sorts and I'm working one on one, just figuring out how to use it to the benefit of everybody." David is

formulating a plan to meet the needs of the students in the next year. David added, “Because every teacher gets to that [point] if you are a good teacher. You’re always, how do I move this kid up? You see them struggling and you want to help but you don’t want to do it for them.” David views tailoring instruction to meet the needs of students as essential to the classroom, be that with small group interventions or with help from volunteers. Using the results from the DSA can pinpoint the specific features that need to be included in the tailored instruction.

Ellen. Ellen’s schoolwide view was noted during a one-on-one session, “So I think everybody [teachers] understands, I’m giving a spelling test on this word pattern that is taught the whole week.” Ellen spoke about sharing information with the teachers in the primary grades. Ellen also shared, “Now we are going to base the spelling test on this whole DSA data. The DSA is the purpose of differentiation.” Ellen assessed all other grade levels and classes not included in this study. During the individual interview Ellen noted, “I like this [referring to the DSA] as we don’t have an official progress monitoring tool.” Ellen went on to say, “So this [using the DSA] is a great way for us to monitor and have the same tool across grade levels. Using this I think it would offer more teacher discussion about it [reading progress].” Ellen demonstrates an understanding of the need for a universal screener and a way to monitor the progress of the students. Using the DSA as a whole school can provide opportunities to tailor instruction for all students.

Fran. Fran had a more systematic view of meeting students’ needs, she shared, “As a counselor that helps with choosing curriculum and choosing professional development and choosing resources for our classrooms to know that this [orthography] is something that is needed.” She went on to share,

> Just skimming the surface of it [orthography] just that knowledge enough is enough for me to be able to take back [to the administrative team] and say this [orthography] is needed. This is something that needs to be included and embedded into our curriculum.

Fran believed instruction inorthography should be implemented as part of the school curriculum. This mindset can help keep orthography at the forefront of conversation as decisions about curriculum are being made in the future.

Throughout the professional development the teacher participants were engaged in work sessions that provided experiences to help promote orthographic knowledge, from assessments to strategic instruction and practice activities. These activities were designed to help teachers teach orthography in their different contexts. Each of the participants noted tailored instructional changes or plans to change current practices to help promote orthographic instruction based on meeting the needs of the students.

Participation in the professional development enabled teachers to use the developmental spelling assessment to identify student orthographic needs and strengths. The data-based assessment is designed to highlight needed features to help tailor instruction and teachers saw an immediate application in their work.

Influencing Practice

The third research question for this study: What aspect of this professional development influences changes in practice for these teacher participants? sought to highlight professional development elements that supported changes in the classroom. During this study changes in classroom practice were noted in assessing student orthographic knowledge and practices focused on tailored instruction to meet student needs. The design of this study was intentionally crafted to include elements of effective professional development (Darling-Hammond, 2017).

Those elements include: (a) content focus, (b) active learning, (c) collaboration, (d) use of models, (e) coaching and expert support, (f) feedback and reflection, and (g) sustained duration. Data analysis points to three elements that were most influential; (a) coaching and expert support, (b) content focused, and (c) active learning. Information collected from field notes and session recordings, value voting, and individual interviews were used to gather insight into the aspects of professional development the teachers identified as most impactful.

Coaching and Expert Support

Data analysis indicated coaching and expert support was ranked as the most valuable element of this professional development. The professional development was facilitated by the researcher, expert in orthography and its role in the reading process. Each session included opportunities for participants to share and ask questions. Through dialogue and planned activities, the teachers were coached through the implementation for the Developmental Spelling Assessment (DSA) and activities that promote orthographic instruction. Teacher participants implemented the DSA and, with the support of the researcher, planned additional implementation of activities shared during the professional development.

The value voting activity captured participants' perspectives of the professional development design. The raw results of the question sets with participant rational responses are included in Appendix F. After ranking the professional development elements David wrote, "PD should have a focus and work to accomplish a goal. Someone leading [the professional development] should be able to provide next steps to the feedback teachers are giving." David's expression focuses on the leader (expert) having a deep understanding of the content being covered. Ellen shared a similar sentiment in adding, "Being able to support/coach and help w/process." These statements allude to the researcher's ability to coach teachers through a step-

by-step process according to the needs of the teacher. Teachers valued the researcher's ability to answer questions and clarify concepts during the sessions. Fran expressed, "If there was a question we didn't have to wait to get clarity, you were able to give it to us simultaneously as you were presenting the information." Fran recognized the importance of knowledgeable feedback.

During each session teachers were encouraged to ask questions. As teachers began to see the needs of their students in a new light, their questions related to implementing instructional strategies. Participants learned about word sorts in session four. During the discussion Allen wanted more information about selecting appropriate words to use for the strategy:

> How do you choose your [words to use for word] sorts? Do you just do it out of the content that you're covering in class like a book you're reading or like something that you've noticed that they're having difficulty with? How long would this lesson be? How much time would you devote to playing around with the words? Allen wanted details that support implementing the Making Words (Cunningham & Cunningham, 1992) activity so that students have time to explore word patterns to learn specific orthographic features.

Similar to Allen, David shared, "I wasn't sure. What do I do next with the results of the data? Do you spend more time on the kids that are needy?" The participants' questions revealed their need for guidance to help with implementing what they were learning. Using teachers' questions and feedback, I was able to understand the needs of the teacher to adjust the coaching and support.

Ellen frequently sought guidance in developing protocols for the entire school. Ellen asked, "Is there a set number of words kids need to see [to learn the pattern of feature]?" Ellen's questions refers to the number of exposures to a feature that are needed to achieve a level of

mastery. Ellen also added, “My question is right now our [intervention] groups are based on the MAP (Measure of Academic Progress assessment) data, should we adjust the groups based on the DSA results?” Because of her role, she began considering a new school wide approach to grouping students for intervention supports instead of individual classroom implementation. Ellen inquired, “Do you think that the routine that we talked about [introduction, sorting, hunting of harvesting words in a familiar text, recording, and then assessment through dictation] is a good routine for teachers to implement?” Again, Ellen’s questions indicate her goal to provide guidance to teachers who did not participate in the study. She wants to help these classroom teachers implement word sorts in their instruction. The role of the researcher included not only content expertise but also being able to respond to participants’ questions as their understanding of orthography progressed.

Content Focused

Content focused was ranked as the second most valuable aspect of this professional development influencing change in classroom practice. The professional development was designed to show the role of orthography in a systematic format by starting with the process of reading, prominent reading theories, and research noting the importance of orthography. As the professional development progressed the content became increasingly more relevant to the teachers. Once the teachers saw the content as relevant (session 4), the learning was more meaningful. Session three focused on learning how to assess student orthographic knowledge using the developmental spelling assessment (DSA). During session four, as teachers looked at the results of the assessment, overwhelmingly they reported shock at the results, discovering their students scored lower than expected. With these realizations, teachers seemed to shift from compliant participants to engaged consumers. The DSA results demonstrated the need for this

work. As the professional development continued the focus of the content seemed to shift from "What is orthography?" to "How can I support my students?" Seeing the data created buy-in and more intentional engagement in understanding the role of orthography in the reading process.

Ater the realization of student needs, teachers became more interested in the activities that help students learn orthographic features. Understanding how the students performed on the DSA seemed to be the driving force for the remainder of the professional development and influenced changes in classroom practice. Allen stated, "Understanding student data is paramount, because I must understand before identifying the correct tool to best assess," and Beth shared, "Knowing student data is important to me because it helped to explain some of the issues that I have been seeing with student achievement in reading and writing." Cathy also reported, "Student data is vital to planning instruction using differentiation" and David shared, "You have the analyze the data before you can come up with a plan to help." Implementing and analyzing the DSA results provided teachers with the data required to plan for tailored instruction. Knowing student's strengths and areas for growth helps with planning activities that reinforce current skills, addresses needs, and moves students to the next level. When teachers know what students are able to do, they are better able to provide the support needed to strengthen and challenge students. Ellen shared, teachers "Need to know about DSA and why this and what we will ultimately use it for to be motivated to use it." If there is no relevance or connection to the content, then learning becomes increasingly difficult.

As the professional development continued, the teachers seemed to internalize the role orthography plays in reading. This was evidenced as the teachers began to reflect on their own school experiences related to reading. They began to see how orthographic knowledge might have impacted their own school experiences. David candidly shared:

> I think there's a lot of stuff [orthography] I didn't know as a kid, which hindered my reading. I was a struggling reader my whole life. This is exactly how reading was for me as a kid. Like how everybody gets it but I don't understand what's going on.

David is reflecting on his experience as a struggling reader, noting how his reading was hindered as a child and may have been impacted if he had a better understanding of orthography. Allen shared, "I went to a Catholic school. The teachers weren't stressing this stuff [orthography]. When I got to high school, I was like: What the hell is this?" Allen posits that knowing orthographic features could have helped him during high school, recognizing that orthographic development extends into high school and beyond. Beth reflected,

> I really feel like, if my teachers had this knowledge, that would have help me be a better reader or have a love and a passion for reading. I'm a book collector. I got a whole lot of books that I would love to read, but I don't have that passion and love for reading, because I felt like it was always such a chore, and I didn't get the reading for pleasure thing.

These reflections attest to the personal meaning teachers constructed, making connections to their personal experiences as children and the young people. For some participants, orthography became personally relevant.

Active Learning

The third most valuable aspect of the professional development is active learning. Each session of this professional development was designed with active learning in mind. Active learning was incorporated through structured collaborative discussions to facilitate content understanding, having teachers experience activities as students, and practicing strategies in the

One of the activities included in this professional development included jigsaw activity (Aronson et al., 1978) reading research articles and selected sections of the Word Journeys (Ganske, 2014) text. The structured collaborative discussions is designed to promote deeper comprehension by allowing participants to focus on a portion of the content and sharing their section with the other participants. The use of this strategy engaged teachers in empirical research to deepen their understanding of the reading process.

The jigsaw (Aronson et al., 1978) structure led to important realizations about reading. Cathy noted,

> I think it's interesting that this is really the stage where kids are learning to read for pleasure and how it goes together and how they're not going to grow unless they can find the book that is engaging that they can read successfully.

Cathy was surprised that students started to develop reading for pleasure before middle school. Beth reported, "My article was talking about the continuum of literacy development. I guess the biggest thing I can say is in this it talks about it moving along the continuum from phonologically to orthography." introducing orthography's role in the reading process. Fran added to the conversation with a different article by sharing, "One thing I did learn in this article was that spelling instruction leads to more development of their reading skills." Allen noted the progression of orthography as students grow, "So they spell by using the dominant letter sounds and then they start incorporating other letter sounds." David chose to read an article about invented spelling and shared, "That's interesting because this article talks about invented spelling as being part of the developmental process. I never really understood where the cut off should be." Ellen chimed in sharing, "Invented spelling is super helpful because you can see what sounds they know. Invented spelling is more about what sounds they are hearing." Through the

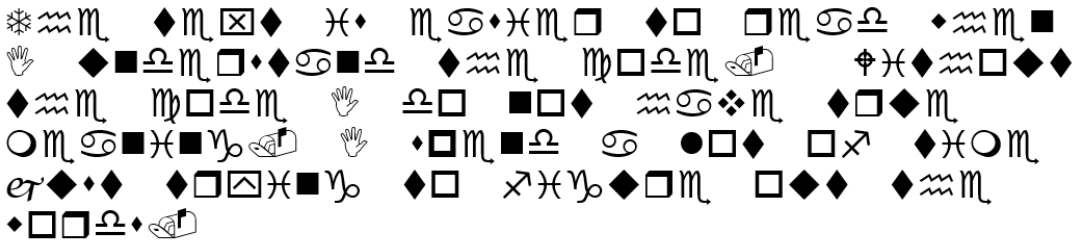
collaborative conversations the teachers were able to discuss and share aspects of the content in a multifaceted manner. Participants read, synthesized and discussed the content read instead of passively receiving information about the role orthography plays in reading.

This study purposefully engaged participants in styles they were encouraged to try with their students. Teachers were able to take on the role of a student when learning about the activities. David shared, “I am a visual learner, just like my students, I like to see a visual to help support them when learning something new.” Participants experienced a decoding activity, guessing the covered words (Kohfeldt et al., 2000), in addition to learning to give the developmental spelling assessments before being encouraged to implement the activities in the classroom.

During each session teacher participants were asked to interact with content. In session one a message was presented to help the teachers understand the struggle of decoding. The teachers were given a key that helped identify the letter symbol correlation (see Figure 6).

Figure 6

Example of Activity to Demonstrate Decoding



Note. The message reads: The text is easier to read when I understand the code. Without the code I do not have true meaning. I spend a lot of time just trying to figure out the words.

As they worked together Allen shared, “The mailbox is a period.” Beth responded, “The text is easier to understand. It’s crazy it is like I could literally see understand.” Beth was able to figure out the word by decoding the message. Using symbols instead of letters forced the teachers to figure out the letters before they were able to identify the word and helped them understand the experience of a struggling reader. Modeling activities and giving teacher opportunities to engage in the learning as a student helps teachers adjust instruction according to the appropriate level of challenge.

In addition to experiencing activities as the students, the teachers were provided time to practice the activities. Allen noted, “The whole ‘See/Say/Do’ principle at work, actually practicing these activities prior to implementation, is of most value to me.” Practice allowed him to ask clarification questions about implementation: “So are these strategies more appropriate for different situations?” He even noted preferences, “I am thinking the open sort would be better. I’d have a better understanding of how they’re [students] thinking.” These comments indicate Allen’s thinking about and planning for implementation in his own class. Beth added, “Being able to practice activities before implementing is important to me because I feel that small group planning and implementation has been an area that I need to grow.” Beth went on to share, “I feel like I can trust the process. It is one thing to have the manual but if you’re not understanding how it applies and connects with other things. I felt like I was on a hamster wheel.” Beth appreciated having time to practice the strategies. During the individual interview she was excited to shared, “I’ll put my razzle dazzle with your razzle dazzle and we are going get them up and out!” Beth was excited to have a plan for her students to move them forward and out of interventions. Ellen shared, “[There is a] need to practice learning, know what to do how to prep/plan, have examples to pull from, then after actual implementation having opportunity for

questions and reflection," emphasizing the cycle of learning. Teachers valued the opportunity to practice the learning for themselves, in order to plan more effectively with their students in mind.

This study used active learning as an invitation for teachers to design and experiment with instructional strategies themselves, giving them firsthand experience with the types of learning they can create to help students develop orthographic knowledge. This approach to professional development focused on interactive tasks, and other hands-on methods that anchor learning in real classroom contexts in an attempt to make learning relevant and meaningful. Coaching and expert support, content focused material, and active learning experiences provided opportunities for teachers to recognize the relevance of orthography and apply new strategies in their classrooms. The design of the professional development allowed teachers to experiment with instructional approaches, make informed decisions, and create plans for their students.

Conclusion

This chapter focused on the findings obtained during the implementation of professional development sessions. This study deepened teachers' understanding of orthography and the important role it plays in the reading process. Through sustained, interactive professional development sessions, teachers strengthened their ability to identify orthographic features and recognized how orthography connects to decoding, fluency, reading and writing. Using the developmental spelling assessment further expanded their knowledge by helping them analyze student strengths and needs. Teachers reported making intentional instructional shifts based on what they learned. They planned or implemented tailored orthographic instruction aligned to student needs, used assessment data to guide decisions, and incorporated new strategies that supported students' reading development. The hands-on nature of the profession development encouraged teachers refine instructional approaches that were relevant to their classrooms.

Chapter 5

This qualitative descriptive case study was designed to position orthography as a foundational component of reading development (Share, 1995; Ehri, 2014; Conrad & Deacon, 2022) and to introduce this construct within a structured professional learning experience for teachers of adolescent readers. Guided by established features of effective professional development (Darling-Hammond et al., 2017), participants engaged in a ten-week embedded professional development intervention intended to deepen their understanding of orthography and its role in adolescents' reading processes. Collaborative activities and shared analyses were incorporated to support collective inquiry and application. Research has demonstrated that teachers with strong content knowledge, pedagogical knowledge, and specialized literacy knowledge exert the greatest influence on students' reading outcomes (Piasta et al., 2009).

Participants for this study were recruited from a private preparatory school serving male students in grades Pre-K to 8th grade. The school prides itself on developing a family-like culture taking ownership of all students. The teachers selected for this study taught adolescent readers. The six participants selected by the head of the school consisted of both intermediate teachers, the middle school English Language Arts teacher, the upper school interventionist, instructional coach, and the school guidance counselor.

The design of this study included two components. The first component centered on the essential role orthography plays in reading and the second component looked at professional development elements that expand teacher knowledge. Participants were guided through an introduction to prominent reading theories to practical application noting the role orthography plays in the reading process. This study sought to enhance middle school and intermediate teacher's understanding of orthography and the crucial role it plays in the reading process by focusing on the following research questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?
2. In what ways does participation influence these teachers' classroom practice?
3. What aspect of this professional development influences changes in practice for these teacher participants?

Review of Findings

Analysis found that teachers increased their understanding of the role orthography plays in the reading process and increased their ability to identify features associated with orthography. Analysis further revealed classroom practices were influenced through the analyzation of orthographic assessments where teachers discovered the needs and strengths of the students. Tailored instruction was then based on the new knowledge instead of perceived understanding. Analyis also noted coaching and expert support, content focus, and active learning as influential elements leading to change in classroom practices. This chapter focuses on a discussion of the findings, implications for practice, limitations of current study, and recommendations for future research.

Significance of Study

This study was derived from concern about the National Assessment of Educational Progress (NAEP) reports that 31% of fourth grade and 30% of eighth grade students score at or above proficient (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2024). This statistic indicates that two-thirds of the students are scoring below proficiency. During this study teachers were presented with information that showed reading as a synergistic process with orthography as a key component. Orthographic knowledge is the knowledge of the underlying sound (alphabetic), pattern, and meaning

relationships in the English spelling system that enables children to become more fluent readers and writers (Carlisle, 2010; Ehri, 2000; Graham & Hebert, 2010; Moats, 2005; Snow et al., 2005). Prominent reading theories such as Simple View of Reading (Gough & Tunmer, 1986), Cognitive Foundations Framework (Hoover & Tunmer, 2019), Reading Rope (Scarborough, 2001), the Verbal Efficiency Theory (Perfetti, 1985), and the Four-Part Model of Word Recognition (Seidenberg & McClelland, 1989) point to decoding/word recognition as an essential component of reading comprehension. These theories demonstrate clear connection between word reading fluency and reading comprehension (Hoover & Gough, 1990; Kim et al., 2012; Schwanenflugel et al., 2006). The results of this study demonstrated the possibility of a professional development design that helped teachers understand orthography and the role it plays in the reading process, thus demonstrating potential support for adolescent struggling readers.

The findings in this study confirm the need for teachers to understand the role orthography plays in the reading process, and that this knowledge can be gained from professional development that targets orthography. Understanding the role orthography plays in reading enabled teachers to consider the needs of the adolescent readers differently. Students may struggle with comprehension for several reasons. If teachers understand how orthographic knowledge impacts students' ability to comprehend, they are better able to address the needs of the students by focusing on more than comprehension skills. During this study teachers reported comprehension was an issue being addressed in the current intervention groups. Additional concerns were expressed noting the amount of effort given by students with seemingly little results. Reading seemed laborious for these students. Research notes that students that are not fluently reading often lose the meaning of the text (Shankweiler et al., 1995). Laboriously

exhausting reading will continue to be a hindrance unless the underlying issues are addressed (Paige & Magpuri-Lavell, 2014). Prior to the intervention, the teacher participants in this study were focusing on the lack of comprehension without considering orthographic impact. Findings describing increases in teacher awareness of the role and features of orthography addressed a gap in participants' knowledge of the reading process and the needs of adolescent readers.

Participants in this study confirm the findings of other studies pointing to the need for teacher orthographic knowledge to help support students. Studies have shown that teacher knowledge is an important part of student learning (Brownell et al., 2016; Lane et al., 2008; McCutchen et al., 2002, 2009; Piasta et al., 2009; Spear-Swerling & Brucker, 2004) and that not all teachers have the knowledge needed to teach reading (Otaiba et al., 2019; Lyon, 1998; Pittman et al., 2019). Research supporting evidence-based reading practices may not be included in teacher preparation programs, school curricula, or even professional development (Moats, 2020; Solari et al., 2020). Findings using pre and post assessments demonstrated that the teachers in this study did not have a solid understanding of the features of orthography despite having taught for a number of years (18 years on average).

This study contributes to the extant literature by emphasizing the need for orthographic knowledge as an essential part of the reading process. Findings related to this study continue to point to the pivotal role of teacher knowledge. Teachers with an understanding of the role of orthography in reading are better able to incorporate strategies to help students as they navigate more complex spelling patterns in reading. As noted in this study, the teacher participants demonstrated a change in their understanding of the role orthography plays in the reading process, confirming the need for teachers to understand the role of orthography in this process.

Change in Teacher Knowledge

Findings noted in this study were congruent with the literature presented in Chapter 2 related to orthography's impact on adolescent readers. This study was designed to add to the current body of literature related to the struggles of adolescent readers by continuing to highlight their literacy needs. During adolescent years of education instructional time is spent on developing and accessing academic literacies (Comperatore & Hall, 2022). Students at this age have more challenging text to navigate through. Time spent reading focuses more on comprehension of the content and bolstering their knowledge base instead of being able to accurately identify each word written on the page (Fisher et al., 2022). Students are expected to use their ability to read to evaluate, critique, and classify information to make sound claims and arguments (Moje, 2015). Expectations for adolescent readers shift from learning to read to using the ability to read to learn new information. Students with reading deficits will struggle to understand the increasingly complex text presented in middle school (Moats, 2020). Students who are not proficient readers read less than their counterparts and do not have equal access to the core content (Coggins, 2023). Teachers of adolescent students spend more time on content than they do on teaching foundational reading skills.

This is an important finding as research notes teachers with deep knowledge will be better equipped to make sound instructional decisions based on the needs of the students (Reutzel et al., 2016). Research has revealed that many teachers feel insecure in their knowledge of the spelling system and in how to teach spelling (Gill & Scharer, 1996; Moats, 1995; Johnston, 2000; Pitman et al., 2022; and Pitman et al., 2023). This sentiment was noted during this study as teachers revealed they did not have a solid understanding of orthography and the role it played in the reading process; four of the six participants (Allen, Beth, David, and Fran) expressed limited or no knowledge of orthography at the beginning of the professional development. After the

intervention, teachers expressed more confidence in teaching their students about orthography. The findings in this study confirm the need for teachers to develop strong understanding of orthographic features and the role of orthography in the reading process.

Influence in Classroom Practice

Peltier et al., (2020) and Spear-Swerling and Brucker, (2004) both noted a statistically significant, positive correlation between preservice teacher's knowledge of foundational literacy skills and tutored students' growth in foundational reading abilities. Teacher knowledge can have a positive effect on quality teaching. This study intentionally targeted the learning of orthographic features to help build teachers' knowledge of the developmental stages of spelling. The assessments in this study help pinpoint where the students fell on the spelling development continuum. Teachers with a strong understanding of where their students are developmentally, will be able to provide appropriate support to foster orthographic growth.

At the time of this study the school was using an assessment focused on comprehension and vocabulary skills to dictate reading intervention groups. Students were placed based on needed comprehension skills. Teachers expressed frustration in the lack of progress the students made in the groups. Some chose to abandon small groups all together. As part of this professional development teachers assessed the students' orthographic knowledge. using a dictated spelling inventory. Results revealed a clear mismatch between teachers' expectations and students' actual performance. Many teachers anticipated that their students would score higher, and several expressed surprise at how many students were identified at lower developmental spelling stages than they had assumed. Administering a dictated spelling inventory like the DSA (Ganske, 2014) allowed for the discovery of students' understanding about words (Perfetti, 1992; Bear, 1992). Increased understanding about the developmental

nature of spelling and the importance of orthographic knowledge in reading and writing have led to more child-centered instruction (Bear et al., 1996; Bloodgood, 1991). Students with weak reading skills have far fewer chances to close achievement gaps once reading is no longer taught as its own subject. Those who enter middle school with low reading self-efficacy are especially unlikely to strengthen their skills without targeted, explicit instruction (Wigfield et al., 2008). Concerted intentional efforts must be made in order to make positive changes in reading instruction for adolescent students. Teacher participants expressed a greater confidence in tailoring instruction after administering the DSA and tailoring instruction to meet the orthographic needs.

Effective Professional Development Elements

Professional development offered to teachers should result in higher quality instruction (Gess-Newsome et al., 2019). Kostina (2015) noted effective professional development aimed at lifelong quality teacher development is a vital component for academic improvement. Both Desimone, et al., (2002) and Darling-Hammond, et al., (2017) noted professional development models that resulted in positive outcomes for students. The design of this study focused on the incorporation of the seven elements of effective professional development, noted by Darling-Hammond, et al., (2017): (1) content focus, (2) active learning, (3) collaboration, (4) use of models, (5) coaching and expert support, (6) feedback and reflection, and (7) sustained duration. While all seven were strategically included in this study, coaching and expert support, content focus, and active learning were most noted by participants as influential in changing classroom practices. This study confirms the importance of these elements in effective professional development and questions the assumption that all seven design elements contribute equally to teacher learning and instructional change. Although each element was intentionally embedded in

the professional learning model, the findings raise questions about whether certain components exert a stronger influence than others or whether their effects can be meaningfully disentangled. The analysis also prompts consideration of whether a particular level or "dose" of each element is necessary before measurable changes in practice emerge.

This study adds to the literature base by confirming the role of coaching and expert support to build teacher capacity. Research supports literacy coaching effectiveness in helping teachers implement instructional practices and meet the needs of their students (Glover, 2017; Vernon-Feagans et al., 2018; Di Domenico et al., 2018). Coaching and expert support in this study was conducted solely in the professional development sessions. Teachers engaged with research that established the importance of orthographic knowledge, received targeted feedback, and were given structured opportunities to reflect on their instructional decisions. They were equipped with the materials to assess students and provide word study instruction. Participants were also guided to analyze student data in order to construct individual and class profiles that could inform responsive planning. Coaching and expert support played a critical role in navigating content, implementing the DSA, interpreting student data, developing relevance and learning strategies to strengthen orthographic knowledge. Most of the participants in this study did not have formal training in teaching orthography. The researcher, an expert, provided specialized knowledge, precision, and instructional judgment. Teachers benefited from having an expert that could build conceptual clarity, model instruction, and ensure the work is aligned with research.

Content focus was rated as the second most valuable element associated with a change in classroom practice. Darling-Hammon et al., (2017), noted that teacher professional development that is context specific, job embedded, and content based is particularly important for addressing

the diverse needs of students (and thus teachers) in differing settings. Teachers need the content to connect to the context of their classroom. The inclusion of the DSA and corresponding analysis made a profound impact on the relevance of orthography to teachers. The teachers' attitude towards orthography became more urgent as they noted the needs of their students. The teachers in this study were cordially compliant before implementing the DSA. Upon examining student results, they became more aware of unmet learning needs and became interested in changing practice. The findings of this study confirm that when professional development is considered relevant and authentic, improved learning and practice is more likely (Hunzicker, 2011).

The third element that influenced classroom practice was active learning. Active learning helps teachers synthesize the new learning and promotes transformation (Darling-Hammond et al., 2017). Park and Xu (2022) reported an increase in the variety of activities in classroom practices after being exposed to courses classified as active learning as opposed to a lecture intensive. The design of this professional development was intended to promote the use of the activities in the classroom. The participants were engaged in activities that allowed teachers to analyze, try out, and reflect on new strategies. Teachers expressed value in being able to experience the activities before attempting to implement the activities with their students.

While participants did not note sustained duration as a valuable component of this professional development, this professional development was strengthened by having multiple sessions. This work could not have been completed in one session or fewer sessions. Having time to learn the content in manageable portions allowed for multiple exposures and opportunities to adjust to meet the needs of the teacher learners. The role of sustained duration

calls into question whether the seven elements of effective professional development work in tandem or if they can be isolated.

This study corroborates the findings covered in the elements of effective professional development (Darling-Hammond et al., (2017). Providing experiences that encouraged implementation supported by coaching and expert support influenced changes in classroom practices. Diving into the role of orthography through coaching allowed the relevance of the content to resonate with the participants. As relevance grew the teachers focused more on tailoring instruction to meet the needs of their students. The findings in this research add to the literature base by emphasizing the components coaching and expert support, content focus, and active learning. Change in teacher knowledge could not have been achieved in a single session. Teachers needed time to digest the content, spotlighting the role of sustained duration.

Implications for Practice

The findings of this study have implications for building teacher knowledge to influence classroom practice and the components of effective professional development. Building teacher knowledge can be accomplished through teacher preparation programs at the university level or through effective professional development at the school level. Teacher preparation programs would be strengthened by including instruction on orthography and its role in the reading process for all teachers, especially for those preparing to teach adolescent students. In many secondary settings, teachers are neither provided with nor required to attain the extensive grounding in reading theories that characterize the preparation of primary teachers and literacy specialists, leaving gaps in their understanding of how reading develops. Reading is heavily dependent on the ability to accurately identify words. This process develops through adulthood (Ganske, 2014). Teachers of adolescent students could benefit from understanding the role orthography

plays in reading to help support students as they navigate more complex texts even in non-ELA content classes. Teachers of any subject could use strategies associated with promoting word consciousness that aid in orthographic understanding. Providing preservice teachers with foundational reading knowledge will allow teachers to effectively support readers who struggle or may have gaps in reading skills. Peltier et al, (2020) and Spear-Swerling and Brucker, (2004) both noted a statistically significant, positive correlation between preservice teacher's knowledge of foundational literacy skills and tutored students' growth in foundational reading abilities. Teachers with greater knowledge were better able to provide targeted explicit instruction with accuracy and efficiency.

The design of the professional development is just as important as the content being covered. Myhill and Newman (2016) observed that when teachers have limited access to professional development that builds substantial content and pedagogical knowledge, they often lack the expertise needed to design coherent, supportive instruction that fosters increasingly sophisticated student understanding. Similarly, Mantei and Kervin (2020) noted that without professional learning opportunities that develop the considerable expertise required in both content and pedagogy, teachers' knowledge and instructional skills remain constrained. A lack of sustained, high-quality professional development can therefore hinder teachers' ability to address students' misconceptions and to extend their content-related learning. Administrative teams at the district level (or at least at the school level) should consider content relevance, learning engagement, and coaching and expert support when designing effective professional development. The content being covered needs to be relevant to the school context and the work of the teachers. The professional learning offered should be tied to the needs present in the classroom, for teachers to view the learning as necessary. Teachers should be engaged in active

verses passive learning and coaching and expert support should be readily available to aid in implementation. When possible, collaboration, use of models, feedback and reflection, and sustained duration should be embedded in professional learning to support coherent implementation and to provide the time necessary for these elements to meaningfully influence classroom practice and deepen teacher learning.

Limitation of This Study

This study has three limitations. The context of this study is based on a private preparatory school. The class sizes are lower than those found in most public schools, allowing for greater sense of shared responsibility of the students. Many of the staff members in the school wear multiple hats. While all of the participants were from the same school setting not all were classroom teachers at the time of the study. Three of the participants in this study were full-time classroom teachers. The other participants had regular access to the students in different capacities. One participant was the athletic director who was also assigned to be the upper school interventionist. The school counselor and the instructional coach were also included in the study. It was not uncommon for the counselor, instructional coach, and interventionist to cover classrooms or to push-in for academic support. These conditions are not readily found in public school settings and may even be different from other private school models.

Another limitation with this study is acknowledging the complexity of reading. This study focuses on orthographic knowledge, which is an aspect of reading development. Orthography alone will not guarantee reading success (Ganske & Heller, 2022). While during this study orthography was noted as an area of focus to help support students, comprehension skills should be explicitly taught. Finally, while teachers' orthographic knowledge was measured through pre- and post-assessments, students were not assessed after teachers attempted the word

work activities. Although increases in teacher knowledge were documented, no student data were collected to determine whether these gains translated into improved reading or spelling outcomes.

Another limitation of the study is classroom observations were not included, and no follow-up component was built into the design to capture how teachers used the materials or whether students engaged with the word work activities. Although teachers retained all professional development materials, no data were gathered to confirm their use, and in-classroom coaching was not available to support or refine implementation. This study relied on teacher self-reporting. Participants indicated that they administered assessments, however, the researcher did not review student work or verify scoring accuracy. Coaching conversations were therefore grounded solely on the information teachers chose to share. While administration and scoring procedures were reviewed during the professional development sessions, teachers were not required to demonstrate their implementation, leaving open the possibility that assessments were conducted without complete accuracy or unintentional errors produced significant inaccuracies. In the absence of a fidelity protocol, consistency of implementation cannot be determined. Similarly, the instructional changes teachers described were based on planned intentions rather than observed classroom practice. Because the study concluded before the start of the following school year, the researcher did not collect evidence of actual implementation, nor was fidelity of instructional change documented.

Recommendations for Future Research

This current study could be extended by looking at the timing of implementation. During the individual interviews, multiple participants mentioned wishing the timing of the study could be extended or started sooner in the year. This study started in the second semester of the current

school year. Future research could be conducted considering the impact starting the study at the beginning of a school year. Participants would attend the professional development starting before the school year began and continue throughout the school year. This could potentially provide teachers with additional time to develop a deeper understanding of orthography features and refine implementation. The extension of time could be conducted with weekly sessions over several months allowing for more time to delve deeper into the research, materials, and student data. Another option would be to continue with the initial ten weeks and add periodic follow-up sessions throughout the school year. Each option would provide additional support for students and teachers and allow for more nuanced understanding of teacher growth.

Another suggested study would be the addition of in classroom coaching. During the individual interviews teachers suggested having lessons demonstrated for them in an actual classroom setting. This extension would allow for more opportunities to refine implementation practices. In classroom coaching would help support implementation by way of modeling strategies learned in the sessions with the students, providing actionable feedback, and being able to build on teachers' strength. Being able to have conversations around implementation would strengthen collaboration and cohesiveness in supporting students. Adding the classroom observation component would allow for more opportunities to understand the classroom dynamics, the fidelity of instruction, help fine tuning tailored instruction.

Teachers were asked to assess students during the time of this study and were not expected to reassess the students. Reassessing the students would be instrumental in determining student growth. This study could be extended with student progress monitoring over the course of the school year or multiple years. Students would be initially assessed, taught needed features to strengthen their orthographic knowledge, assessed for mastery of skills for each

developmental stage, and then reassessed to determine new developmental spelling stage. Information for progress monitoring could be used for further refinement of classroom practices and tailored student needs. Additional opportunities to analyze student work may strengthen the literacy program for the entire school by monitoring student progress over time.

Conclusion

In conclusion, this study serves as an addition to the body of research that focuses on supporting and strengthening adolescent readers through teachers understanding of orthographic knowledge and effectively designed professional learning. This professional development intervention sought to increase teachers' orthographic knowledge by using a conceptual framework comprised of two major components orthographic knowledge (the central content focus) and the processes through which teachers develop professional knowledge (the design focus) were aligned with prominent theoretical models. The professional development learning experience was intentionally structured to answer the following questions:

1. In what ways does participation in professional development increase middle school and intermediate teacher orthographic knowledge?
2. In what ways does participation influence these teachers' classroom practice?
3. What aspect of this professional development influences changes in practice for these teacher participants?

As noted in the findings, the intervention deepened middle school and intermediate teachers' understanding of orthography and its essential role in the reading process. Through sustained, active engagement in collaborative learning tasks, and targeted assessment, participants strengthened their awareness of orthography and improved their ability to identify orthographic features. Teachers developed an awareness of evidence-based insights into

students' strengths and needs and began considering ways to tailor instruction to better support their learners. Collectively, these outcomes demonstrate the potential of targeted, conceptually grounded professional development to enhance teachers' orthographic knowledge and inform more responsive literacy instruction for adolescent readers. If teacher quality is central to student learning, and teacher knowledge is a foundational component of teacher quality, then student performance ultimately depends on access to high-quality instruction delivered by well-prepared teachers. Effective teachers who possess strong content knowledge and pedagogical skill are better positioned to provide the kind of rigorous, responsive instruction that helps students overcome barriers to literacy achievement (Denton et al., 2003; Fahle & Reardon, 2018). In this sense, teacher orthographic knowledge is a needed component for developing proficient adolescent readers in classrooms today.

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Appendix A

Session Lesson Plans

Session 1 (Wiggins & McTighe, 2005)

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="6">ESTABLISHED GOALS
• Establish a baseline of teacher orthographic knowledge
• Develop a working understanding of the definition, importance, role, and function of orthography/orthographic mapping
• Establish implications for adolescent readers
• Make connections to prominent reading theories related to orthography and reading comprehension</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Teachers will be able to independently use their learning to…
Define orthography
Identify the role and function of orthography plays in reading comprehension</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Teachers will understand that…
• orthography plays a key factor in reading comprehension
• orthography needs to be explicitly taught especially to struggling adolescent readers</td><td>ESSENTIAL QUESTIONS
• What is word study?
• What is the role of orthographic knowledge?
• How is orthographic knowledge related to reading comprehension, writing, and vocabulary?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Teachers will know…
the role orthography plays in reading comprehension</td><td>Teachers will be skilled at…
identifying components of reading comprehension</td></tr>
<tr><th colspan="3">Stage 2 - Evidence</th></tr>
<tr><th>Evaluative Criteria</th><th colspan="2">Assessment Evidence</th></tr>
<tr><td>Q1. In what ways does participation in professional development increase teacher orthographic knowledge?</td><td colspan="2">PERFORMANCE TASK(S):
• Teachers will participate in a jigsaw reading activity focusing on orthographic knowledge (Teachers will be asked to share information)
• Teachers will examine reading theories related to this study (SVR, CFF, Reading Rope, VET and Four-Part Processing) and create a visual that links orthography to reading comprehension.</td></tr>
</table>

Active Learning (Darling-Hammond et al., 2017)	OTHER EVIDENCE: Active learning will help teachers synthesize new information

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Teachers will be given a pre-assessment to establish a baseline of their current level of orthographic knowledge

Teachers will participate in a jigsaw reading activity focusing on orthographic knowledge

Teachers are encouraged to take notes while reading and then share them in a small group before sharing whole group

Teachers will examine the components of Simple View of Reading (Gough & Tunmer, 1986), Cognitive Foundations Framework (Hoover & Tunmer, 2019), Reading Rope (Scarborough, 2001), the Verbal Efficiency Theory (Perfetti, 1985), and the Four-Part Processing (Seidenberg & McClelland, 1989) to demonstrate the role of orthography in reading comprehension.

Teachers will be encouraged to read chapter 1 of Word Journeys Ganske, 2014

Session 2

Stage 1 Desired Results

ESTABLISHED GOALS Teachers will learn the five developmental stages of spelling and the unique features associated with each stage.	***Transfer***	
	Teachers will be able to independently use their learning to… Identify and describe the five developmental stages of spelling including the unique features of each stage	
	Meaning	
	UNDERSTANDINGS *Teachers will understand that…* Spelling(orthography) follows a set pattern that endures beyond third grade	ESSENTIAL QUESTIONS What are the developmental stages of spelling? What features are unique to each stage?
	Acquisition	
	Students will know… How crucial each stage is to reading comprehension and writing	*Teachers will be skilled at…* Identifying features of each developmental spelling stage

Stage 2 - Evidence

Evaluative Criteria	**Assessment Evidence**
Focus will be on new knowledge Q1. In what ways does participation in professional development increase teacher orthographic knowledge?	PERFORMANCE TASK(S): Teachers will work with a sort of errors representing the different stages of spelling. Teachers will create an infographic highlighting the five developmental stages of spelling and their unique features.

Feedback and Reflection Active Learning	OTHER EVIDENCE: Teachers will reflect on the last session and have opportunities to ask clarifying questions Teachers will participate in sorting activity resulting in a corrected table after reading chapter 2
Stage 3 – Learning Plan	
Summary of Key Learning Events and Instruction Teachers will have an opportunity to reflect on session 1. They will have a chance to ask clarification questions as well as share new information and discoveries. Before reading chapter 2 teachers will be given a sort containing examples of errors by developmental stage along with descriptive headings. Teachers will be asked to sort errors based on the description of the stages where they believe they should be located. As we are reading and discussing teachers will be allowed to revisit the sort to make any corrections based on new learning. Teachers will share conformations and discoveries.	

Session 3

Stage 1 Desired Results		
ESTABLISHED GOALS Teachers will learn to assess and analyze orthograph/word knowledge using the Developmental Spelling Assessment (Ganske, 2014)	***Transfer***	
	Teachers will be able to independently use their learning to… Administer the Developmental Spelling Assessment screener and feature inventory (Ganske, 2014) Analyze the data And develop individual and class profiles	
	Meaning	
	UNDERSTANDINGS *Teachers will understand that…* The DSA screener will help predict which feature inventory to administer and the feature inventory will give more detailed information about the individual feature	ESSENTIAL QUESTIONS What are the implications for the DSA results in my classroom setting?
	Acquisition	
	Teachers will know… How the inventories can be used to leverage future learning in the content area	*Teachers will be skilled at…* Administering and scoring the assessments
Stage 2 - Evidence		
Evaluative Criteria	**Assessment Evidence**	
Q2. In what ways does participation influence a	PERFORMANCE TASK(S): Administering the DSA Screener and subsequent feature inventory	

teacher's classroom practice?	Given a model data set teachers will make instructional decisions pertaining to scoring and feature inventories Given a model data set teachers will develop individual and class profiles
Feedback and Reflection Active Learning Use of Models and Modeling Coaching and Expert Support	OTHER EVIDENCE: Teachers will have opportunities to reflect on the developmental stages Teachers will be provided with practice time for test administration Teachers will be coached through the administration of the DSA and Feature Inventories Teachers will have support in developing individual and class profiles to use for next steps in instruction

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Teachers will start with reviewing information covered in session 2

Teachers will be given an opportunity to ask questions and reflect on their learning

Teachers will read chapter 3 while answering questions to check for understanding

Teachers will participate in a mock assessment session to help apply the skills learned in the reading

Teachers will be given model data to use to help scoring practice and profile development

Teachers will create an assessment kit to use in their classroom before the next session

Session 4

Stage 1 Desired Results

ESTABLISHED GOALS Teachers will learn about planning appropriate and engaging activities to foster word knowledge	***Transfer***	
	Teachers will be able to independently use their learning to… Create effective word sorts to help foster word consciousness	
	Meaning	
	UNDERSTANDINGS *Teachers will understand that…* The use of the DSA will help leverage skills to extent student learning	ESSENTIAL QUESTIONS What role does word sorts play in my daily classroom practices?
	Acquisition	
	Teachers will know… How to develop word sorts to help foster reading comprehension within content areas	*Teachers will be skilled at…* Using the data and leveraging learning of new

		words to aid comprehension
Stage 2 - Evidence		
Evaluative Criteria	**Assessment Evidence**	
Q2. In what ways does participation influence a teacher's classroom practice?	PERFORMANCE TASK(S): Teachers will create word sorts based on the needs of the students and their individual content area (Common content teachers can work together)	
Content Focused Collaboration and Collective Participation	OTHER EVIDENCE: Teachers will have opportunity to work together to share ideas about sorts based on the needs of the students and content area demands	
Stage 3 – Learning Plan		
Summary of Key Learning Events and Instruction Teachers will have opportunities to reflect, ask questions, and receive feedback. Teachers will participate in examining different types of word sorts Teachers will have opportunities to select a proper sort for their classroom Teachers will establish a protocol for creating word sorts 1. Determining categories 2. Selecting words 3. Introducing the sort and building vocabulary 4. Follow up practice, application, and integration 5. Evaluating a word study cycle Teachers will focus on solving additional word problems Teachers will engage in extension activities for word study		

Session 5

Stage 1 Desired Results		
ESTABLISHED GOALS Teachers will learn about planning appropriate and engaging activities to foster word knowledge	***Transfer***	
	Teachers will be able to independently use their learning to… Create effective word sorts to help foster word consciousness	
	Meaning	
	UNDERSTANDINGS *Teachers will understand that…* The use of the DSA will help leverage skills to extent student learning	ESSENTIAL QUESTIONS What role does word sorts play in my daily classroom practices?
	Acquisition	
	Teachers will know…	*Teachers will be skilled at…*

	How to develop word sorts to help foster reading comprehension within content areas	Using the data and leveraging learning of new words to aid comprehension

Stage 2 - Evidence	
Evaluative Criteria	**Assessment Evidence**
Q2. In what ways does participation influence a teacher's classroom practice?	PERFORMANCE TASK(S): Teachers will create word sorts based on the needs of the students and their individual content area (Common content teachers can work together)
Content Focused Collaboration and Collective Participation Active Learning	OTHER EVIDENCE: Teachers will have opportunity to work together to share ideas about sorts based on the needs of the students and content area demands

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Teachers will have opportunities to reflect, ask questions, and receive feedback on the first half of chapter 4.
Teachers will participate in examining different types of word sorts and activities included in the 2nd half of chapter 4
Teachers will have opportunities to select a proper sort for their classroom
Teachers will establish a protocol for creating word sorts

1. Determining categories
2. Selecting words
3. Introducing the sort and building vocabulary
4. Follow up practice, application, and integration
5. Evaluating a word study cycle

Teachers will focus on solving additional word problems
Teachers will engage in extension activities for word study

Session 6

Stage 1 Desired Results		
ESTABLISHED GOALS Teachers will gain a deeper understanding of the Letter Name and Within Word pattern stages and the	***Transfer***	
	Teachers will be able to independently use their learning to… Identify features of Letter Name and Within Words study	
	Meaning	
	UNDERSTANDINGS *Teachers will understand that…*	ESSENTIAL QUESTIONS What ways can features of Letter Name and Within Words patterns be

<table>
<tr><td rowspan="3">features the stage contains</td><td>Word study can be used to foster success and extend vocabulary and academic language.</td><td>incorporated into daily instruction for learning, review, and enrichment?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Teachers will know…
Develop word study activities that will help students who need reteaching or review</td><td>Teachers will be skilled at…
Developing word studies that address the features in Letter Name</td></tr>
<tr><td colspan="3">Stage 2 - Evidence</td></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Assessment Evidence</td></tr>
<tr><td>Q1. In what ways does participation in professional development increase teacher orthographic knowledge?
Q2. In what ways does participation influence a teacher's classroom practice?</td><td colspan="2">PERFORMANCE TASK(S):
Teachers will chart the features included in the Letter Name and Within Word Pattern stages collaboratively
Teachers will make notations of the feature description, teaching tips, student characteristics, type of words included in the feature.
Teachers will share out information.
Teachers will have opportunities to read and reflect on the chapters 5 and 6</td></tr>
<tr><td>Content Focused
Active Learning
Sustained Duration
Reflection and Feedback</td><td colspan="2">OTHER EVIDENCE:
Word sorts will focus on Letter Name and Within Word Patterns word studies while incorporating content specific vocabulary words
Teachers will develop an action plan to intentionally select words for the word sorts
The deeper dive into each feature will refresh and extend knowledge
Focus will be given to the rational for the word sort selected</td></tr>
<tr><td colspan="3">Stage 3 – Learning Plan</td></tr>
<tr><td colspan="3">Summary of Key Learning Events and Instruction
Teachers will have opportunities to reflect, ask questions, and receive feedback.
Teachers will participate in examining different types of word sorts associated with Letter Name features and Within Word Pattern features
Teachers will work as a team/pair to create a sort using one of the features explored
Teachers will have an opportunity to share the sort with colleagues in a share fair fashion
Teachers will reflect and receive feedback during the share time
Teachers will review the data from their class assessments
Teachers will begin to plan ways to incorporate word study activities using content specific vocabulary
Teachers will be encouraged to try an activity before the next session.</td></tr>
</table>

Session 7

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="6">ESTABLISHED GOALS
Teachers will gain a deeper understanding of the Syllable Juncture and Derivational Constancy and the features the stage contains</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Teachers will be able to independently use their learning to…
Identify features of Syllable Juncture and Derivational Constancy word study</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Teachers will understand that…
Word study can be used to foster success and extend vocabulary and academic language.</td><td>ESSENTIAL QUESTIONS
What ways can features of Syllable Juncture and Derivational Constancy be incorporated into daily instruction for learning, review, and enrichment?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Teachers will know…
Develop word study activities that will help students who need reteaching or review</td><td>Teachers will be skilled at…
Developing word studies that address the features in syllable juncture and derivational constancy</td></tr>
<tr><th colspan="3">Stage 2 – Evidence</th></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Assessment Evidence</td></tr>
<tr><td>Q1. In what ways does participation in professional development increase teacher orthographic knowledge?
Q2. In what ways does participation influence a teacher's classroom practice?</td><td colspan="2">PERFORMANCE TASK(S):
Teachers will chart the features included in the Syllable Juncture and Derivational Constancy stages collaboratively
Teachers will make notations of the feature description, teaching tips, student characteristics, type of words included in the feature.
Teachers will share out information.
Teachers will have opportunities to read and reflect on the chapters 7 and 8</td></tr>
<tr><td>Content Focused
Active Learning
Sustained Duration
Reflection and Feedback</td><td colspan="2">OTHER EVIDENCE:
Word sorts will focus on syllable juncture and derivational constancy studies while incorporating content specific vocabulary words
Teachers will develop an action plan to intentionally select words for the word sorts
The deeper dive into each feature will refresh and extend knowledge
Focus will be given to the rational for the word sort selected</td></tr>
<tr><th colspan="3">Stage 3 – Learning Plan</th></tr>
</table>

Summary of Key Learning Events and Instruction

Teachers will have opportunities to reflect, ask questions, and receive feedback.

Teachers will participate in examining different types of word sorts associated with Syllable juncture and derivational constancy features

Teachers will work as a team/pair to create a sort using one of the features explored

Teachers will have an opportunity to share the sort with colleagues in a share fair fashion

Teachers will reflect and receive feedback during the share time

Teachers will review the data from their class assessments

Teachers will begin to plan ways to incorporate word study activities using content specific vocabulary

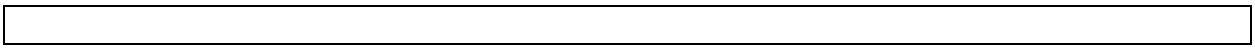
Teachers will be encouraged to try an activity before the next session

Session 8

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="5">ESTABLISHED GOALS
Teachers will gain a deeper understanding of the features the stage contains and ways to assess students</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Teachers will be able to independently use their learning to…
Identify features of orthography and other ways to assess students</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Teachers will understand that…
Word study can be used to foster success and extend vocabulary and academic language.</td><td>ESSENTIAL QUESTIONS
What ways can features of orthography be incorporated into daily instruction for learning, review, and enrichment?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Teachers will know…
Develop word study activities that will help students who need reteaching or review</td><td>Teachers will be skilled at…
Developing word studies that address the features in</td></tr>
<tr><th colspan="3">Stage 2 - Evidence</th></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Assessment Evidence</td></tr>
<tr><td>Q1. In what ways does participation in professional development increase teacher orthographic knowledge?
Q2. In what ways does participation influence a teacher's classroom practice?</td><td colspan="2">PERFORMANCE TASK(S):
Teachers will discuss ways to support each feature of the DSA that will help address the needs of the students assessed
Teachers will review information covered in this professional development
Teachers will have opportunities to ask, reflect, review, and receive feedback.</td></tr>
<tr><td>Content Focused
Active Learning
Sustained Duration
Reflection and Feedback</td><td colspan="2">OTHER EVIDENCE:
The deeper dive into each feature will refresh and extend knowledge</td></tr>
<tr><th colspan="3">Stage 3 – Learning Plan</th></tr>
<tr><td colspan="3">Summary of Key Learning Events and Instruction
Teachers will have opportunities to reflect, ask questions, and receive feedback.
Teachers will participate in examining different types of word sorts associated with features</td></tr>
</table>

Sessions 9

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="6">ESTABLISHED GOALS
Teachers will reflect on the experiences and knowledge gained in this intervention with opportunities for authentic feedback for the process.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Teachers will be able to independently use their learning to…
To use orthographic knowledge as leverage to help adolescent readers within their classroom</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Teachers will understand that…
Orthographic knowledge play a crucial role in reading comprehension</td><td>ESSENTIAL QUESTIONS
How has participating in this intervention/books study influenced your classroom practice?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Teachers will know…
Ways to use orthographic features of the Developmental Spelling Assessment to leverage content learning for struggling adolescent readers</td><td>Teachers will be skilled at…
Using word sort based on orthographic knowledge to help teach and support adolescent struggling readers in the content area</td></tr>
<tr><th colspan="3">Stage 2 - Evidence</th></tr>
<tr><th>Evaluative Criteria</th><th colspan="2">Assessment Evidence</th></tr>
<tr><td>Q1. In what ways does participation in professional development increase teacher orthographic knowledge?
Q2. In what ways does participation influence a teacher's classroom practice?
Q3. What aspect of this book study influences changes in teacher practice?</td><td colspan="2">PERFORMANCE TASK(S):
Teachers will participate in a post-assessment
Teachers will participate in a value voting activity with follow-up reflection questions based on the answers given</td></tr>
<tr><td>Content Focused
Active Learning
Reflection and Feedback</td><td colspan="2">OTHER EVIDENCE:
Teacher reflection journals will be collected</td></tr>
<tr><th colspan="3">Stage 3 – Learning Plan</th></tr>
<tr><td colspan="3">Summary of Key Learning Events and Instruction
Teachers will participate in a value voting activity during which they will identify aspects of this intervention they liked and did not like to provide feedback on any aspect that influenced or hindered change
Teachers will be given time to complete the post-assessment</td></tr>
</table>



Sessions 10

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="6">ESTABLISHED GOALS
Teachers will be offered support in their classroom setting

Teachers will have to option of selecting an observation of a lesson they have planned, or they can schedule a lesson to be modeled in their classroom</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Teachers will be able to independently use their learning to…
Leverage orthographic knowledge to help adolescent readers in the content area</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Teachers will understand that…
Orthographic data should drive instructional practices</td><td>ESSENTIAL QUESTIONS
With this knowledge how can I leverage orthography in my content area to help support the learning of the students?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Teachers will know…
Assess and plan lessons using orthographic knowledge</td><td>Teachers will be skilled at…
Developing lessons that effectively support orthographic feature learning</td></tr>
<tr><th colspan="3">Stage 2 - Evidence</th></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Assessment Evidence</td></tr>
<tr><td>Q1. In what ways does participation in professional development increase teacher orthographic knowledge?
Q2. In what ways does participation influence a teacher's classroom practice?
Q3. What aspect of this book study influences changes in teacher practice?</td><td colspan="2">PERFORMANCE TASK(S):
Teachers will provide answers to individual interview questions
Teachers will provide rational for their scores on the pretest vs. Post test</td></tr>
<tr><td>Feedback and Reflection
Active Learning
Use of Models and Modeling
Coaching and Expert Support
Content Focused
Sustained Duration</td><td colspan="2">OTHER EVIDENCE:
Follow-up questions, feedback, and notes</td></tr>
<tr><th colspan="3">Stage 3 – Learning Plan</th></tr>
<tr><td colspan="3">Summary of Key Learning Events and Instruction
Additional support will be offered if need or desired</td></tr>
</table>

Appendix B

Pre-and Post Assessment

Linguistic Terminology Survey

This assessment is adapted from Word Journeys by Kathy Ganske, 2014

* Required

* This form will record your name, please fill in your name.

Linguistic Terminology Survey

Using the following word bank write the word(s) that serve as an example of each term. Be mindful that more than one word in the set may be an appropriate answer. Words may be used more than once or not at all.

Word Bank One: Terms 1-7

which Blake's ox don't sort reread sigh them moist trace

1. Initial consonant blend * (1 Point)

2. Contraction * (1 Point)

3. Rime * (1 Point)

4. Consonant digraph * (1 Point)

5. Diphthong * (1 Point)

6. Onset * (1 Point)

7. Word with two phonemes * (1 Point)

Section 2

Word Bank Two: Terms 8-14

margin scent hotel fishes guiding sheep sun's bow cymbal can't

8. Vowel team * (1 Point)

9. Homograph * (1 Point)

10. Homophone * (1 Point)

11. Inflectional ending * (1 Point)

12. Open syllable * (1 Point)

13. R-controlled vowel * (1 Point)

14. Soft c * (1 Point)

Section 3

Word Bank Three: Terms 15-21baseball its slide mistrust retelling democratic bringing villain sharp he's

15. Prefix * (1 Point)

16. Possessive * (1 Point)

17. Compound word * (1 Point)

18. Bound root * (1 Point)

19. Schwa in the second syllable * (1 Point)

20. Suffix * (1 Point)

21. Bound morpheme * (1 Point)

Section 4

Word Bank Four: Terms 22-26

contain residential really charming sandwich sip reduce payments under participation

22. Word with four syllables * (1 Point)

23. Word with three morphemes * (1 Point)

24. Stressed (accented) second syllable * (1 Point)

25. Vowel alteration * (1 Point)

26. Eponym * (1 Point)

Section 5 Word Sorting

Categorize the words from Bank Five according to their vowel sound. Write each word under the appropriate category heading.

Word Bank Five: bike have cart slim short cap boy gold spot eight breath sheet

27. Long vowel sound * (1 Point)

28. Short vowel sound * (1 Point)

29. Other sound * (1 Point)

Appendix C

Semi-structured Interview Protocol

Each participant will be interviewed in a one-on-one setting. Each interview will be audio recorded and transcribed using Microsoft Teams and Otter AI respectively. Copies of the transcripts will be made available upon request at the conclusion of this study.

1. Please state your name and position in the school
2. Tell me about your experience participating in the professional development.
3. What aspect did you value the most?
4. What aspect would you change?
5. In what ways did participating in this professional development increase your orthographic knowledge?
6. Before participating in this profession development, how did you incorporate word study or vocabulary acquisition into your content area?
7. Have you changed or are planning to change any classroom practices?
8. Did participating in this professional development influence or discourage any of these changes?
9. What aspects of the professional development influence or discourage said change?

The following may be used to solicit additional information if needed:

- Tell me more.
- Why do you feel that way?
- Why was that important to you?
- How did that affect you?
- Can you explain what you mean by that?
- What was your contribution?
- What do you think was really making it work?
- How has it changed you?

Appendix D

Value Voting

Value Voting

Value voting is a process to help determine which of the components you find most valuable. This feedback is very valuable in understanding your viewpoint based on your experience. You will be asked to justify or support your answers. Feel free to provide examples from your experience. Please keep in mind this is about your preferences so there are no wrong answers. Please be honest and explain your answer. Thank you for your participation.

* Required

* This form will record your name, please fill your name.

1. Please rank the following professional development aspects in order from most valuable (top) to least (bottom). Slide the responses to reflect your thinking.

Content Focus

Active Learning

Collaboration

Use of Models

Coaching & Expert Support

Feedback & Reflection

Sustained Duration

2. Please explain your ranking in question 1. *

3. Rank the professional development activities in order of value to you. Slide the activities top (highest value) to bottom (least value). *

- Making word sorts that fit my content
- Learning to create word sorts
- Being able to experience word sorts
- Learning about word sorts

4. Please explain your ranking in question 3 *

5. Please rank the following in order of importance to you. Slide the activities top (highest value) to bottom (least value). *

- Reading about prominent readings theories
- Having a text as a reference (Word Journeys)
- Understanding more about reading foundational skills
- Learning about the DSA

6. Please explain your ranking in question 5. *

7. Rank the professional development activities in order of value to you. Slide the activities top (highest value) to bottom (least value). *

- Learning about the DSA
- Knowing student data
- Creating individual and class profiles
- Analyzing student results and data

Creating visuals to demonstrate learning

Reflecting on learning and practice

Participating in jigsaw activities

Being able to practice activities before implementing

8. Please explain your ranking in question 7. *

9. Please rank the following in order of importance to you. Slide the activities top (highest value) to bottom (least value). *
10. Please explain your ranking in question 9. *

11. Rank the professional development activities in order of value to you. Slide the activities top (highest value) to bottom (least value). *

Collegial conversations

Being able to work with colleagues

Having multiple sessions to learn content

Receiving feedback

12. Please explain your ranking in question 11 *

13. Is there anything not mentioned that you found valuable? Please explain your answer *

Appendix E

Raw Data Linguistic Survey Pre and Post test Scores

Question Number/Answer(s)	Allen		Beth		Cathy		David		Ellen		Fran	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1. Initial consonant blend	1	1	1	1	1	1	1	1	1	1	1	1
2. Contraction	1	1	1	1	1	1	1	1	1	1	1	1
3. Rime	1	1	0	1	0	1	0	1	1	1	0	1
4. Consonant diagraph	1	0	0	1	1	1	0	1	1	1	0	1
5. Diphthong	1	1	0	0	0	0	0	1	0	0	0	1
6. Onset	0	0	0	0	0	0	0	0	0	0	0	0
7. 2 phonemes	0	0	0	0	1	0	0	0	0	0	0	0
8. Vowel team	0	1	1	1	1	0	0	1	1	1	0	1
9. Homograph	1	0	1	1	1	1	0	1	0	0	0	0
10. Homophone	0	0	0	0	1	1	0	1	0	0	0	1
11. Inflectional ending	0	0	0	0	0	1	0	0	1	1	0	1
12. Open syllable	0	1	0	0	1	1	0	0	1	0	1	1
13. r-controlled vowel	0	1	1	1	1	1	1	1	1	1	1	1

14. Soft c	1	1	1	1	1	1	1	1	1	1	1	1
15. Prefix	1	0	1	1	1	1	1	1	1	1	1	1
16. Possessive	0	0	0	1	0	1	0	0	0	1	0	0
17. Compound word	1	1	1	1	0	1	1	1	1	1	1	1
18. Bound root	0	0	0	0	0	1	0	0	0	1	0	0
19. Schwa in the 2nd syllable	0	0	0	1	1	1	0	1	0	1	0	1
20. Suffix	1	0	1	1	1	1	1	1	1	1	1	1
21. Bound morpheme	0	0	0	0	0	0	0	0	0	0	0	0
22. Word with 4 syllables	1	1	1	1	1	1	1	1	1	1	1	1
23. Word with 3 morphemes	0	1	0	0	0	0	0	0	0	0	0	0
24. Stressed (accented) 2nd syllable	0	1	0	1	1	0	1	0	1	1	0	0
25. Vowel alternation	0	0	0	0	0	1	0	0	0	0	0	1
26. Eponym	0	0	0	0	0	0	0	1	0	0	0	0
27. Long vowel sound/4	4	3	3	3	1	4	3	3	1	1	1	3
28. Short vowel sound/5	4	5	5	5	1	5	2	4	1	1	0	4
29. Other vowel sound/3	0	1	3	3	1	3	0	2	0	1	0	2
Total point out of 38	19	21	21	26	18	30	14	25	16	19	10	26

Appendix F

Raw Value Voting Results by Question Set With Rational

Participant	Allen	Beth	Cathy	David	Ellen	Fran	Average score
Content focus	5	4	1	1	1	4	2.7
Active learning	2	3	3	2	7	1	3
Collaboration	3	5	5	5	6	3	4.5
Use of models	7	1	2	6	2	6	4
Coaching and expert support	1	2	4	3	3	2	2.5
Feedback and reflection	4	6	6	4	4	5	4.8
Sustained duration	6	7	7	7	5	7	6.5

Rational:

Allen: I believe 1-4 build the foundation for professional growth, 5-9 while valuable these can be interchanged from one discipline to the next.

Beth: Use of models ranked top because the activities can be used in my classroom.

Cathy: If the content doesn't correlate to what I teach. My time is wasted. I don't have time for feedback and reflection.

David: PD should have a focus and work to accomplish that goal. Someone leading should be able to provide next steps to the feedback teachers are giving. It should apply to what they're teaching.

Ellen: Need for reading support/relevance! Being able to support/coach and help w/process. Seeing examples and hearing effectiveness. Presentation piece and scheduling just comes with.

Fran: I ranked in this particular order based on my individual learning style.

Participant	Allen	Beth	Cathy	David	Ellen	Fran	Average score
Making word sorts that fit my content	4	2	1	4	3	4	3
Learning to create word sorts	2	1	3	3	4	3	5.3
Being able to experience word sorts	3	4	2	2	2	2	2.5
Learning about word sorts	1	3	4	1	1	1	1.8

Rational:

Allen: Ranked from vague (big picture) to content specific

Beth: Learning to create word sorts ranked top because this skill can be used across the curriculum.

Cathy: I already knew about word sorts and how to create them.

David: I would like to use word sorts but don't really understand them. Need to get a better understanding of them before I can make them and use them effectively in my class.

Ellen: Need to know what kind of sorts and importance to know what kind to use in different situations.

Fran: Soley based upon my learning style.

Participant	Allen	Beth	Cathy	David	Ellen	Fran	Average score
Reading about prominent reading theories	3	4	2	4	4	4	3.5
Having a text as a reference (Word Journeys)	1	3	3	3	3	2	2.5
understanding more about reading foundational skills	4	2	1	1	1	1	1.6
Learning about the DSA	2	1	4	2	2	3	2.3

Rational:

Allen: the text book is the most valuable resource to me, because I can continue moving forward I can find answers or solutions to any issue.

Beth: Learning about the DSA was important because it helps me to determine what areas my students need additional support and help creating meaningful group activities.

Cathy: Understanding more about reading foundational skills is valuable to any educator.

David: I think that foundational reading skills are the most important thing to understand for beginning readers.

Ellen: Absolute need for resource/book after learning about skills/test. So we can take action and go back and figure out answers to our own questions/try to interpret before clarifying with you.

Fran: Personal learning style

Participant	Allen	Beth	Cathy	David	Ellen	Fran	Average score

Creating visuals to demonstrate learning	3	2	3	1	1	3	2.2
Reflecting on learning and practice	2	4	4	2	4	1	2.8
Participating in jigsaw activities	4	3	2	4	3	4	3.3
Being able to practice activities before implementing	1	1	1	3	2	2	1.7

Rational:

Allen: The whole ‘See/Say/Do principle at work actually practicing these activities prior to implementation is of most value to me.

Beth: Being able to practice activities before implementing is important to me because I feel that small group planning and implementation has been an area that I need to grow.

Cathy: I used two activities in class !! (smiley face)

David: I am a visual learner, so students like to see a visual to help support them when learning something new

Ellen: Need to practice learning, know what to do how to prep/plan, have examples to pull from, then after actual implementation having opportunity for questions and reflection.

Fran: Personal learning style

Participant	Allen	Beth	Cathy	David	Ellen	Fran	Average score

Learning about the DSA	2	4	4	4	1	4	3.2
Knowing student data	1	1	1	2	4	1	1.7
Creating individual and class profiles	4	3	3	3	3	2	3
Analyzing student results and data	3	2	2	1	2	3	2.2

Rational:

Allen: Understanding student data is paramount, because I must understand before identifying the correct tool to best assess.

Beth: Knowing student data is important to me because it helped to explain some of the issues that I have been seeing with student achievement in reading and writing

Cathy: Student data is vital to planning instruction using differentiation.

David: You have the analyze the data before you can come up with a plan to help.

Ellen: Need to know about DSA and why this and what we will ultimately use it for to be motivated to use it. Of course the other steps have to happen.

Fran: Personal learning style

Participant	Allen	Beth	Cathy	David	Ellen	Fran	Average score
Collegial conversations	1	3	2	4	3	3	2.7

Being able to work with colleagues	2	2	1	2	4	2	2.2
Having multiple sessions to learn content	4	1	3	1	1	1	1.8
Receiving feedback	3	4	4	3	2	4	3.3

Rational:

Allen: Internal conversations tend to feel more authentic, and learned material seems to 'stick' better more reinforcement.

Beth: Having multiple sessions was valuable because it didn't feel like so much information was thrown on us at one time that it was hard to digest.

Cathy: It was good to talk and work with David as a 5th grade teacher since I teach 6th.

David: I just need multiple opportunities to practice something before I feel comfortable implementing it in my classroom or understanding next steps

Ellen: Multiple sessions that provide time to do the work and analyzing actual data. Being able to talk about it as we are doing it. Group settings w/ colleagues is just a plus in case we are running into same thoughts confusions relatable situations different perspectives.

Fran: Personal learning style

Anything not mentioned that you found valuable:

Allen: Blank

Beth: Blank

Cathy: No

David: The initial assessment was helpful, I just didn't know how to use that to make next steps for the different levels of learners.

Ellen: Everything was pretty much mentioned appreciated the given materials! Clear folder, blue book, etc.

Fran: All the work, conversations and activities were valuable.

Coaching and expert support on average was ranked the highest followed by content focus. The least valued was sustained duration.

Learning about word sorts (1.8) and being able to experience word sorts (2.5) ranked the highest. Learning to create the sorts ranked as the least valuable (5.3).

Understanding more about reading foundational skills ranked the highest (1.6). Having the text and learning about the DSA only had a difference of less than two- tenths. Reading about prominent reading theories (3.5) ranked as the least valued.

Being able to practice activities before implementing was most valued (1.7). Followed by creating visuals to demonstrate learning (2.2). Participating in the jigsaw reading (3.3) was least valued by the participants.

Knowing student data (1.7) ranked the most valued followed by analyzing student results and data (2.2). Learning about the DSA ranked as the least valued (3.2) on this question. Where previously it scored a little higher (2.3) on question number five.

Having multiple sessions to learn content ranked the most valuable (1.8) followed by being able to work with colleagues (2.2), Receiving feedback ranked as the least valuable (3.3).