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The Effects of a Science of Reading Professional Development Plan on Teachers' Perceptions of Content Knowledge and Self-efficacy in Instruction: A Mixed-Methods Study

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The Effects of a Science of Reading Professional Development Plan on Teachers' Perceptions of Content Knowledge and Self-efficacy in Instruction: A Mixed-Methods Study

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of the requirements for the degree of
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by

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Abstract

The purpose of this study was to measure the impact of a year-long professional development plan designed to support K-3 teachers in two elementary schools in making shifts to align instructional practices with the science of reading. This mixed methods approach incorporated an action research design to answer the following research questions: *What was the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading? What impact does strategic and ongoing PD in the science of reading have on teachers' practice? What are teachers' perceptions of year-long professional development in the science of reading?* A synthesis of research on professional development and pre-survey data were used to inform the development of the plan and post-survey data were used to measure its impact on teachers. Findings revealed in focus group data substantiated the positive results obtained through the surveys. Findings also suggest that designing professional development based on research, combined with district and teacher needs can have powerful results and enact change. Recommendations for other districts interested in implementing ongoing professional development to impact instructional changes include designing a logical, focused delivery of content responsive to teacher's needs, using curricular materials during training, and providing coaching support.

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Dedication

This has been a challenging and rewarding journey personally and professionally. Throughout the process, I had unwavering support from family and friends who believed in me. I am forever grateful to all of them.

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To my nephew Jack, my godson, and my joy, you are an inspiration for my work. Follow your dreams and always fight for what you believe in. Keep reading!

In memory of Celine and Patty, you each had such a special place in my life. I wish you were here to celebrate with me. You were supposed to be here.

Finally, to the many dedicated teachers who strive every day to do the best for their students, regardless of the challenges. I hope that they truly understand how much they matter and the impact they have on the lives they touch in and out of the classroom.

Table of Contents

CHAPTER ONE – INTRODUCTION

Introduction

Have teachers nationwide been teaching reading wrong? Have we been promoting the strategies of struggling readers through instructional practices? I have grappled with these questions over the last few years alongside teachers and administrators across the United States. "There is a profound disconnect between the science of reading and educational practice" (Seidenberg, 2017, p. 9). The science of reading (SoR) has dominated the headlines in education over the last few years, focusing on the gap between instructional practices in the classroom and what science says about how children learn to read. The following defines the use of the term SoR in this study.

> The **science of reading** is a vast, interdisciplinary body of scientifically based research about reading and issues related to reading and writing. This research has been conducted over the last five decades across the world, and it is derived from thousands of studies conducted in multiple languages. The science of reading has culminated in a preponderance of evidence to inform how proficient reading and writing develop; why some have difficulty; and how we can most effectively assess and teach and, therefore, improve student outcomes through prevention of and intervention for reading difficulties. (The Reading League, 2021, para. 1)

The SoR and the research driving it must be the foundation of instructional programming, materials, and pedagogy. Views on reading instruction have been controversial since the mid-19th century. These controversies were more recently reignited, in part, by Hanford, a reporter for American Public Media. One of Hanford's (2018) earliest, more notable pieces was a podcast, *Why Aren't Kids Being Taught to Read?* which focused on the educational system and the collective lack of attention to what the research says about how children learn to read. Hanford

described the science behind learning to read and challenged many strategies used in current instruction as promoting those of poor readers, not skilled ones (e.g., using pictures to guess at words or memorizing words instead of explicitly decoding them). Hanford's podcast was a driving force for a national conversation around the SoR, paving the way for legislative and local changes to align programs to research and train teachers to best meet the needs of students learning to read. Teachers' lack of adequate preparation to teach reading became a nationwide concern. "This we know: reading failure can be prevented in all but a small percentage of children with serious learning disorders" (Moats, 2020, p. 4).

In 2019, The National Assessment of Educational Progress (NAEP) released dismal reading scores for grades four and eight. In 2019, these scores revealed a 1-point and 4-point decrease from 2017 in grades four and eight, respectively. A mere 35% of fourth graders and 34% of eighth graders scored at or above the “proficient” level. Additionally, these scores represented a nominal 3-point and 4-point increase in grades 4 and 8 since 1992.

It was time to act, and the place to start was in Pleasantville (pseudonym), the district where I work. This action research study aimed to develop and implement a comprehensive professional development (PD) plan to support teachers in making the instructional shifts necessary to close the gap between research and practice in alignment with the SoR. This collective body of research clearly identified how one learns to read, the role that specific parts of the brain play in learning to read, and what goes wrong when one does not learn to read. This research has important implications for instruction and is critical for making shifts in practice and challenging ineffective practices long taught and applied in classrooms nationwide.

If resources are put in place to bridge the gap between theory and practice, it has the potential to affect change and improve reading instruction and achievement. If teachers

> are taught how to teach their students with the mechanics of reading and structured literacy, reading failure rates plummet. (Hurford, 2020, para. 6)

With evidence-based curricula in place at Pleasantville, a strategic PD plan was needed to support teachers in building the knowledge and skills necessary to make instructional shifts aligned to research, thus eliminating practices detrimental to students learning to read. Research provides evidence that teachers most effective in teaching struggling readers have both content knowledge and practical skill (Moats, 2020). One cannot assume that knowledge alone transfers to practical application or effective implementation.

Background

This study took place in Pleasantville, a small suburban school district in Connecticut with two elementary schools: Pinehurst and Elmhurst (pseudonyms). Classroom observations and curriculum review indicated a gap between research and instructional practices related to teaching reading in our elementary schools. These are the years in which learning foundational reading skills is essential and has life-long implications.

Pleasantville Public Schools was one of many in this problem. Nationwide, there was a significant gap between the SoR and instructional practices in the classroom (Hurford, 2020; Kilpatrick, 2015, 2016; Moats, 2020; Seidenberg, 2017). There was growing pressure for districts and states to ensure the SoR informed and guided instruction, curricula, and teacher training. This pressure was further driven by the lack of improvement in reading scores nationwide over the last two decades.

According to Schwartz (2022), as of July 2022, twenty-nine states had passed laws or implemented policies related to reading instruction and programming in the last nine years. Of those, 23 states included mandates for professional development or coaching for teachers. In 2022, Connecticut passed legislation mandating the selection and implementation of state-

approved reading programs in kindergarten through grade three. “Passing laws that demand change is not enough. There needs to be a meaningful plan in place to support improvement to drive real behavior change” (Riley, 2020, p. 6). Programs do not change beliefs or long-used practices. Additionally, there has yet to be a reading program that works for all or even most students in any given targeted population. This study aimed to improve instruction by aligning programming and practices with the SoR and, subsequently, to improve student achievement at Pleasantville’s elementary schools.

As previously mentioned, a growing awareness of this problem surfaced in the media in 2018. As the SoR became a prominent topic in the research community, it became imperative that I commit myself to learn as much as possible about the research and its instructional implications. Like many others, I too had been trained in many of the instructional practices being called into question, having attended many national conferences over the years. I believed I had a strong understanding of the research, having been taught by some of the best literacy leaders in the nation. As the district language arts coordinator, it was my job to ensure optimal programming, curriculum, and PD to support teacher instruction and student achievement. As these gaps were uncovered in our district, it became a priority to ensure that the teachers in Pleasantville had the resources and training needed to meet the needs of the district’s diverse students.

An ongoing review of the research and the K-3 reading curriculum revealed the need for a more explicit (i.e., direct teaching) and systematic phonics program in K-2. A systematic approach teaches proficiency through a cycle of review and practice of skills taught, progressing from easier to more complex (International Literacy Association [ILA], 2019). During the 2018-2019 school year, four kindergarten teachers volunteered to pilot the *Fundations: Wilson Language Basics* (Fundations) phonics program. Throughout the pilot, discussions ensued about

the strengths and weaknesses of the program. One weakness identified was a lack of daily, explicit phonemic awareness instruction. This need prompted the creation of a week-by-week plan to provide a supplemental scope and sequence of daily phonemic awareness lessons for kindergarten and grade one teachers. At the end of the school year, the district adopted and purchased the Fundations program for kindergarten and grade one teachers.

In the 2020-2021 school year, the year prior to the study, full implementation of Fundations was in place in grades K-2, with a planned future review of e three program planned. The COVID-19 pandemic hit the nation hard in March of 2020 and continued into the following school year, making it a challenging year to implement a new program, yet it was more important than ever. Time for PD was minimal, and teachers faced the challenge of synchronous and asynchronous teaching. As a result, literacy coaches played a vital role in supporting this implementation. While other districts maintained a hybrid learning model, Pleasantville schools were open to all students throughout the 2020-2021 academic year, following a remote learning model from March to June 2020. Despite schools being open, students could opt to learn remotely, and many did. This was not ideal for phonics instruction, especially in these critical early years when learning to read.

As the implementation of Fundations progressed, a district team of reading specialists and lead teachers, working alongside me, identified a need for program modifications. Although Fundations is a research-based phonics program, the team identified weaknesses that needed to be addressed. The team used a thorough review of the research on teaching the foundational skills of reading, feedback from teachers who implemented the program, and results from an EdReports program review to identify the modifications needed. EdReports is an independent organization that reviews programs in three areas: 1) text quality and complexity, and alignment to standards with evidence-based tasks, 2) building knowledge with texts, vocabulary, and tasks,

and 3) instructional supports and usability (EdReports, 2022). Edreports produced guides providing detailed information about each indicator, including the purpose, scoring criteria, and explanation of findings. We used the identified shortcomings of the program, along with comprehensive research, to supplement and revise components of Fundations.

No single program is effective for all students. Each will invariably have strengths and gaps to be addressed to be most effective (Moats, 2020). The district team determined the following weaknesses as a priority to be resolved through program improvement, instructional shifts, and purchase of resources:

- instructional materials were not readily available (resources were in two different digital platforms, requiring time to locate and access);
- phonemic awareness practice was inconsistent, lacking a clear scope and sequence;
- inclusion and availability of connected texts (i.e., multiple sentences related to each other matched to skills taught) were insufficient;
- decodable texts, in which 80-90% of the words contain the letter/sound relationships already taught, were not included in the program;
- the instructional routine for teaching irregular words (referenced as trick words) was not aligned with the most current research; and,
- the program lacked articulation instruction when teaching sounds in kindergarten.

During the summer of 2021, curricular changes included the addition of Kilpatrick's daily one-minute phonemic awareness drills in second and third grade (as needed). Phonemic awareness training is essential to reading instruction in kindergarten through second grade (Kilpatrick, 2016). In collaboration with a reading coach, we developed a document at each grade level K-2 outlining daily learning objectives for Fundations in a week-by-week plan, including all resources needed for each day of instruction (e.g., assessment materials, fluency

passages, small group practice activities). We obtained these resources from various program components and linked them to this central document for easier access and use. Articulation instructional materials were purchased and aligned to instruction. We also linked a connected text (e.g., poem) to each week for the targeted practice of one or more of the skills learned. The district purchased decodable texts for teachers, which the reading team then aligned to the units, allowing students to practice their newly learned phonics skills. Finally, using a routine aligned with research, we developed digital slideshows to support the instruction of heart words (i.e., words with irregular patterns). The next step in the work, and the goal of this study, was to create and implement a PD plan to address the problem of practice and provide teachers with the *why* and *how* to align instructional practices to research.

Problem Statement

Teaching students to read is complex and can be best achieved by aligning instructional practices with research. Although Pleasantville had implemented an explicit, systematic, research-based phonics program and revised the reading curriculum to align with research, teachers needed training in the SoR. As such, the instructional shifts necessary to align practice with research had yet to occur. The PD plan intentionally focused on the foundational skills of reading (i.e., phonemic awareness, phonics, and fluency) and the theories grounding them because they are a foundational, first step in the process. This work was not done in isolation of essential skills such as vocabulary and comprehension, which remained significant components of our reading programming.

We, as educators, have a professional obligation within and across districts to engage in this work and develop a plan to ensure evidence-based instructional practices are employed effectively by well-trained, high-quality teachers. Implementing the structures and opportunities to bridge the gap between theory and practice can affect long-term change and improve reading

instruction and achievement in Pleasantville's two elementary schools.

Focus on Instructional and Systemic Issues

The COVID-19 pandemic in March of 2020 resulted in the closing of schools for the remainder of the year and increasing the number of students falling behind in reading. During the 2020-2021 school year, the pandemic created less than optimal instructional conditions, with some learners in school and others in remote learning environments with limited synchronous learning time, creating challenges for teachers to meet the needs of both groups. Effective pedagogical practices (e.g., student discourse, explicit whole group instruction with teacher feedback, use of manipulatives, and access to physical books) were compromised by the need for social distancing, synchronous and asynchronous learning, and limitations in the ability to meet with students one-to-one and in small groups where instruction can best be differentiated. The COVID-19 pandemic continued into the 2021-2022 school year, making effective teaching a continued challenge with masking and social distancing protocols in place through March of 2022.

Is Directly Observable

In the 2020-2021 school year, state legislation required 23 of the 45 classroom teachers in kindergarten through grade three across both schools to take a reading foundations assessment. The teachers required to take the assessment every two years included those who did not take it as part of their certification process. Districts were intended to use this data to inform PD (see Table 1). The results revealed a 72% average success rate on 37 questions, exposing gaps in content knowledge related to the reading foundational skills.

Table 1

Results of the Connecticut Foundations of Reading Assessment Developed by Pearson

Subarea	Total Number of Questions	Number of Questions Correct	Percent of Questions Correct
Understanding Phonological and Phonemic Awareness	9	5.7	63.43
Understanding of Concepts of Print and the Alphabetic Principle	10	7.43	74.35
Understanding the Role of Phonics in Promoting Reading Development	9	7.48	83.22
Understanding Word Analysis Skills and Strategies	9	5.3	59.09

Note: N = 23.

These results supported the need for PD in the foundational skills of reading.

I administered a reading survey (see Appendix A) at the end of the 2020-2021 school year to all K-3 teachers, which further established the need for PD. The survey asked teachers to rate their preparedness to teach reading foundational skills, their understanding of critical concepts related to the SoR (i.e., reading theories, PA, and phonics), and their confidence in applying those concepts in the classroom. One of the questions asked teachers to what extent five key theories or models underpinning the SoR were used to inform classroom instruction. The following shows the percentage of teachers who responded *"not at all"* for each theory or model: *The Simple View of Reading* (43%), *How the Brain Learns to Read* (41%), Ehri's Phases of Reading Development (50%), The Four-Part Processing Model (36%), and *Scarborough's Reading Rope* (32%). These conceptual understandings are necessary to teach reading effectively and to make informed instructional decisions in the classroom. The results demonstrated little understanding of these theories or their instructional implications. "To reach all learners, teachers

must understand how students learn to read and write, why some students fail to learn, and the instructional strategies best supported by research" (Glaser & Moats, 2008, p. 3).

With effective instructional resources, support, and training, teachers can align their instruction with the SoR. Subsequently, student achievement will improve, and the number of students needing intervention will decrease (Moats, 2020). For Pleasantville, the missing piece of the puzzle was teacher training.

Is Actionable

Putting the right resources and training in place specific to the unique context of each district is challenging work, but it was critical for improving reading instruction. As the language arts coordinator, I was responsible for providing effective curriculum, assessments, and PD opportunities to meet the needs of the district's diverse learners and the teachers who serve them. In my literacy leadership role, I worked collaboratively with the reading teachers, coaches, and administrators to review and revise the reading curriculum and to plan and implement PD to meet this need.

In June 2021, two reading coaches, one from each elementary school, attended train-the-trainer training for the *Language Essentials for Teachers of Reading and Spelling* (LETRS) PD based on the SoR in preparation for developing an action plan to improve teaching and learning in reading. The training involved 18 hours of in-person training, additional independent study requirements, and assessments. These literacy coaches were then poised to be integral in designing and presenting PD on the SoR for teachers.

Connects to Broader Strategy of Improvement

As prominent literacy authors and researchers weighed in on the SoR, districts and schools across the United States began to review widely used phonics and reading programs and to challenge that some of the practices promoted by figures and programs considered to be

respected and reputable in the field were misaligned with current research (e.g., using picture cues to decode words, assigning reading levels for students, and using guided reading practices with leveled texts as the sole means of differentiation). School districts could no longer assume that widely used programs and practices were aligned with current research. Instead, districts needed to be careful consumers of programs and modify or replace them when necessary. Programs are often reviewed for alignment to standards but not to the SoR. They must be reviewed for alignment with research and standards moving forward.

Almost all students can learn to read by the end of first grade (Allington, 2011; Moats, 2020; Moats & Glaser, 2009). Nevertheless, this was not occurring on the national, state, or local level and was not happening in Pleasantville Public Schools. “We now know that classroom teaching itself, when it includes a range of research-based components and practices, can prevent and mitigate reading difficulty” (Moats, 2020, p. 32). Closing the gap in reading achievement becomes increasingly more challenging as students grow older as gaps continue to expand. Early assessment, explicit instruction, and targeted interventions are critical for later success in reading and across the content areas.

Additionally, literacy is one of Pleasantville's Board of Education goals each year. One of the goals for the 2021-22 school year was to:

> Focus on student achievement outcomes, in literacy and mathematics, as measured by the progress of matched cohorts on the Smarter Balanced Assessments (grades 3-8); and PSAT and SAT (high school)...In addition, use other standardized metrics, as determined by the Board of Education, to measure district-wide improvements in literacy, mathematics, and science. (Pleasantville, 2021, para.1)

Although standardized assessments in the upper grades primarily measured outcomes, teaching the reading skills that lead to that success begins as soon as students enter our schools.

Is High Leverage

Current research suggests that teachers need better preparation in higher education studies and programs (Moats, 2020). As such, a thoughtful, targeted plan for teacher training is intricately tied to the delivery of effective instruction. This type of instruction requires teachers to have an in-depth understanding of how students learn to read to meet the needs of struggling readers and prevent reading failure. For teachers to align their instruction to the research, they needed to understand not only the "how" but also the "why" of effective practices to make informed instructional decisions and support the diverse needs of their learners.

According to the Educational Advisory Board ([EAB], 2019), failing to teach students to read can have life-long implications. Only 25% of students not reading proficiently by the end of third grade will reach proficiency in later years. Further, 75% of students who are not reading proficiently by the end of third grade will never reach proficiency. Fifty-four percent of those struggling readers are less likely to go on to college. Yet, 95% of students can learn to read with the right strategies and support (EAB). "As adults, poor readers cannot participate fully in the workforce, adequately manage their own healthcare, or do much to advance their own child's education" (Seidenberg, 2017, p. 7). All students deserve an education that will prepare them to succeed.

Research Questions

Research has yet to make it into teacher practice due to a lack of higher education preparedness, professional development, and appropriate curriculum (Moats, 2020). With evidence-based curricular materials in place, this study aimed to create a PD plan to support teachers in building knowledge and making shifts in practice to align instruction to research. The development of a PD plan was intended to build knowledge in a logical sequence of theories and content while still being responsive to the real-time needs of teachers.

This mixed-methods study sought to answer the following research questions:

- What was the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading?
- What impact does strategic and ongoing PD in the science of reading have on teachers' practice?
    - What was the impact of PD in the science of reading on *teachers' perceptions of their knowledge* related to the foundational skills of reading?
    - What was the impact of PD in the science of reading on teachers' *confidence in applying that knowledge* in teaching the foundational skills of reading?
- What are teachers' perceptions of year-long professional development in the science of reading?

The first question aimed to determine the relationship between content knowledge and confidence in applying that knowledge in the classroom (self-efficacy). I posed this question because I hypothesized that content knowledge would be significantly stronger than confidence in teaching, given that the latter is a higher-level skill.

The second research question has two subcomponents: content knowledge and teachers' confidence in applying that knowledge in the classroom or their self-efficacy in instruction. Efficacy is the ability to perform a task by effectively organizing the cognitive, social, emotional, and behavioral skills to match its purpose. Self-efficacy is a person's belief in their ability to perform a task effectively based on the purpose. Change is only possible with motivation and the belief that one can succeed at a task. "People's beliefs about their personal efficacy, constitute a major aspect of their self-knowledge" (Bandura, 1977, p. 79).

The choice to measure teacher self-perceptions about each subcomponent through a pre-survey and post-survey (Appendix B), instead of measuring teacher knowledge through an

assessment was purposeful. A measure of teacher content knowledge would not necessarily demonstrate transfer to practice. Furthermore, it was unnecessary to put any additional undue stress on teachers still experiencing the ongoing strains brought on by the COVID-19 pandemic.

The third question sought to develop an understanding of the PD teachers received. Given the intent to deliver effective PD that was responsive to teacher feedback, it was essential to obtain and gain an understanding of the successes and challenges of PD throughout the study, to learn from it, and to inform future PD and its impact on affecting change in teacher practice.

Few studies have examined building a comprehensive year-long PD plan aligned to the SoR, developed with a logical sequence of content yet flexible and responsive to teacher needs in real-time. This study could lay the foundation for developing a similar plan in other districts. Further studies might explore the relationship between program improvement and PD with different programs or approaches.

Overview of Methodology

This action research study used a mixed methods design. An action research approach supported the iterative process of creating a better understanding of the problem and developing a strategy to close the gap between research and practice through ongoing, responsive PD. Researchers use action research to seek solutions to complex and unique problems. A systematic approach to finding effective solutions was employed collaboratively and democratically. According to Bloomberg and Volpe (2019), “The research process is iterative, cyclical, and participative in nature and is intended to foster a deeper understanding of a given situation informing future action” (p. 59). It took several iterations to implement instructional shifts, evaluate the outcomes, and determine the next steps based on timely feedback to inform the PD plan and effect change over time.

A mixed methods approach was used because both quantitative and qualitative methods were needed to capture the trends and details of the study's complex nature (Terrell, 2016). “Teaching reading really is rocket science” (Moats, 2020, p. 3). Preparing teachers to teach reading effectively in alignment with research is even more complex due, in part, to the necessity for teachers to change practices long used in their teaching.

A survey administered at the end of the 2020-2021 school year was based on content related to the science of reading and teaching foundational skills contained in the *LETRS: An Introduction to Language and Literacy* manual. The quantitative data provided by this pre-survey established a need for PD in all three categories of questions: reading models and theories, PA, and phonics. Participation in the survey was voluntary, and teachers who completed the survey were notified of the collection of their email (i.e., identity). A similar survey was conducted at the end of the 2021-2022 school year to measure the impact of the PD plan on content knowledge and self-efficacy in reading instruction.

Following the post-survey completion, I facilitated focus groups to generate more comprehensive data about content knowledge and self-efficacy resulting from PD, instructional shifts made, and next steps. Additional qualitative data were collected via exit slips after each PD offering at each school. Appendix C provides sample questions asked via the exit slips. This data was analyzed in real-time to determine the following:

- what (if any) instructional shifts teachers made based on previous PD.
- what (if any) instructional shifts teachers planned to make (used to identify shifts being made, celebrate successes, and to provide coaching support).
- what content in which teachers requested support to inform next steps by grade level throughout the action plan.

Data were also gathered from records such as my personal journal containing summaries and reflections following PD sessions, PD agendas documenting the goals for each session, and documentation of the overall PD plan as it was developed.

Positionality

In my role as language arts coordinator for Pleasantville Public Schools, I was positioned as a researcher and inside practitioner. According to Bloomberg and Volpe (2019), positionality refers to "the researcher's relationship with participants, the nature of that involvement, how much of the study's purpose will be revealed to the participants, and how ethical dilemmas will be managed" (p. 195). I have developed relationships with the participants (i.e., K-3 teachers) throughout my eight years in the district. I have had frequent opportunities to meet with grade-level teachers for PD, to collaborate during summer curriculum work, and to visit schools and classrooms.

In Pleasantville Public Schools, I am responsible for curricula, programming, and assessment in literacy K-12 and see my administrative role as highly collaborative. Although situated at the central office, I spend much of my time in the schools working primarily with teachers and reading staff. As an administrative team member, I participated in ongoing and collaborative discussions about program improvement, PD, student data and achievement, and many other prominent issues related to curriculum and instruction. My role working collaboratively with teachers and administrators offers me invaluable insight into the work.

I have been an educator for 30 years, with 13 of those years spent working as a classroom teacher at the elementary level. Additionally, I worked for three years as a school-based staff developer, one year as a reading interventionist, and six years as a curriculum leader for K-5 literacy. I am currently in my eighth year as a K-12 language arts coordinator. I completed all graduate work at Sacred Heart University, including a master's degree in teaching and

completion of technology, administration, and reading specialist certifications. Upon completion of the literacy specialist certification in 2014, I was hired by the university as an adjunct professor within the Connecticut Reading Specialist Program and taught most of the courses offered within the program. The role as adjunct professor provided some understanding of what prospective teachers learned in master's level courses and what experienced teachers came into the reading specialist program knowing and able to do. Having a deeper understanding of the skills necessary to teach reading, and strategies that worked with adults in the classroom, enhanced my skill set to collaborate with well-trained coaches to design high-quality PD for the teachers I serve.

This research aimed to bridge the gap between research and instructional practices through program improvement and responsive PD related to the SoR for the 2021-2022 school year. The short-term goal was to use what was learned through this action research study to continue refining and improving literacy instruction in Pleasantville's schools. Another goal was to produce a study in which the findings could inform and contribute to other researchers and districts doing this work. A long-term goal was to ensure students reach their greatest potential in reading and subsequently impact their ability to find meaningful employment, make informed life decisions, and be contributing citizens in society.

Researcher's Role

As a K-12 language arts coordinator, I am responsible for literacy programming, curriculum, assessment, and PD at Pleasantville Public Schools, a small but diverse suburban district. I evaluate the reading teachers and coaches in each of the elementary schools. In such a role, this positionality can impact trust and honesty in feedback as teachers may want to support their evaluator's viewpoints instead of offering oppositional thinking when it existed. Every effort was made to ensure this was not the case. I have worked hard to build trusting,

collaborative relationships with these teachers and value their expertise and ideas. They have played a vital role in making curricular and programmatic improvements and providing PD over the years we have worked together.

I do not evaluate the K-3 teachers participating in the study; however, I was the decision-maker for literacy programming, which directly impacted their teaching and, thus, put me in a position of authority. This positionality could impact participation, relationships, and motivation to do the work. Throughout the study, I worked closely with the reading teachers and coaches to understand and address the needs of teachers and build a responsive PD plan. It was also essential to be transparent with teachers about my desire to collaborate with them and incorporate their ongoing feedback in teacher training and resource needs decisions.

Additionally, I worked collaboratively with the two administrators in the elementary schools who were also invested in improving literacy. In doing so, I recognized that the administrators had different competing priorities in their buildings. For example, in the 2020-2021 school year, during the COVID-19 pandemic, Pinehurst had most students participating in in-person learning, while Elmhurst had over half of the students in remote learning. This alone created unique needs to address. Going into the 2021-2022 school year, many students had not been in school for a year and a half, and the social and emotional needs of students had increased. In addition, substitute coverage was a challenge with ongoing staff illnesses and staffing shortages. I understood there were times during this study when building-level leaders needed to prioritize other school-based needs over PD.

Assumptions

There were three primary assumptions made regarding this study. Assumptions "reflect what you hold to be true as you go into the study and from which you will be able to draw some conclusions" (Bloomberg & Volpe, 2019, p. 130). I assumed that teachers were honest in their

self-reflections and responses because I know the teachers and have worked to establish a culture of trust and collaboration. Openly sharing experiences, perspectives, and goals was routine practice. Also, 44 of the 52 teachers invited to complete the voluntary reading survey at the end of an exceedingly difficult year of teaching (2020-2021) did so. Most scored themselves on the lower end of knowledge about essential reading skills and theories, demonstrating honesty and vulnerability in their self-reflections.

Another assumption I made was that teachers who know better would do better, and if instruction was aligned with the SoR, student achievement would improve. As such, focusing on changing teaching practices was critical to improving student achievement in reading (Moats, 2020). Teachers who were self-reliant would apply their learning as they knew more, improving instruction. Change takes time, but with the proper support, instructional practices would shift.

A third assumption was that teachers' motivation would increase when their input was part of the decision-making process, and PD was ongoing and responsive to their needs and interests. The stronger the perceived self-efficacy, the higher the goals people set for themselves and the firmer their commitment is to them (Bandura, 1997). Teacher feedback informed decisions about the resources developed and provided, the data collected, and the PD plan.

Finally, as the language arts coordinator, I am inherently invested in program improvement and the success of students. This awareness was critical to ensure I made decisions based on research, not personal beliefs. I had to challenge my own long-standing beliefs and practices often over the last few years as I gained a better understanding of the research related to the SoR. Relying on research was integral to my journey and my own change process.

One valuable way I continue to challenge my own biases is through collaboration. I value and respect the knowledge and experience of the reading teachers, coaches, and the assistant superintendent of curriculum and instruction (also pursuing her doctorate and formerly in my

role). Collaboration involves engaging with others (e.g., teachers, administrators, specialists) with a common goal. It should be done to help the researcher address biases, power, and equity, increasing the study's validity (Ravitch & Carl, 2021). Enlisting constructive feedback and input throughout the study was ongoing in my role as a researcher and practitioner.

Definition of Key Terms

Connected Text: Words that are linked (as opposed to words in a list) as in sentences, phrases, and paragraphs (Florida Center for Reading Research [FCRR], 2020, p. 3).

Decodable Text: Text in which a high proportion of words (80%-90%) comprise sound-symbol relationships that have already been taught. It is used for the purpose of providing practice with specific decoding skills and is a bridge between learning phonics and the application of phonics in independent reading (FCRR, 2020, p. 4).

Decoding: The ability to translate a word from print to speech, usually by employing knowledge of sound symbol correspondences; also the act of deciphering a new word by sounding it out (FCRR, 2020, p. 4).

Five Components of Reading: Phonemic awareness, phonics, fluency, vocabulary, and comprehension (FCRR, 2020, p. 6).

Grapheme-phoneme Units: The smallest letter-sound units used to spell words (Ehri, 2022, p. 53).

Graphemes: One or more letters that represent single phonemes or sounds, such as /t/ or /sh/ (Ehri, 2022).

Letter-Sound Correspondence: The matching of an oral sound to its corresponding letter or group of letters (FCRR, 2020, p. 9).

Oral Language: Spoken language. There are five components of oral language: phonology, morphology, syntax, semantics, and pragmatics (FCRR, 2020, p. 10).

Orthographic Mapping: The grapheme-phoneme forming process to store spellings bonded to pronunciations of words in memory (Ehri, 2022, p. 54).

Phoneme: The smallest unit of sound within our language system. A phoneme combines with other phonemes to make words (FCRR, 2020, p. 11).

Phoneme Manipulation: Adding, deleting, and substituting sounds in words (e.g., add /b/ to oat to make boat; delete /p/ in pat to make at; substitute /o/ for /a/ in pat to make pot) (FCRR, 2020, p. 11).

Phonemic Awareness: The ability to focus on, distinguish, separate, and manipulate phonemes in words. Various tasks are used to teach and assess these skills (e.g., segmenting words into phonemes, blending separated phonemes, and adding, substituting, or deleting phonemes (Ehri, 2022)

Phonics: A form of instruction that teaches students the major phoneme-grapheme relations and their uses to decode and spell words; knowledge about reading and spelling skills acquired through systematic instruction (Ehri, 2022).

Phonological Awareness: One's sensitivity to, or explicit awareness of, the phonological structure of words in one's language. This is an "umbrella" term used to refer to a student's sensitivity to any aspect of phonological structure in language. It encompasses awareness of individual words in sentences, syllables, and onset-rime segments, as well as awareness of individual phonemes (FCRR, 2020, p. 11).

Professional Development: Structured professional learning that results in changes to teacher knowledge and practices, and improvements in student learning outcomes (Darling et al., 2017, p. 2).

Sight Words: Words that have been orthographically mapped to the brain and are recognized with automaticity during reading (Ehri, 2022).

Story Grammar: The general structure of stories that includes story elements (FCRR, 2020, p. 15).

Train-the-Trainer Model: A capacity-building plan to develop master trainers who then deliver the program information to users (FCRR, 2020, p. 16).

Organization of the Dissertation

This dissertation is organized into five chapters: The introduction, the literature review, inquiry methods, results and findings, and conclusions and recommendations. The next chapter in this dissertation provides an introduction, a review of literature related to the problem statement and research questions, a conceptual framework, and a chapter summary. Chapter three includes an introduction, rationale for the research design, the setting and context of the study, the population sample, data collection, and analysis methods. Following the methodology's description is an explanation of the measures taken to address any issues of trustworthiness and a chapter summary. Chapter four presents the results and findings of the study for the three research questions, and limitations and delimitations. The final chapter includes a discussion of the findings, implications, recommendations, contributions of the study, and the impact of the study on the researcher.

CHAPTER TWO – LITERATURE REVIEW

Introduction

This action research study aimed to develop a comprehensive PD plan to engage teachers in making the instructional shifts necessary to close the gap between research and practice in alignment with the SoR. This review of the literature is presented in several parts. It is intended to address current research on how students learn to read, what teachers need to know to teach reading, and how to effectively support teachers in changing beliefs and instructional practices. Seidenberg et al. (2020) stated, "The lack of improvement in literacy outcomes over many years has led to new pressure to incorporate the science of reading in curricula, instructional practices, and teacher education" (p. S119).

This literature review begins with the SoR as it provides the context and relevance of this study. It is followed by the underlying reading theories with implications for instruction, most often referenced in literature on the SoR. Research on critical topics related to the foundational skills of reading, including PA, phonics, orthographic mapping, connected text, fluency, and assessment follows. Next is a detailed description of the conceptual framework guiding this study with the relevant research on changing instructional practices, including Bandura's Social Cognitive Theory, PD, and coaching. This chapter concludes with a brief chapter summary. This literature review presents the most current and long-standing research; as such, the historical context is limited and specific only to the developing theories and research about how students learn to read.

To better understand this problem of practice, I completed a comprehensive review of the literature using multiple search engines and keywords. The search engines used most often included the University of Arkansas Library, Google Scholar, ProQuest, JSTOR, and ERIC. Search terms included, but were not limited to, the following: the science of reading, reading

theories, phonics, phonemic awareness, orthographic mapping, fluency, professional development, and self-efficacy. Included in the review process were several peer-reviewed journals which released articles on the SoR, including *The Reading Teacher* (International Literacy Association [ILA]), *Educational Leadership* (Association for Supervision and Curriculum Development [ASCD]), *Educational Advisory Board* [EAB] (District Leadership), *IDA Examiner* (International Dyslexia Association), and *Reading Research Quarterly* (ILA). Additionally, I reviewed several prominent online educational organizations that developed information specific to the SoR in the research process. These organizations included: *The Reading League, 95% Group, Student Achievement Partners*, and *Amplify* (Science of Reading Toolkit).

Science of Reading

Many literacy organizations have offered their definitions of the SoR, similar in content but different in explanation. The following definition was selected for use in this study because it offers a clear and thorough explanation of the SoR:

> The *science of reading* is a vast, interdisciplinary body of scientifically-based research about reading and issues related to reading and writing. This research has been conducted over the last five decades across the world, and it is derived from thousands of studies conducted in multiple languages. The science of reading has culminated in a preponderance of evidence to inform how proficient reading and writing develop; why some have difficulty; and how we can most effectively assess and teach and, therefore, improve student outcomes through prevention of and intervention for reading difficulties. (The Reading League, 2021, para.1)

Views on reading instruction have been controversial for years, dating back to the 1840s when Horace Mann insisted that teaching whole words was the best way to teach reading, a

perspective protested by his colleagues (Seidenberg, 2017). Over the last thirty years, the most prominent opposing views were between supporters of whole language (the belief that readers learn to read naturally) and phonics proponents. Eventually, the supporters of whole language shifted to balanced literacy, a belief that a balance of whole-word reading and some phonics instruction is important (Riley, 2020). Both sides claimed to be supported by science.

In response to these ongoing contradictions in research, the United States Congress mandated an evaluation of the effectiveness of varied approaches to teaching students to read and established the National Reading Panel (NRP) to do this work in 1997 under the direction of the United States Department of Education (National Institute of Child Health and Human Development [NICHD], 2000). This panel produced one of the largest syntheses of scientific reading research. The panel convened 14 members (including a parent, an administrator, a teacher, and scientists) to synthesize the research related to reading achievement (Shanahan, 2003). The results of this seminal study identified five areas of reading instruction critical to reading achievement: phonemic awareness, phonics, fluency, vocabulary, and comprehension.

The report by the NRP has been criticized for the process used to narrow the topics reviewed (by vote), for the narrow scope of the topics (eight selected out of 30), and for the quality of the studies included (only scientific studies). Shanahan (2003) has written extensively about this and found that most complaints were about the process rather than the findings. The NRP completed this research more than 20 years ago, yet instructional strategies in reputable, widely used programs and classroom instruction remain disconnected from research (Kilpatrick, 2016, 2020; Moats, 2020; Seidenberg, 2017; Shanahan, 2003).

Seidenberg (2013) contends a major weakness of the NRP's work was the lack of a mandate to research and recommend what is developmentally appropriate to teach, how to assess the components identified, or what instructional methods are most effective within an

appropriate curriculum. This omission of pedagogical approaches left out the science to inform instructional practices and further perpetuated the divide between science and reading instruction. Seidenberg claimed it provided a loophole in which programs and curricula could claim to be aligned to the research if they contained those five components: phonemic awareness, phonics, fluency, vocabulary, and comprehension. As a result, education has been vulnerable to popular instructional approaches instead of those backed by science.

Reading Theories That Inform Reading Instruction

The disconnect between science and educators has become a priority in discussions about reading instruction (Seidenberg, 2013). Since 2018, a renewed focus on the SoR in the media has caught the attention of researchers, scientists, neurologists, educators, and others interested in how students learn to read and how to teach them best. Educators must deeply understand the underlying theories of how students learn to read to close this gap between research and practice. These theories provide a scientifically supported understanding of what does and does not work in teaching students to read and why.

Simple View of Reading

Gough and Tunmer (1986) proposed the Simple View of Reading to demonstrate the predictive relationship between word recognition and linguistic (language) comprehension to achieve comprehension in reading. This simple formula multiplies decoding by language comprehension to achieve reading comprehension. In other words, if word recognition (i.e., decoding) is at 0.5% and language comprehension is at 0.5%, then reading comprehension is at 0.25%. A score of 0 is no comprehension, and a score of 1 is perfect comprehension. Gough and Tunmer used this model to clarify the vital role decoding plays in comprehension, dispelling common myths that strategies like guessing or whole-word reading are effective approaches to teaching reading.

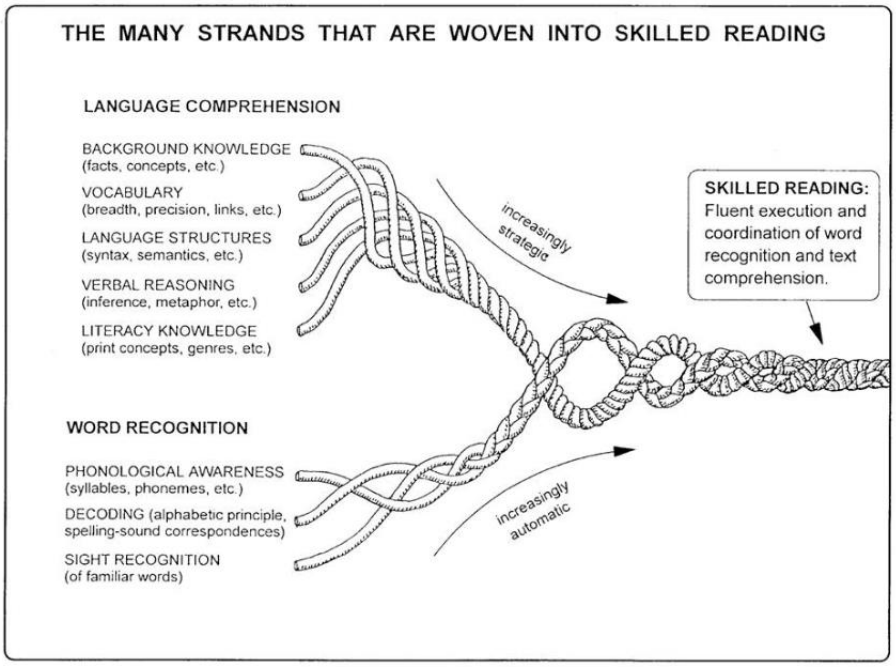
The Simple View of Reading demonstrates the importance of strengthening both word recognition and language comprehension while teaching students to read. The optimal approach is using an explicit, systematic approach to phonics and decoding strategies, reading aloud, and engaging in text discussions with a focus on language development (Moats, 2021). One must fully comprehend written text with proficient decoding skills and language comprehension.

Scarborough's Reading Rope

Scarborough (2001), psychologist and literacy expert, later developed the reading rope infographic (i.e., Scarborough's Reading Rope), originally designed to demonstrate to parents how key reading subskills are loosely interconnected when learning to read and are fully interwoven in skilled readers. Any loose strand within word recognition, language comprehension, or both creates a weakness, negatively impacting fluency and comprehension. It aligns with the work of Gough and Tunmer's Simple View of Reading. However, it provides greater detail by elaborating on the subskills in the two parts (i.e., word recognition and language comprehension). As each subcomponent within these broader concepts strengthens, so does reading comprehension.

Figure 1

Scarborough's Reading Rope



Note. This infographic originally appeared in the following publication: Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S. Neuman & D. Dickinson (Eds.), *Handbook for research in early literacy* (pp. 97–110). New York, NY: Guilford Press.

The subcomponents of the word recognition strand include phonological awareness, decoding, and sight recognition of words. Each subcomponent is equally important and must work together with increasing proficiency for readers to develop the accuracy and fluency necessary to comprehend text. To ensure students develop this proficiency requires explicit instruction in phonological awareness (more specifically, phonemic awareness, as identified by the NRP) and decoding skills to increase the number of words read with automaticity.

The subcomponents of language comprehension include background knowledge, vocabulary, language structures (i.e., grammar and sentence formation), verbal reasoning (i.e., thinking about text and following written instructions), and syntax (i.e., the arrangement of

words in sentences). Each of these skills needs to become increasingly and equally strategic to gain proficiency in comprehension.

> To be a skilled reader, one must know, understand, and be able to retrieve from memory facts and concepts associated with an infinite number of topics. Skilled readers also have breadth and depth of vocabulary, a vast personal dictionary of words they understand and can use correctly in context, identify multiple meanings of, and link to other known words. (Gehris, 2021, para. 4)

This learning takes time and requires explicit instruction in texts written across various genres, topics, and cultures.

The Four-Part Processing Model

The Four-Part Processing Model, based on the work of Seidenberg and McClelland (1989), helps to explain what occurs in the left side of the brain during reading and what can go wrong to impede reading growth. Their original model was developed before functional imaging brain studies revealed where and when these processes occurred in the brain. Advances in neuroscience and imaging of the human brain before and after instruction have provided information about what areas of the brain are impacted by and can be improved through instruction. This model reveals the importance of including all the component parts in instruction and an understanding of how those parts work together (Moats & Toleman, 2009). Substantial research demonstrates that explicit instruction in phonemic awareness and phonics instruction can build neural pathways, improving sight word vocabulary and word reading skills (Glaser & Moats, 2008; Kilpatrick, 2015, 2016, 2020; Seidenberg, 2017).

Four processing systems are at work in the left side of the brain when reading occurs. The phonological processor (i.e., where speech sounds are processed) and the orthographic processor (i.e., memory for letters and letter patterns) are the model's foundation and must work together

with automaticity and then connect to the meaning processor to make meaning of a text. Finally, the context processor, which processes the word meanings and the context in which they are used, works to achieve an accurate understanding of a text (Glaser & Moats, 2008). Any disruptions in these neural passages can cause a student to struggle to read (Kilpatrick, 2015, 2020; Seidenberg, 2017; Shaywitz & Shaywitz, 2004). Identifying the weaknesses in any of these processors is critical for selecting appropriate interventions.

The phonological processing system, or the processing of speech sounds, engages several areas of the brain and "enables us to perceive, remember, interpret and produce the speech sound system" of language (Moats & Toleman, 2009, p. 34). It is responsible for skills such as identifying phonemes (i.e., sounds), distinguishing between words spelled similarly, and retrieving and remembering words. The orthographic processor must be linked to the phonological processor because it stores information about letters and letter patterns essential for knowing and reading the connecting sounds. Once these letters and letter sequences are stored, they are linked to the sounds and meanings contained in words. These two processors work together to decode and encode words.

The meaning processor connects the words read to meaning in and out of context. It stores words, their features, and their meanings in a "mental dictionary" where words and word relationships are stored (Moats & Toleman, 2009, p. 36). Children learn words more easily if they are learned in context and connected to images of the sounds and spellings. The context processor supports the meaning processor in making sense of the words based on the context in which they are used (e.g., "I swung the bat." versus "The bat was hanging in the cave."). This processor supports understanding the intended meaning of a text but also making sense of words with similar sounds and words with multiple meanings. The context may also assist in determining the meaning of unfamiliar words.

Each of the four parts of the model contributes to the goal of reading comprehension; thus, instruction in each area is essential. Explicit teaching of phonemic awareness, phonics, and spelling provides the foundation for linking the phonological and orthographic processors. Instruction in vocabulary and comprehension strategies supports the work of the meaning and context processors. Understanding the role of these processors has essential implications for instruction. To effectively apply these understandings in the classroom, knowing how these skills build, develop, and are interconnected is necessary.

Ehri's Phase Theory

Ehri's Phase Theory (2020) posits that learners go through four sequential but overlapping phases of learning to read. These occur in typical age ranges in typically developing readers: pre-alphabetic (i.e., nonreaders), partial alphabetic (i.e., can use letter-sound connections to read and write but are unable to decode unknown words), full alphabetic (i.e., can decode words to read and write from memory), and consolidated alphabetic (i.e., have acquired a large number of spelling patterns in memory and can analyze spellings). Eventually, word decoding becomes seemingly effortless and automatic. The research findings within the first three phases have implications for instructional practices based on skill progressions.

In the pre-alphabetic phase, before students can read, they do not have enough letter-sound knowledge to map words to memory, so they use symbols or other visual cues (Ehri, 2020, 2022; Kilpatrick, 2016). Students require instruction in letter shapes, names, and grapheme-phoneme correspondences (letters and sounds) to move to the next phase. A comparison study indicated that students who learned letter-sound correspondences were better prepared to move into the partial alphabetic phase than when learning smaller chunks of words, such as onset and rime (Ehri, 2020, 2022).

Students in the partial alphabetic phase can learn and store words in memory, but they do not know enough letter-sound correspondences to decode words. A useful approach in this phase is to increase student knowledge of letters and sounds while teaching them to segment and blend sounds (Ehri, 2020). An experimental study by Gonzalez-Frey and Ehri (2020) revealed that during the blending process of CVC (consonant-vowel-consonant) words with continuous sounds, the students who stretched out the sounds in the decoding process (e.g., /sssss-aaaa-mmmm/) were more successful than those who isolated the sounds as they worked on decoding and reading words (e.g., /s/-/a/-/m/). Students with weak phonemic awareness skills can get stuck in this phase (Kilpatrick, 2016). Using continuous phonation when teaching students to blend sounds to read words and explicit teaching of phonemic awareness skills can accelerate a student's likelihood of moving through this phase.

Boyer and Ehri (2011) conducted an experimental study on preschoolers' language and literacy development to determine whether phonemic segmentation instruction would move them from the pre-alphabetic to the partial alphabetic stage. Qualifying participants were placed into groups based on similar pretest scores. One group received phonemic segmentation training with letters only (LO), another group received training with letters and articulation pictures (LPA) (i.e., eight pictures of different mouth articulations correlating to 15 sounds), and a third was a no-treatment group. Several posttests were administered to determine the effectiveness of teaching phoneme segmentation and transfer to word reading and spelling. The LPA and LO groups were superior to the no-treatment group in phoneme segmentation and spelling, but not nonsense words. The LPA group required additional instructional time; however, statistical tests revealed that the time may have impacted spelling, but not word reading differences, in which LPA proved more significant. Hence, instruction in articulation concurrent with phonemic awareness instruction may support spelling instruction.

In the full alphabetic phase, students can identify and map all the sound-letter combinations they see to decode words. Strategies such as guessing and whole-word instruction interfere with permanent storage (Ehri, 2020; Kilpatrick, 2016). The implication for instruction is to focus on letter-sound correspondences when teaching students to decode words, not on practices such as guessing, using picture clues, and whole-word instruction. Moving to the next phase (i.e., consolidation) requires students to map multiple letter units to the sounds they make in real words. Explicit instruction at the syllable level and teaching morphology and orthographic mapping (i.e., mapping sounds to letters or letter clusters) are beneficial for moving students to the consolidation phase, where these patterns are bonded to memory and become automatic (Ehri, 2020).

Ehri's Phase Theory illuminates the importance of the foundational skills of reading and the use of assessments necessary to understand where students are in the phases to inform instruction. Important to the process is systematic phonics instruction, including a focus on phoneme-grapheme relationships and decoding skills. "Phase theory focuses on the acquisition of sight words and the processes that enable students to read words accurately and automatically from memory" (Ehri, 2022, p. 60). It demonstrates that reading and spelling skills develop gradually and require instruction to become proficient and automatic.

These four reading theories represent essential knowledge for teachers who teach early reading skills. The Simple View of Reading demonstrates limited comprehension results if there are deficiencies in language comprehension or decoding skills, identifying the importance of each for early readers. Scarborough's Reading Rope breaks down the subskills for each into teachable and measurable components. Assessing these subskills and analyzing the results can aid in determining priorities and areas in need of additional instruction, making instruction more precise. The Four-Part Processing Model demonstrates the importance of each of the parts of the

brain working together to comprehend and construct meaning, emphasizing the importance of phonemic awareness and phonics working together as the foundation of the reading process. Finally, Ehri's Phase Theory helps inform instruction, providing information about what needs to happen developmentally for a reader to progress and what skills need to be mastered to transition from one phase to the next.

Foundational Skills in Reading and Instructional Implications

The foundational skills of reading include those needed to collectively achieve word recognition and language comprehension, allowing developing readers to improve fluency and access reading comprehension. The areas related to the foundational skills in this study include three of the five components identified in the NRP report as being critical to learning to read: phonemic awareness, phonics, and fluency. Also important and closely related to phonics is orthographic mapping (how letter patterns map to the brain) and using connected texts to apply and practice phonics skills. These skills contribute to the development of reading fluency. Additionally, assessment analysis is critical for targeting skills for instruction and monitoring student growth.

Phonological Awareness

PA is the sensitivity to language structure, including the ability to discriminate and manipulate sounds at the sentence, syllable, word, and individual sound level (i.e., phonemic awareness). The research overwhelmingly suggests that students with poor PA almost always become struggling readers, but that can be prevented for many students if they are trained in PA beginning in kindergarten (Glaser & Moats, 2011; Kilpatrick, 2016; Moats, 2020). As such, explicit, systematic instruction in PA is a necessary component of K-2 curriculum and may be beneficial through grade three. The NRP's report indicated that phonemic awareness, focused on manipulating phonemes, significantly affected a child's ability to read real words and pseudowords and comprehend what is read (NICHD, 2000).

Although many studies on the impact of PA training have involved individual cases, Shapiro and Solity (2008) performed a study on the implementation of PA and phonics training on a broader scale. The study occurred over three years, comparing the UK's equivalent of kindergarten through grade two with a similar group of students receiving conventional instruction. The study involved 424 students across 12 schools tested at the beginning and end of each three years. Not only did the schools receiving the intervention improve reading skills more quickly, but phonological skills improved in students of all levels, not just those who struggled. By the end of first grade, the incidence of reading difficulties was 5% in the intervention group compared to 20% in the comparison group (with 75% lower reading difficulties than the comparison group). This further supports the importance of explicit phonological instruction focusing on phonemic awareness.

Phonemic awareness (a component of PA) is the ability to hear and manipulate individual sounds and is one of the best predictors of successful reading in the early years. According to Kilpatrick (2016), students who are trained in phonemic awareness beginning in kindergarten

can learn to read more efficiently. "Phonemic skills are foundational for fluent, word-level reading in alphabetic writing systems. They not only assist in sounding out new words, but they are central to remembering words" (Kilpatrick, 2020, p. 15). Training with kindergarteners can begin with rhyming, alliteration, and clapping out syllables. It can then move to oral segmenting, blending, and phonemic manipulation tasks such as adding, deleting, and substituting phonemes. This training positively impacts grades kindergarten through two (ILA, 2019; Kilpatrick, 2015, 2016). For students to be fluent readers, they must be proficient and automatic at the phoneme level, usually achieved between grades two and four (Kilpatrick, 2016).

Ehri et al. (2001) replicated a meta-analysis by Bus and van IJzendoorn in 1999 on the effects of phonemic awareness training on reading, including 52 experimental studies that met the criteria and included a control group. The study focused on students identified as "at risk" through a phonemic awareness assessment. Results were reported as effect sizes. Cohen (1988) suggested that a $d = 0.2$ effect size is considered small, $d = 0.5$ is considered moderate, and $d = 0.8$ or above is considered large. The effect size of training on phonemic awareness was large (0.86) and the effect of phonemic awareness training on reading was moderate (0.56). Ten studies measured the effect on reading comprehension that produced 20 treatment comparison groups. More than half (12) yielded moderate (6) or large gains. The effect sizes that were close to zero tended to be studies that included students with disabilities.

As recommended by the NRP and many other studies, phonological awareness (specifically phoneme awareness training) benefits learners and may positively impact phonemic awareness, word reading fluency, comprehension, and spelling outcomes.

Phonics

The report from the NRP also concluded that an explicit, systematic approach to phonics instruction positively impacts student achievement, particularly when it begins in kindergarten. Research findings revealed kindergarten and first grade students can benefit from both phonemic awareness and phonics instruction, even before they can read. Explicit, systematic phonics instruction was determined to be the most effective way to improve a child's ability to decode words (i.e., identify individual sounds in words and blend them) with regular patterns and pseudowords, or words which are not real (NICHD, 2000). Phonics instruction plays a critical role in helping students to decode words.

Understanding how words are learned impacts decisions about how to teach students to read. It was long believed students learned to read through visual memory, which Kilpatrick (2015, 2016) proposed as the reason there are so many children with reading difficulties today. If words were stored in visual memory, it would make sense to have students memorize words with irregular spelling patterns, which is common in today's classrooms. Several arguments can be made against this theory. For example, if visual memory was involved, how can we read words in different fonts or words written in cursive letters? Visual memory does, however, play a role in letter recognition, one of the foundational skills of learning to read.

One impact this has on instructional decision-making is specific to the teaching of words with phonetically irregular spelling patterns (i.e., often referred to as trick words or heart words). Most irregular words have only one irregular sound-letter pattern in them. For example, in the word “said” the only irregular sound is made by the “ai” pattern. We store irregular words in long-term memory similarly to how we store regular words; therefore, most of the word “said” has typical letter-sound correspondences able to be taught and mapped in the brain (Kilpatrick, 2016). This is a necessary shift from the long-standing whole-word instructional approach (i.e.,

memorization) to the practice of identifying a word's regular and irregular parts during instruction. Blevins (2017) suggests additional strategies for instruction, including:

- teaching words together that have something in common (e.g., an irregular “ou” sound with regular “ou” words),
- teaching word families together (e.g., could, should, would), and
- teaching and reviewing words that are easily confused more consistently and for longer periods of time (e.g., were, here, there; of, for, from).

The comprehensive research on PA and phonics provides significant implications for reading programming in K-3 and is critical for informing decisions about curricular and instructional changes aligned to research.

Orthographic Mapping

For words to become automatic, they need to be “mapped” in the brain through a mental process called orthographic mapping (Ehri, 2020). Kilpatrick (2016) states that “orthographic mapping uses sound-to-letter relationships to anchor phonemes in a word’s pronunciation to the printed letter strings into long-term memory for future retrieval” (p. 40). This enables a reader to recognize words by sight or automatically (Ehri, 2014). It is important to distinguish phonics from orthographic mapping. Phonics involves decoding letter and letter sounds and blending those sounds together to read a word. Understanding how orthographic mapping works impacts what and how we teach. Critical to the orthographic mapping process are three components: automaticity in letter-sound connections, strong phonemic awareness skills, and the ability to make connections between the sounds in oral words and the letters which represent those sounds (Kilpatrick, 2016).

Students need to be able to decode words, often several times, before they can be mapped to memory. Once students can read words automatically, it frees up energy to focus on

comprehension. Ehri's Phase Theory provides insight into how these reading skills develop. Orthographic mapping is critical for building sight word vocabulary, fluency, and comprehension (Ehri, 2014; Kilpatrick, 2016).

Connected Text

It is essential to connect the skills learned in phonics to a text in which those skills can be applied. Decodable texts (controlled for specific spelling patterns) are developed for just this purpose. They provide readers with the opportunity to practice new skills with a high level of success, which is vital for early readers. In addition, decodables are essential for mastery and transfer for some students. When students spend time each day applying their phonics skills in both reading (with decodables) and writing, they will progress in phonics skills much faster (Blevins, 2021). "The use of decodable booklets enables the repeated practice necessary to build the automatic systems in the word form region that lead to fluent reading" (Shaywitz & Shaywitz, 2004, Evidence-Based Effective Reading Instruction, para.3). As reading skills develop and improve, the use of decodable texts phases out, and the reading of trade books increases.

Blevins (2023) conducted an experimental study in two New York City schools to determine the effectiveness of decodable texts. Two first-grade classes participated from each school, totaling 101 students. All groups received the same phonics instruction but used different text types for reading practice. In the control group, reading practice following phonics instruction included using predictable pattern books and trade books in which approximately 35% of the text was decodable. The experimental group read decodable texts which were 100% decodable. Both teachers in the experimental group were trained in the use of these decodable books in their classrooms. From the pretest to the posttest, the students in the experimental group made significant gains over the control group on the Woodcock Reading Mastery Test (which

assesses the reading of printed words). Eighty-seven percent achieved mastery on a decoding assessment, while only 54% of the control group achieved mastery. Additionally, on a Phonics-Phonemic Awareness Quick Assessment, 92% of students from the decodable group spelled all five words correctly as compared to 66% in the control group.

Reading words in meaningful contexts facilitates the bonding necessary for orthographic mapping and the bonding of that word's meaning. Giving students texts they can read establishes "fully formed sight words with all their identities-spellings, pronunciations, meanings, roles in sentences-bonded together as one unit in memory" (Ehri, 2022, p. 57). Decodable books can also build fluency and comprehension (ILA, 2019).

Fluency

Fluency is often referred to as the bridge from decoding to reading comprehension. Fluent reading requires efficient, automatic word recognition skills that free the reader to focus on comprehending the text, hence, the reference to a bridge. "Fluency is manifested in accurate, rapid, expressive oral reading and is applied during, and makes possible, silent reading comprehension" (Pikulski & Chard, 2005, p. 510). Automatic recognition of words, their pronunciation, and typical meanings are the key to building fluency, eventually allowing the reader to focus on comprehension. Pikulski and Chard (2005) further state, "Ehri's theory and research indicate that it is the careful processing of print in the Fully Alphabetic Stage that leads to this rapid, instant recognition" (p. 512). Readers who have reached Ehri's consolidated stage, having mapped familiar patterns in words, are poised to be increasingly fluent in their reading. Evidence suggests fluency can be developed through repeated oral reading strategies with corrective feedback (Shaywitz & Shaywitz, 2004).

Assessment

According to Ehri (2022), specific assessments can help determine a student's phase of reading development, allowing for targeted instruction and moving students to the next phase. These assessments include letter names and letter sounds, phonemic awareness, reading words with automaticity, decoding pseudowords, spelling words, and reading grade-level text. According to Black and Wiliam (2010), using formative assessment to drive instruction is essential to student achievement.

Conceptual Framework

Making instructional changes requires increasing teacher knowledge and confidence in applying it in the classroom to build self-efficacy. “Among the many elements that make up an effective educator, the most important is self-efficacy—the belief that one has the abilities and resources necessary to accomplish a set goal” (Mielke, 2021, para. 5). As teachers’ understanding and ability to apply the foundational skills of reading increase, the likelihood and effectiveness of making instructional shifts increase (Bandura, 1977; Moats, 2020). Professional development and coaching can improve teacher knowledge and self-efficacy.

Social Cognitive Theory

Bandura’s Social Cognitive Theory was instrumental in framing the context of PD and coaching within this study when considering the most effective ways to enact change. For teachers to make long-standing and purposeful change, acting with agency or with intentionality is necessary. “Beliefs of personal efficacy constitute the key factor of human agency” (Bandura, 1997, p. 3). Bandura posits that these beliefs are built on four sources of information: mastery experiences, vicarious experiences, verbal persuasion, and emotional state.

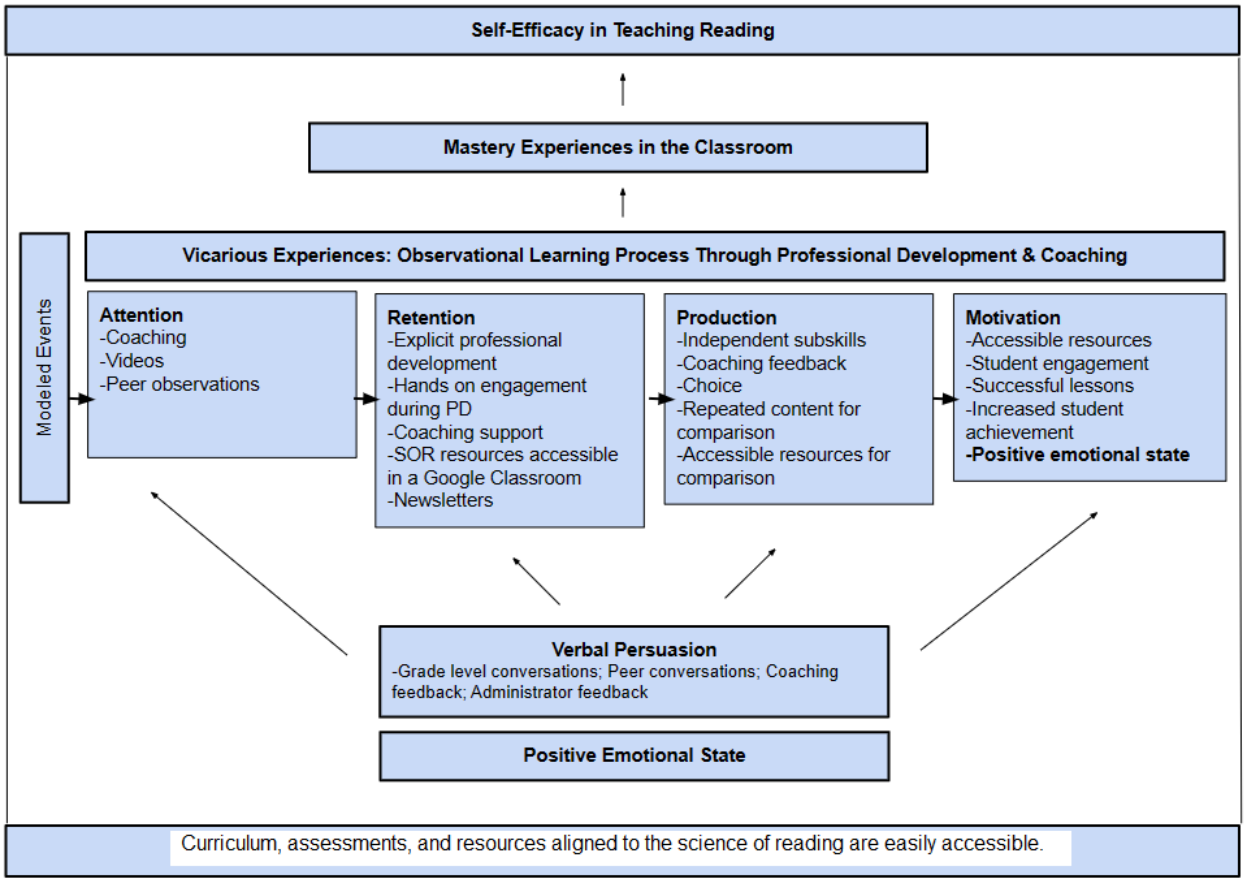
This PD plan aimed to improve teachers’ content knowledge and self-efficacy in teaching reading using research-based instructional practices. In the conceptual map framing this study (see Figure 2), Bandura’s four sources of information for self-efficacy are visually organized

from the most to least impactful. Mastery experiences, being the most effective, are gained through experiencing success in situations requiring perseverance and minimal failure early on. The greater and more frequent successes, the greater the influence on self-efficacy. These are best impacted and supported in two ways: 1) ongoing coaching support and 2) vicarious experiences. Vicarious or indirect experiences, including observational learning through modeled events, empower the success of mastery experiences. Vicarious experiences are portrayed in greater detail in the conceptual map because observational learning is where PD can have the most significant impact.

Verbal persuasion (i.e., persuasion by others) can impact any part of the observational learning process. Verbal persuasion was assumed to be an incidental and variable factor in the plan that could be encouraged through positive collaboration and dialogue opportunities. The least impactful component of the model was the emotional state of teachers. Connecting positive emotion to learning experiences is an essential motivator in making positive change (Meilke, 2021). The COVID-19 pandemic was a unique context for PD and undoubtedly impacted teachers' motivation throughout the PD plan. As such, teachers' well-being, or lack thereof, may have had a negative impact during the PD process. Mielke (2022) identified inefficacy as a major contributor to teacher stress and burnout. Building efficacy requires confidence and competence attained through mastery experiences and high-quality PD.

Figure 2

PD Plan Based on Bandura's Social Cognitive Theory



The observational learning process, a primary focus of this PD plan, was dependent on an iterative cycle of gaining the attention of the observer, retention of the learning, production (or attempts by the observer to implement), and the motivation to increase knowledge and experience through a continuous learning process. The components within this conceptual model align with the work of other PD researchers (i.e., Darling-Hammond et al., 2017; Desimone & Pak, 2017; Knight, 2021). Instructional improvements can be achieved through high-quality PD and coaching.

For modeling to be successful, it must catch the observer's attention. This can be achieved by presenting new and engaging materials, supporting resources, and opportunities to view videos, models, and live presentations (Bandura, 1977). Developing an understanding of reading theories provides a foundation for drawing attention to new practices (Joyce & Showers,

2002). Embedded PD and coaching support provide expert models for gaining the learners' interest (Darling-Hammond et al., 2017).

Teachers must then retain the information observed and the learning which took place. This is achieved, in part, by multiple exposures and multiple modalities for professional development, opportunities for rehearsal in PD, and coaching support. Access to videos, articles, and hands-on opportunities to apply and practice strategies during and after training promotes and supports the retention of new skills. The ability to perform and apply new skills requires varied opportunities to practice (Bandura, 1977). Hands-on workshops in which teachers observe a modeled strategy, then engage in and apply the learning strategies in a safe and supportive environment provide valuable learning opportunities. Opportunities to collaborate with a coach for modeling, co-teaching, and meaningful feedback supports the implementation process (Darling-Hammond et al., 2017). Collaboration time with colleagues is also important.

Teachers are best motivated through mastery experiences. The ability to perform and apply learned skills requires opportunities to practice, and teachers must feel motivated to act. In an interview, Pink explained the importance of allowing teachers the freedom to make decisions, master something they believe to be meaningful, and understand why they are doing it (Azzam, 2014). Bandura provided the theory of making change happen and Pink provided key considerations in the change process. Choice can be motivating but must be purposeful and aligned with PD goals. Understanding the content and skills related to teaching reading increases self-efficacy (Bandura, 1977).

Professional Development

PD is instrumental in changing teachers' instructional practices. Darling-Hammond et al. defined effective PD as "structured professional learning that results in changes in teacher practices and improvements in student learning" (2017, p. v). The NRP identified PD as one of the topics included in their meta-analysis and determined it to have a "significant and positive impact" on student learning (Shanahan, 2005, p. 4). PD must be ongoing, focused, supported by coaching, and progress logically. Darling-Hammond et al. (2017) reviewed 35 studies on PD and identified seven features of effective PD: it is content-focused, incorporates active learning, incorporates collaboration, uses models of effective practice, provides coaching and expert support, offers feedback and reflection, and is of sustained duration.

Similarly, Desimone (2011) identified effective PD as having a content focus, active learning and participation, coherence with school and district goals, collective participation, and spread across 20 or more hours. Collective participation and collaboration in trusting settings can promote risk-taking, inquiry, reflection, and collective growth (Desimone & Pak, 2017). Creating a safe, trusting setting for teachers to engage in learning is essential.

Additionally, it is beneficial to incorporate curricular materials in PD to support teachers in applying new skills with materials they use in the classroom (Desimone & Pak, 2017). "Professional learning experiences must be planned that assist teachers in adapting innovations to the unique characteristics of their students, classrooms, schools, and communities while maintaining the elements of the innovation most vital to success" (Guskey, 2021, para.13). PD that incorporates curricular materials and supports teachers in adapting materials to school and student needs promote coherence and intentional implementation.

Finally, PD must incorporate teacher voice and choice. “The audience of the experience must have a say in design prior to the event and an opportunity to reflect after it concludes” (Ende, 2021, p. 39). This was a critical and essential component of the design of the PD plan.

Coaching

Teachers who receive coaching support from someone with expertise are more likely to apply new skills and to do so appropriately (Darling-Hammond et al., 2017). “Teachers need ongoing PD that has topical continuity, practical application, and opportunities for collaboration with peers. These PD opportunities should be linked to continuous in-class coaching” (Moats, 2020, p. 27). A reading coach can play a significant role in providing ongoing support as teachers implement new instructional strategies and make changes in practice. The coach provides an expert model and opportunities for active learning, collaboration, and feedback.

Coaching experiences may include modeling, co-planning, collaboration, peer observations, and individual or group discussions, followed by opportunities for feedback and reflection. Knight (2021) suggests general rules of conduct are essential to an instructional coach's role. One rule of conduct contends that although coaches have content expertise, they must act like partners who have equal power. They help to create conditions empowering teachers to make instructional decisions for themselves. Another rule of conduct proposes coaching as a goal-directed action. If the goals matter to teachers, the entire coaching process moves forward. In addition, much like teaching, the person doing the work is the one learning; therefore, the coach is advised to play a supporting role, not one with all the answers. Asking reflective questions can be a powerful tool in this regard. Reflective instruction can be promoted through collaborating to understand data and using it to promote instruction (Mraz et al., 2016). Coaches can deliver PD in a large or small group setting. “Listening to teachers and involving them as valued members of a collective conversation is essential for establishing trust between

the coach and the teacher and meeting common goals that will improve student learning" (Mraz et al., 2016, p. 27).

In the context of this study, there were three interconnected components grounding the work of increasing content knowledge and self-efficacy and transferring learning to the classroom: curriculum and assessment aligned to research; ongoing, embedded PD responsive to teachers' needs; and coaching to support the skills learned in PD. Collaborative, job-embedded PD has been shown to positively impact teacher confidence and efficacy and can result in school-wide improvement (Darling-Hammond, et al., 2017; Desimone & Pak, 2017; Moats, 2020).

Chapter Summary

The premise of the conceptual map relied on the belief that if teacher content knowledge in the foundational skills of reading improved through responsive PD and coaching, then teacher self-efficacy would also improve as teachers apply their learning with success and make instructional shifts. That belief is grounded in Bandura's Social Cognitive Theory and research on coaching and professional development. For teachers to make appropriate decisions for their readers, a deep understanding of the research and how to apply it is crucial to meet the needs of the students in front of them.

CHAPTER THREE – INQUIRY METHODS

Introduction

The purpose of this action research study was to develop a comprehensive PD plan, responsive to teachers, to engage teachers in making the instructional shifts necessary to close the gap between research and practice, in alignment with the SoR. This study was guided by the following research questions:

- What was the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading?
- What impact does strategic and ongoing PD in the science of reading have on teachers' practice?
    - What was the impact of PD in the science of reading on *teachers' perceptions of their knowledge* related to the foundational skills of reading?
    - What was the impact of PD in the science of reading on teachers' *confidence in applying that knowledge* in teaching the foundational skills of reading?
- What are teachers' perceptions of year-long professional development in the science of reading?

Rationale

This action research study used a mixed methods design. Researchers use action research to seek solutions to complex problems situated within unique contexts. A systematic approach to finding practical solutions is employed collaboratively and democratically. "The research process is iterative, cyclical, and participative in nature and is intended to foster a deeper understanding of a given situation informing future action" (Bloomberg & Volpe, 2019, p. 59). It took several action cycles (involving planning, acting, observing, and reflecting) to implement instructional

shifts, evaluate the outcomes, and determine the next steps based on timely feedback to inform the PD plan and effect change over time (Herr & Anderson, 2015).

A mixed methods approach was used in this study because neither quantitative nor qualitative methods were sufficient by themselves to capture the trends and details of the complex nature of this study, as there were multiple points in the plan where distinct types of data were needed to inform the research questions (Creswell, 2022; Terrell, 2016). The qualitative and quantitative data are built on each other in an explanatory sequential design. In the first phase of the study, quantitative data were collected and analyzed. Qualitative data were collected in the study's second phase to explain the quantitative data through a deeper understanding of individuals' experiences (Creswell, 2022). As is typical in action research, aspects of this study had already been completed. "The strength of this design lies in the fact that the two phases build upon each other so that there are distinct, easily recognized stages of conducting the design" (Creswell, 2022, p. 54). The qualitative data helped contextualize and better understand the quantitative results from the reading surveys.

Problem Setting/Context

The foundational work for this study included the alignment of curriculum and instructional materials, which began in the 2019-2020 school year, with the implementation of the Fundations program for phonics instruction in kindergarten through grade two. Over the summer of 2020, a team comprised of the district reading staff and pilot teachers collaborated to identify the weaknesses in the Fundations program and our curriculum. This process involved a thorough review of current research, teacher feedback, and recommendations from an EdReports program review of Fundations. EdReports is an independent nonprofit organization that reviews published programs. As a component of this work, it reviewed kindergarten through grade two reading and phonics programs for three gateways: 1) text quality and complexity, alignment to

standards, and use of evidence-based practices, 2) building knowledge through texts, vocabulary, and tasks, and 3) instructional supports and usability. The curriculum team sought to improve on the areas of Fundations identified as only partially meeting expectations. Table 2 outlines the curricular improvements designed to align materials to research and identify resources needed to support that alignment. This work was foundational to the PD design and informed what teachers needed to know and be able to do.

These improved curricular materials and resources, aligned with the SoR, were made available to teachers prior to the start of the 2021-2022 school year. Over that year, PD was designed to support the implementation of revised curricular materials and assessments, make instructional shifts to align practices to the SoR, and ensure instructional decisions were informed by student data. "Such alignment [to curricular materials] provides teachers with clearer directions, rather than leaving it up to the teacher to integrate new ideas and strategies into their teaching" (Desimone & Pak, 2017, para.24).

Bandura's Social Cognitive Theory (1977) and the comprehensive research in effective PD informed the design of an ongoing, responsive PD plan. A synthesis of the research was used to identify effective components, identify considerations for the PD design, and provide examples of how that research was applied within the plan. (See Figure 3).

Table 2

Timeline of Curriculum and Programmatic Changes

Timeline	Curricular Improvements	Rationale
2019-2020 school year	Fully implemented the Wilson Fundations phonics program K-2.	To implement an explicit phonics program.
	Provided PD and coaching in Fundations.	To support teachers in learning the materials and instructional routines.
Summer 2020	Created a document at each grade providing a week-by-week scope and sequence for instruction in Fundations and PA in K-1. These documents included all resources necessary for teaching (linked digitally by week).	To supplement Fundations with a daily scope and sequence for phonemic awareness instruction and to make all relevant resources accessible in one document (i.e., practice activities, fluency word charts, assessments, and stories).
	Purchased decodable books for grades K-2.	To incorporate connected texts for students to practice and apply phonics skills learned.
	Created "heart word" slides for instruction on irregular words.	To provide an evidence-based routine for teaching irregular words.
	Identified formative assessments to supplement current assessments (i.e., phonics and oral reading fluency).	To produce actionable data, easily used to inform instruction and monitor skill-based progress.
	Purchased sound wall materials for K-1, incorporated into curriculum.	To support the shift to sound walls and speech to print instruction, including articulation instruction.
Fall 2020	Implemented Fundations in grade two along with similar materials and resources.	To align instruction K-2. (Grade three was piloted in 2022).
Ongoing	Developed a SoR PD Google Classroom, including articles, videos, websites, webinars, infographics, and more.	To provide resources to support independent professional learning for teachers in various formats.

Figure 3

Building a Professional Development Plan Aligned to Research

Research on PD	Design Considerations	Examples from the study
	Buy-In	
Establish Buy-In (if you can) (Aguilar, 2022)	Design PD that articulates a clear purpose and need. If there is data that supports the need for PD, share it with teachers.	Data included survey results about teachers' preparedness to teach reading and understanding of concepts related to the SoR.
	Content	
Is Content Focused (Darling-Hammond et al., 2017; Desimone & Pak, 2017)	Design PD to be content-specific, geared toward the unique context of the diverse teachers involved and students served.	PD focused on the SoR throughout the year and incorporated context-based needs, such as the EL population.
Build Coherence (Desimone & Pak, 2017)	Design PD that is aligned with the curricula and programs teachers are using.	PD incorporated curricular materials, supplemental resources, and assessments.
Use Evidence-based Practices (Guskey, 2021)	Design PD responsive to improvement needs in student learning. Identify appropriate practices to be used.	Goals were articulated at each session and were grounded in teacher and student data. Evidence-based strategies were used in PD.
Provide Guidance in Balancing Adaptations (Guskey, 2021)	Design PD that considers the shifts teachers are being asked to make and the ways it may look different by school or teacher.	PD incorporated multiple strategies for teachers to use to meet students' needs in various contexts and at different levels.
	Engagement and Collaboration	
Incorporate Active Learning/Engagement (Darling-Hammond et al., 2017; Desimone & Pak, 2017; Ende, 2021)	Design PD that engages teachers in hands-on, active participation and opportunities to apply learning.	PD incorporated activities such as models of instruction, role-playing, lesson planning, data analysis, text analysis, and hands-on application of skills and strategies.
Support Collaboration/ Collective Participation (Bandura, 1997; Darling-Hammond et al., 2017; Desimone, 2011; Desimone & Pak, 2017)	Design PD that is collaborative and job embedded. It positively impacts teacher confidence and efficacy and can result in school-wide improvement.	Some PD sessions involved all teachers in the district, while others involved grade-level teams. Sessions allowed time for collaboration, planning, and coaching.

Coaching		
Use Models of Effective Practice (Bandura,1997; Darling-Hammond et al., 2017)	Design PD that involves opportunities to see models such as demonstration lessons, peer observations, and models of lesson plans or sample student work.	Coaches modeled lessons and activities during PD and in classrooms. Coaches created sample lesson plans and provided videos of instructional practices.
Provide Coaching and Expert Support (Darling-Hammond et al., 2017; Desimone & Pak, 2017)	Design PD to include a strategic approach of providing one-to-one coaching support in the teacher's classroom or group workshops.	Coaches received train-the-trainer training in LETRS. They provided model lessons, side-by-side teaching, individual meetings and more.
Feedback		
Offer Feedback and Reflection (Darling-Hammond et al., 2017; Guskey, 2021)	Design PD that provides opportunities for teachers to receive feedback and time to reflect on and improve their practice.	Coaching provided support and feedback. Teachers could reflect on their practice through surveys, conversations, and exit tickets.
Provide Feedback on Successes with Students Based on Evidence Teachers can Trust (Ende, 2021; Guskey, 2021)	Before PD implementation, determine how teachers will measure growth or how positive results will look. Teachers do not want to fail their students; therefore, they need to see student progress to stick with it.	PD incorporated data discussions on program and benchmark assessments that provided growth data on student achievement. Teachers observed student gains and improvement.
Logistics		
Sustain Duration (Bandura, 1997; Darling-Hammond et al., 2017; Desimone & Pak, 2017; Ende, 2021; Moats, 2021)	Design PD that provides multiple opportunities to learn about a topic or series of related topics, allowing time for implementation and transfer.	PD took place during district designated days. It also included time during the school day. Sessions were all related to the SoR and built on each other.
Responsive to Teacher Feedback, Including Voice and Choice of Participants (Ende, 2021)	Design PD that is responsive to teachers' needs and includes choice. Collect feedback throughout the process.	Teacher feedback was incorporated into each PD design and was responsive to teacher input and needs expressed in exit slips.
Time Conscious (Ende, 2021)	Design PD in which facilitators have enough time to present and teachers have enough time to practice and apply. Make the time meaningful.	PD was designed collaboratively. Sessions were spaced out with time for teachers to apply new learning in the classroom.

The two reading coaches were integral to designing and delivering the PD plan. The coaches worked collaboratively with me, the language arts coordinator, and with each other to develop each training session. They had opportunities to contribute ideas and content based on their unique strengths, experiences, and areas of expertise. Coaching support followed up on content learned in PD and was responsive to grade-level and individual requests that included planning, modeling, co-teaching, feedback, and more. "Using feedback to modify future facilitation strategies or to rethink the design of professional learning shows that you are open to change, hear the information being shared, and are focused on continuous improvement" (Ende, 2021, p. 43). Data and teacher feedback collected after each PD session in the 2021-2022 school year informed the ongoing development and implementation of the year-long PD plan.

Research Sample and Data Sources

Participant Selection

All K-3 general education teachers and specialists who taught reading at Elmhurst and Pinehurst were invited to participate in an end-of-year 2021 reading survey. Teachers who completed the 2021 survey, the 2022 post-survey, and consented to participate were included in this study. In addition, three focus groups were conducted. A focus group was conducted in each of the two elementary schools. Six teachers who served in leadership or specialist roles were selected to participate at each school and included a representative from kindergarten through grade three and two additional teachers or specialists to expand diverse perspectives. Pinehurst participants included an English learner (EL) teacher and a new teacher. Elmhurst included an EL teacher and a special education teacher. The two EL teachers were selected in part because they attended the PD and delivered one of the sessions. A third focus group of five participants included three literacy coaches and two reading interventionists. Two of the literacy coaches presented most of the PD. The other coach does not work in the K-3 elementary schools but

attended all district PD sessions to inform her work in grades four and five. The two reading interventionists attended much of the PD or took part in the planning.

There were 35 participants: 31 took part in the survey and 17 took part in the focus groups. Table 3 contains the participants' demographic information. Most teachers included in this study have a master's degree. Over half of the teachers have an additional reading, special education, or Teachers of English to Speakers of Other Languages (TESOL) certifications. Slightly over half of the participants had more than 15 years of teaching experience, and only one had less than five years of experience. The participants were veteran staff, highly educated and experienced, yet in the pre-survey, less than 40% of teachers reported feeling well-prepared for teaching reading.

I obtained approval for conducting the study from the Superintendent of Schools and the Institutional Review Board at the University of Arkansas (Appendix D). Upon completion of the post-survey, a consent form was provided to teachers for participation in the study with an explanation of the specific information that would be used, including exit slip data collected throughout the school year and survey data (Appendix E). Focus group participants signed an additional consent form (Appendix F).

Table 3

Study Participants

Characteristics	*n*	%
Sex		
Male	1	2.86
Female	34	97.14
Years of Experience		
1-5	1	2.86
6-10	10	28.57
11-15	6	17.14
16-20	4	11.43
21-25	5	14.29
26-30	9	25.71
Highest Level of Education		
Bachelor's degree	2	5.71
Master's degree	23	65.71
Sixth-year degree	10	28.57
Doctorate degree	0	0.00
Certifications		
Early Education	2	5.71
Elementary	35	100.00
Reading	12	34.29
Special education	4	11.43
TESOL	2	5.71
Administration	2	5.71

Note. N=35.

Data Sources

A reading pre-survey was administered using a Google Form at the end of the 2020-2021 school year. The data collected from the pre-survey was used to plan PD. As part of the PD plan, the relevant components of the survey were administered again at the end of the 2021-2022 school year. This study used historical data produced throughout the PD plan implemented in the 2021-2022 school year as one of the data sources.

"Surveys alone can be of limited value for examining complex social relationships or intricate patterns of interaction" (Bloomberg & Volpe, 2019, p. 197). Qualitative data were gathered and analyzed to provide context and depth to the survey results in the form of document reviews and focus groups. Additionally, the post-survey included two open-ended questions. Exit slips collected qualitative data following each 2020-2021 PD session. Additional documents for review included the researcher's journal following PD sessions and charts documenting the dates, times, and content of each PD session for each school.

Political and Ethical Concerns

With this action research study being employed in a school district and two separate schools, there were inherent politics at play. "The attempt to gain control over and redefine one's profession is essentially a political move" (Herr & Anderson, 2022, p. 77). As a researcher and participant, I recognized that there may have been political constraints or building-based needs that narrowed the scope of the work planned for PD (e.g., building-based initiatives, teachers' ability to commit to this work during the pressures of the COVID-19 pandemic, or availability of resources). Micropolitics, such as negotiations about resources, personal beliefs, and personal interests within institutions, may have affected this action research. For example, administrative support was essential to this study. How each administrator prioritized time, resources, PD, and how they viewed the coach's role impacted implementation of the PD plan. In addition, there was

potential for those involved to demonstrate resistance or indifference toward the goals of the research (Herr & Anderson, 2022).

Herr and Anderson further state that “who creates knowledge, how it is created, and who uses it for what purpose” is also inherently political (p. 80). The collaborative nature of action research is one way to address this. As such, it was important to be sensitive to the knowledge that the participants brought to any learning situation, recognizing that teachers with significant levels of expertise were involved, including the reading staff, teachers with a reading certification, special education teachers, and teachers with other levels of expertise. The process of planning PD was collaborative between the reading coaches and me and included time for collaboration within and across the grade-level teams of teachers.

Data Collection Methods

There were various collection methods employed to gather both quantitative and qualitative data. In the first phase of the study, pre- and post-surveys were administered providing quantitative data on content knowledge and confidence in applying it in the classroom. Qualitative data were collected through open-ended questions on the surveys and digital exit slips completed by participants in each of the training sessions. In the study's second phase, focus groups were conducted to provide greater insights about what the quantitative data may or may not have captured in relation to the research questions. Collecting data using multiple techniques is a "deliberate strategy to develop a more complex understanding of the phenomena being studied" (Bloomberg & Volpe, 2021, p. 192).

Quantitative: Survey Data Collection

Quantitative data were collected from teachers who completed both the pre-survey and post-survey. The survey was developed as an electronic Google Form. It was sent via email to all K-3 certified teachers in Pleasantville's two elementary schools who teach reading, including special education teachers and EL teachers. The pre-survey administration was completed at the end of the 2020-2021 school year and the post-survey administration was completed at the end of the 2021-2022 school year as a part of the PD process. Respondents rated each reading concept or question on the survey using a 5-point Likert scale where 1 = not at all, 2 = very little, 3 = some, 4 = quite a bit, and 5 = very much. Results were reported by the overarching topics of reading theories and models, PA, and phonics.

Each component of the survey was intentionally designed. The first question in the pre-survey sought to gain an understanding of the preparedness teachers felt from schooling alone. It was important that teachers understood this to be a systemic problem that could be improved through PD and an understanding of the research related to teaching reading. According to Moats (2020):

> The fact that teachers need better preparation, professional development, and resources to carry out deliberate instruction in reading, spelling, and writing should prompt action rather than criticism. It should highlight the chronic gap between what teachers need and what they have been given. (p. 5)

The second question asked about teachers' preferences related to the types of PD (e.g., half-day, grade level, and self-paced). The remainder of the survey asked teachers to rate their content knowledge and confidence in teaching concepts related to the SoR. This part of the survey development was informed by the content presented in *LETRS: An Introduction to Language and Literacy* (Glaser & Moats, 2008). This book was purchased for all teachers and

was one of the resources used to develop and deliver PD. Three areas of focus were identified as priorities in the instruction of the foundational skills of reading: reading theories, phonological awareness, and phonics for year one. These overarching topics in the survey and the questions within each reflected prioritized learning objectives in the LETRS book. The pre-survey results provided quantitative data, establishing a need for PD in all three categories of questions.

Cronbach's alpha was used to test the reliability of the pilot survey, determining the survey to be credible and reliable. A *Cronbach's alpha* was calculated to determine internal consistency in each of the three sections of the survey. The reading theories and models section consisted of 10 items ($\alpha = .97$). The PA section consisted of 12 items ($\alpha = .96$), and the phonics section consisted of 12 items ($\alpha = .94$). According to Gliem and Gliem (2003), internal consistency is excellent when α is greater than 0.9; therefore, all three sections of the survey indicated excellent internal reliability.

The survey was also determined to be valid. Bakker (2019) indicated that validity "refers to the question of whether you are really measuring what you intend to measure" (p. 88). The survey was designed by the researcher, the language arts coordinator, who is considered a Subject Matter Expert (SME) in reading. According to Ramirez (2002), subject matter expertise is often essential in survey design, requiring in-depth knowledge of the subjects under study. Knowledge of the components in the LETRS training manual, prior PD, and previous reading assessment results were essential for the survey design. Prior to administering the survey, it was field-tested by three reading specialists who took the survey and provided feedback on the content, including suggestions for improvement. Additionally, the survey was field-tested by the district's assistant superintendent for curriculum and instruction who provided real-time feedback as the survey was taken to correct any glitches in the survey design, discuss the purpose of content included, and revise wording lacking clarity. With respect to the reading survey, its

primary validation is due to its design by an SME and review by five additional SMEs. As such, one can be reasonably confident the survey had both acceptable content validity (i.e., it measures the important content of interest) and face validity (i.e., a typical person would judge it to be a fair assessment of the qualities being examined) (Boslaugh & Watters, 2008). Therefore, the end of year 2021 survey results were used as the pre-survey.

Qualitative: Document Review and Focus Groups

Several documents were available for review, providing qualitative data. These documents included: exit slips, open-ended survey questions, PD schedules for each school, and focus group transcripts. Exit slips, completed in a Google form, provided an opportunity to collect teacher feedback after each training session. The first two questions on the exit slips asked teachers to reflect on the instructional shifts they were making or planned to make. This qualitative data provided greater insight into the results of the quantitative data as patterns emerged. This information was also used to determine if teachers were making shifts and to find areas to celebrate. The third question elicited teacher input on what they wanted to learn more about, which was used to inform the PD plan for each session and to identify coaching needs.

Furthermore, open-ended questions were included in the end-of-year 2021-2022 survey to determine if the resources provided in the *SoR PD Google Classroom* were helpful and identify the areas teachers wanted to continue learning about to improve their practice. Additional documents reviewed included the researcher's personal journal with reflections about each PD session and a chart for each school used to track the dates, times, and topics covered at each session by school and grade level.

Once the surveys were completed, I facilitated three semi-structured focus groups to gain a deeper understanding of the data and the shared experiences of teachers who participated in the PD. Focus groups can be particularly effective for those in specific contexts to explore their

experiences and beliefs related to their shared experiences (Ravitch & Carl, 2021). The research questions addressed content knowledge and instructional practices related to PD and its impact on teachers, making focus groups a valuable approach to uncovering this information.

A protocol (Appendix G) was developed and used to maintain consistency across the three focus groups and provide expectations and structures to ensure productive and respectful participant interactions. As the facilitator, I asked the questions and posed follow-up questions for clarification but did not participate in the discussions. Participants were encouraged to share their thoughts and ideas, build on others' thoughts or opinions, and ask each other questions.

As part of the protocol, participants were informed that the conversation was being recorded. Three recording devices were used in different parts of the room to ensure that all participants' voices could be heard. Following each focus group session, the audio recordings were uploaded to a secure server to be transcribed later. The recordings were then erased from the recording devices.

Data Analysis Methods

Research Question 1: Quantitative Data

Analysis of pre-survey and post-survey data was used to answer the following research question: *What is the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading?* A *Pearson Correlation Coefficient (Pearson's r)* was conducted on the pre-survey and the post-survey to answer this question. According to Abbott (2011), correlations can be used to determine the strength of the relationship between outcome variables. Further, correlations can be used to help predict an outcome based on the relationship between the predictor and the outcome variables. Teachers scored themselves on a 5-point Likert scale for *understanding of concepts* and for *confidence in teaching*. The pre-survey and post-survey means of each of the 17 (2-part)

questions related to reading theories and models, PA, and phonics were used. The mean was calculated for each of the 31 participants' responses for each question in each section of the survey, making it continuous data.

Multiple scatterplots were created to show different views of the data including a visual display of the y = x line. The first two scatterplots showed the year-to-year change in *(1) understanding concepts* and (2) *confidence in teaching* from pre-survey to post-survey. The third and fourth scatterplots displayed the relationship between *understanding concepts* and *confidence in teaching* on the pre-survey and the post-survey.

Research Question 2: Quantitative Data

Data obtained from the pre-survey and post-survey were exported into Microsoft Excel and paired using teacher emails. Following the data pairing, teacher names were removed and replaced with numbers to ensure anonymity. The schools were assigned a number: Pinehurst (1) and Elmhurst (2). Teachers' names were replaced with a school number and a teacher letter; hence, teacher names were Teacher 1A-Teacher 1F and Teacher 2A-2F. Reading staff was also coded with school numbers and RC (reading coach) or RT (reading teacher).

Abbott (2011) suggests Likert scale data cannot be averaged to be continuous data because the numbers on the scale are not of measurably equal distance from each other. Statistical Solutions posits Likert scale data can be used as continuous data in some cases, which is applicable here. There are five levels on the Likert scale, making the data scale appropriate for conversion to continuous data. A continuous variable can be created if the sum or mean of two or more variables is calculated (Statistical Solutions, 2021). The 17 questions were grouped into three sections correlated to the three topics on the survey (reading theories and models, PA, and phonics). Using data analysis features in Excel, descriptive statistics were used to determine the

mean scores in each of the three categories for each participant. A cumulative average for each of the three sections was calculated for all respondents, thus making it continuous data.

T-tests were calculated to answer the following research questions: *What is the impact of PD in the science of reading on teachers' perceptions of their knowledge related to the foundational skills of reading?* and *What is the impact of PD in the science of reading on teachers' sense of self-efficacy in teaching the foundational skills of reading?* A *t-test* allows a researcher to make a comparison and establish the relationship between two variables, in this case, between the pre-survey and the post-survey. "Within group designs are those in which the researcher seeks to ascertain whether subjects in a group change over time" (Abbot, 2011, p. 212). *Dependent t-tests* were performed on the cumulative mean of the participant's responses to determine if significant differences existed between pre-survey and post-survey results in each of the three sections of the survey (i.e., reading theories and models, phonological awareness, and phonics). The results indicated the significance of the difference between the mean pre-survey results and the mean post-survey results, following the year-long professional development plan.

An advantage of using a survey is its relative ease of administration and management. Survey data can also be easy to analyze but is limited in analyzing complex relationships or patterns. Therefore, qualitative data were also collected and analyzed to provide a more complete story in the analysis process and presentation of findings (Bloomberg & Volpe, 2019).

Research Questions 2 and 3: Qualitative Data

Exit Slips

Following each PD session, teachers were asked to complete an exit slip. The exit slips were optional, and not all teachers completed them. This data was primarily used informally to inform the PD design. In response to what teachers reported implementing in the classroom, information was recorded and grouped by topic to identify teachers' shifts in instruction to support conclusions drawn in chapter 5.

Focus Groups

Following each focus group, I transcribed the recorded conversations through multiple data reviews to ensure accuracy. Coding was used to analyze the qualitative data on the transcription of each focus group. “Coding is essentially a system of classifications-the process of noting what is of interest or significance, identifying different segments of the data, and labeling them to organize the information contained in the data” (Bloomberg & Volpe, 2019, p. 239). An inductive approach was used, with the codes being derived primarily from the language used by respondents, eventually grouping codes that were synonymous. The coding process used one or two words to identify a topic (e.g., phonological awareness, fluency, phoneme-grapheme mapping). The process did not include any predetermined codes by the researcher, and all information was coded, whether it supported the research study or not, to eliminate researcher bias (Bloomberg & Volpe, 2019).

During coding, keywords or ideas in each response were highlighted, and a code or multiple codes, depending on the response, were generated, and recorded in the margin. As codes were developed, they were added to a master list of codes for tracking purposes and to avoid using synonymous labels. Bloomberg and Volpe (2019) suggest two things should occur during the coding process: organizing the information into a data summary table for each research

question and writing memos or journals after each data review. These two strategies provided a means to track and analyze the data. The data table provided evidence to support the conclusions drawn and allowed for trends and patterns to emerge. This cyclical process of coding recurred numerous times for each focus group transcript. Trends were identified within each of the focus group transcripts.

Once all three focus groups were transcribed and coded (color-coded by group for identification), data from each focus group were merged by question to identify common and conflicting themes among the groups. I used a journal to record reflections, patterns, or themes emerging and to document any changes throughout the process as they occurred over several weeks. Thomas (2016) suggests researchers can create a consistency check once the data are coded through a check on the clarity of categories. This process was employed by sharing the categories established and asking a second coder to code pieces of the same text as a point of comparison. As such, small sections of the transcripts were reviewed and coded by two other researchers and a reading specialist. This process was used to cross-check the coding compatibility to ensure consistency.

Focus group data were also used to answer research question three: *What were teachers' perceptions on the year-long science of reading professional development plan?* Specific questions were asked to determine attitudes about PD, coaching support, and the impact of the COVID-19 pandemic on the learning process. Coding for these questions followed the same process.

Trustworthiness

Trustworthiness is synonymous with validity or the extent to which conclusions are likely to be accurate and credible. Ravitch and Carl (2021) state that, "the strategic sequencing of methods is directly related to having a robust research design" (p. 179). Herr and Anderson

(2015) connect the goals of action research and five overlapping validity criteria. They identify the first quality indicator as dialogic process validity linked to the generation of new knowledge. This study included a reflective cycle focused on underlying assumptions, with attention to evidence collected to support claims and relationships with participants. In addition, multiple data points broadened the perspective of the quantitative data obtained from the surveys, including open-ended questions, exit slips, and focus groups, providing a narrative to expand the understanding of the quantitative data.

The second indicator links outcome validity to the achievement of action-oriented outcomes. Exit slips collected immediate information about what new practices teachers were implementing in their classrooms. Classroom visits substantiated this information. Additionally, coaches supported implementing newly learned practices and feedback to teachers. This information informed ongoing PD.

The third indicator links catalytic validity to both the researcher and participants as learners. Herr and Anderson (2015) contend, "The most powerful action research studies are those in which the researchers recount a spiraling change in their own and their participants' understanding" (p. 69). One of the goals of this study was to develop a targeted, ongoing PD plan based on feedback from reading staff, coaches, and participants. The ongoing nature of the PD and the collection of teacher feedback provided the necessary data to track the spiraling changes made in the classroom.

The fourth indicator is democratic validity, achieved when the results are relevant to the local setting, and the work toward solving the problem incorporates collaboration with relevant stakeholders. The researcher regularly collaborated with the reading interventionist and coach in each school on curriculum, instruction, assessment, and school improvement topics, including the development and implementation of the PD plan. Additionally, efforts were made throughout

the study to collaborate and communicate with various stakeholders, including the participants, administrators, and the assistant superintendent of curriculum and instruction (Ravitch & Carl, 2021). Many of the PD opportunities promoted collaborative small group (grade-level) learning, which encouraged teachers' feedback, sharing of ideas, and suggestions for the next steps. Building principals provided input on schedules incorporated into the PD design. Principals were encouraged to attend and did so as their schedules allowed.

The last indicator is dialogic validity, achieved through a sound research methodology appropriate to the study. In action research, it is essential for the researcher to cross-check or triangulate findings through peer review or to have the weaknesses or flaws challenged. The researcher relied on the input and feedback of the reading teachers and coaches, all of whom have a specialized reading certification. The assistant superintendent was another critical friend, also certified in reading. Ongoing discussions with my dissertation Chair provided opportunities to be challenged and supported throughout the research process. The focus on these five indicators throughout the study provided assurance and support for the trustworthiness of this study.

Summary

This mixed method, action research study took an explanatory sequential approach analyzing quantitative data first, then using qualitative data analysis to provide greater insights into the findings and results. Quantitative data analysis determined the relationship between content knowledge and confidence in teaching in the classroom. It was also analyzed to determine the significance of the PD plan in developing content knowledge and self-efficacy related to the SOR and the alignment between research and classroom practice. Through several iterations, inductive coding of the focus group transcripts revealed themes and patterns that could not have been obtained through survey data alone. The focus group data provided a more

comprehensive understanding of the findings. Finally, focus group data were also used to determine teachers' perceptions of the year-long PD.

CHAPTER FOUR – RESULTS AND FINDINGS

This mixed methods study sought to answer the following research questions:

1. What was the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading?
2. What impact does strategic and ongoing PD in the science of reading have on teachers' practice?
    a. What was the impact of PD in the science of reading on *teachers' perceptions of their knowledge* related to the foundational skills of reading?
    b. What was the impact of PD in the science of reading on teachers' *confidence in applying that knowledge* in teaching the foundational skills of reading?
3. What are teachers' perceptions of year-long professional development in the science of reading?

Results and Findings

This study examined the results of a year-long PD plan in the SoR and its implications for instructional practices. This chapter is organized by research questions. The first question was answered by the survey data. Questions 2 and 3 were answered with findings from the comparison of the pre-survey and post-survey data, followed by an analysis of themes and findings in the focus group data. Additional data were collected from exit slips and PD plans when more information was needed, or findings were incomplete.

Research Question 1

The results and findings in this study are presented by the overarching themes that emerged through data analysis. Those themes that relate to the surveys are presented first, and other themes that emerged through the focus group data follow.

Relationship Between Content Knowledge and Confidence in Teaching

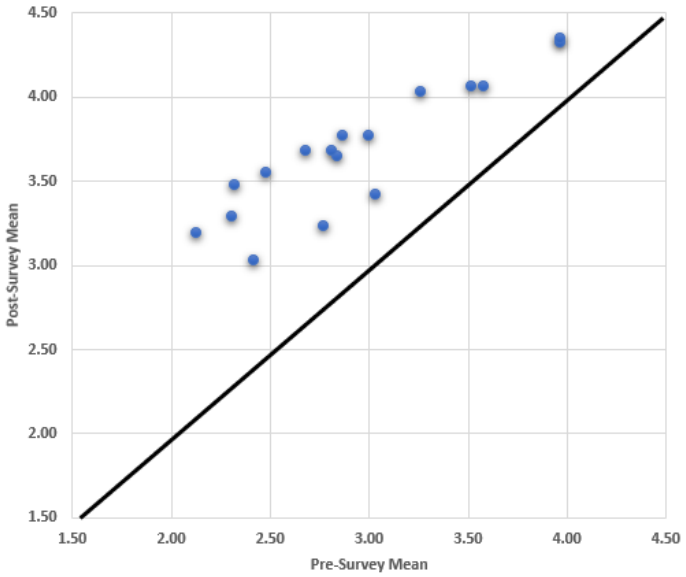
Research question one asked: *What is the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading?* A *Pearson Correlation Coefficient* was calculated using the means of the variables (*understanding the concepts* and *confidence in teaching* the concepts) for the pre-survey data. The two variables were found to be strongly correlated, $r(15) = .99$, $p < .001$. Thus, as teachers' content knowledge increased, so did their confidence in applying that knowledge in the classroom. The value of r^2, the coefficient of determination, is 0.97, which suggests minimal variance between the two variables.

A *Pearson Correlation Coefficient* was also generated for the post-survey data to confirm the pre-survey correlations, using the participants' mean responses for *understanding of concepts* and *confidence in teaching* for each of the 17 questions. The variables of *understanding of concepts* and *confidence in teaching* were again found to be strongly correlated, $r(15) = .96$, $p < .001$. The value of r^2, the coefficient of determination, was 0.92. Abbott (2011) posited, "when the correlation between two variables is stronger, the predicted *Y* values have less variability and can be thought to be more accurate" (p. 385). Although a strong, positive correlation exists, it does not imply causation.

The scatter plots displayed in Figures 4 and 5 include the y = x line, showing how the two variables relate to each other to reveal a different view of the data. Scores that remained the same between the pre-survey and the post-survey would have fallen on the y = x line. The scatter plots demonstrate positive growth in *understanding the concepts* and *confidence in teaching* after year-long PD in the SoR. Additionally, all results in the post-survey were above the line, exceeding the pre-survey results.

Figure 4

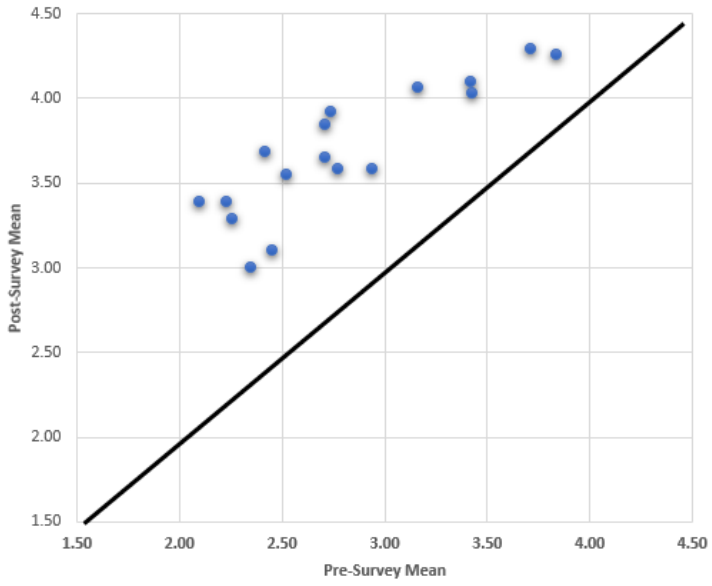
Pre-Survey to Post-Survey Change in Understanding the Concepts



Note. N=17

Figure 5

Pre-Survey to Post-Survey Change in Confidence in Teaching



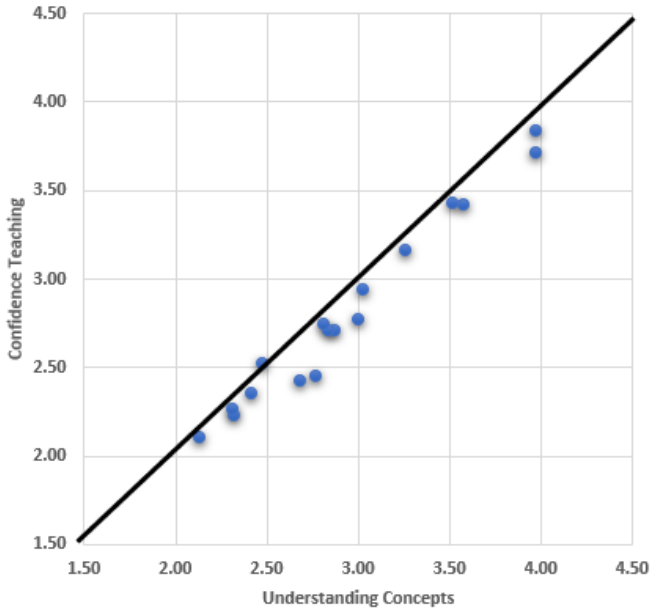
Note. N=17

Figures 6 and 7 also include the y = x line, this time to demonstrate the relationship between understanding concepts and confidence in teaching. In the pre-survey data (Figure 6),

16 of the 17 mean responses demonstrated greater *understanding of concepts* relative to *confidence in teaching*. In the post-survey data (Figure 7), 6 of the 17 mean responses demonstrated greater *confidence in teaching*. This suggests that teachers were more confident in teaching relative to understanding the concepts after the year-long PD. Additionally, the responses demonstrated on the scatter plots ranged between 2 and 4 on the pre-survey and between 3 and 4.5 on the post-survey. As such, the lowest scores increased by one scale interval and the highest scores increased by .5 on the Likert scale, demonstrating growth from pre-survey to post-survey.

Figure 6

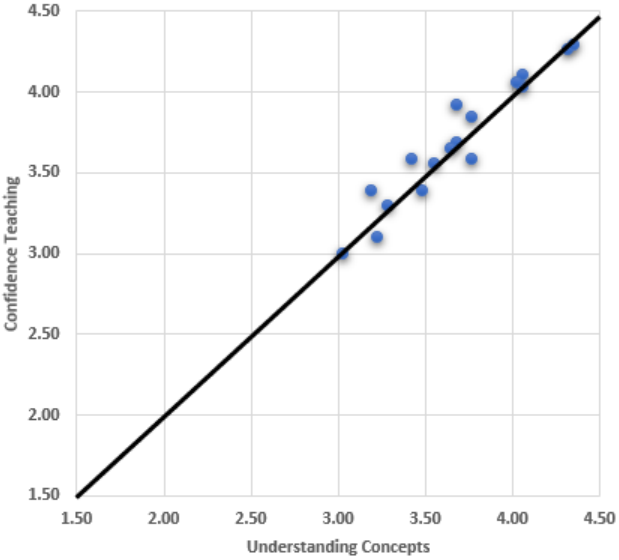
Relationship Between Understanding Concepts and Confidence in Teaching on the Pre-Survey



Note. N=17

Figure 7

Relationship Between Understanding Concepts and Confidence in Teaching on the Post-Survey



Note. N=17

Research Question 2

Survey results and focus group data were the primary data sources used to answer the subsequent questions about the impact of year-long PD on the SoR on understanding of concepts and confidence in teaching. Through analysis of the survey and focus group data, several themes emerged, demonstrating evidence to support teachers' growth. Despite some of the teachers scoring items lower in the post-survey than in the pre-survey, the results in all three areas (theories and models, PA, and phonics) were statistically significant (data follows in the next section). During the focus groups, participants were asked why post-survey results may have been lower than pre-survey results on some questions. Several respondents reported similar sentiments as Teacher 1C: "In the beginning, everyone was like, 'yeah, we got this,' but then when you start to kind of delve into it [PA] you're like, 'wow, there's so much to this,' so maybe I'm not as confident as I initially thought." Further discussions revealed PA to be an area in which teachers came to understand through the PD sessions that their depth of content knowledge in this area was overestimated and surface level in the pre-survey. As teacher 2C stated, "Sometimes, you don't know what you don't know [agreement]!" This appears to have been the case.

Confidence in Applying Reading Theories and Models to Instruction

A *paired sample t-test* for two means of the survey participants (n = 31) was calculated to determine whether there was a difference between the *understanding of key reading models and theories* from pre-survey to post-survey. There was a significant difference in understanding the concepts in the post-survey ($M = 3.44$, $SD = 0.51$), compared to the pre-survey ($M = 2.38$, $SD = 1.05$), $t(30) = 6.69$, $p < .001$.

Similarly, a *paired sample t-test* for two means was calculated to determine if there was a difference between the *confidence in teaching* those same key reading models and theories from

pre-survey to post-survey. There was a significant difference in the mean post-survey (M = 3.46, SD = 0.57), compared to the mean pre-survey (M = 2.31, SD = 1.06), $t(30) = 6.33$, $p < .001$. Year-long PD positively impacted teachers' perceptions about their understanding of key theories and models and their confidence in applying them to their instruction.

Table 4 displays the mean comparisons from pre-survey to post-survey for the reading theories and models to provide another way to view the data. Due to the close relationship between understanding of concepts and confidence in teaching, the discussions that follow will focus on confidence in teaching as that is the more complex skill. The two models showing the greatest increases in the means of the Likert scale survey data for confidence in teaching were also most prevalent in the focus group discussions. Models of how the brain learns to read (1.29) and Scarborough's Reading Rope (1.26) were incorporated into most of the PD sessions. They were also most often referenced during the focus group discussions.

Teacher 2A described her awe at how the brain works:

> It's like Louisa Moats said, "Teaching reading is rocket science!" It's very complex, the brain is complex...when we see the diagrams of the brain, how many parts of the brain are involved, it's no wonder students struggle. There's so much that has to come together.

Teacher 2E added that it becomes even more complex for multilingual learners. Teacher 1C explained that gaining an understanding of how the brain works has helped her to understand the SoR better and why students struggle to read.

Table 4

Mean Likert Scale Scores for ***Reading Theories and Models***

Questions	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey
	Understand Concept	*Understand Concept*	*Confidence Teaching*	*Confidence Teaching*
	M	*M*	*M*	*M*
The Simple View of Reading	2.48	3.55	2.52	3.55
How the Brain Learns to Read	2.13	3.19	2.10	3.39
Ehri's Phases of Reading Development	2.32	3.48	2.23	3.39
The 4-Part Processing Model for Word Recognition	2.31	3.29	2.26	3.29
Scarborough's Reading Rope	2.68	3.68	2.42	3.68
Total M	2.38	3.44	2.30	3.46

Note. N=31. All means are rounded to two decimal places.

The participants' discussions further emphasized the importance of practice with foundational skills to build pathways in the brain and map words to the left side of the brain where word processing occurs. This understanding resulted in instructional shifts focused on the explicit instruction of phonemic awareness and phonics skills. Teachers have embraced such an approach when teaching irregularly spelled words. Teacher RC1 further explained her understanding of the brain's complexity:

> My knowledge and understanding of the brain and the reading brain has expanded greatly this year. Listening to webinars and going through the LETRS training has just really taught me so much more about the pathways that we need to create as we are teaching

young readers and you know, those don't exist, so the instruction that we do specifically creates those pathways.

Although the t-tests revealed the positive impact of PD in the reading theories and models, a few teachers expressed challenges with the terminology in the training, though they conceptually understood their meaning. Teacher 1A reflected, “I just wasn't caught up in the...different names of the different, you know the rope, and remembering the name to this theory...” She followed up by stating, “We embraced knowing there was a shift, and the shift needed to happen because the kids needed it. The ‘why,’ yes, it is important, but I think we were there anyways.” She expressed feeling confident in the content and her teaching without focusing on the terms associated with the theories.

Most of the teachers in the focus groups discussed the benefits of understanding Scarborough’s reading rope and how it helped them to change their practice. Teacher RT2, who participated in planning PD and supported teacher learning, explained, “The repeated use of Scarborough’s reading rope at each collaboration was helpful for teachers to understand the interconnectedness of all the components of reading and how students become skilled readers.”

Teacher 2E shared, “That whole reading rope piece has really come to the forefront *[agreement]* where you need that language comprehension with that decoding piece, and you know what area of weakness or both to target and think about.” Teacher 2D added:

> The reading rope, in particular, has been eye-opening for me. I had no idea about that. I enjoyed seeing how all the pieces connect and how you have to have strong areas in all aspects in order to fully understand how to be a good reader.

Many teachers similarly expressed the clarity the model brought in understanding each of the parts that matter when teaching students to read, and the necessary balance between language

comprehension and word recognition. Teacher RC1 explained her observations about the impact of understanding the reading rope on teachers:

> I think the reading rope was really valuable. It's just a beautiful model for putting it all together as a visual, but also, it helped teachers really understand that all of the components are equally necessary. Some of our second and third-grade teachers, who typically would spend most of their instructional time on comprehension, now see that if their students are struggling with comprehension, it is most likely that they're breaking down somewhere else too. So the teachers were able to take more ownership over all of the skills that are so critical to reading...and they were then able to make those instructional shifts so that they would target all those pieces. And third grade teachers are now not discounting word recognition like, "Oh, the other teachers already took care of that." They're incorporating that more into their instruction which is so crucial for those learners.

Scarborough's Reading Rope model helped teachers see the interconnectedness between all the components of language comprehension and word recognition. It also highlighted that both are necessary and play a role in instructional decisions regardless of grade level.

Confidence in Teaching PA Skills

Two more *paired sample t-tests* (n = 31) were conducted to determine if there was a difference in teacher understanding of concepts in PA from pre-survey to post-survey and for confidence in teaching those concepts. There was a significant increase in the post-survey (M = 3.69, SD = .59), compared to the pre-survey (M = 3.20, SD = .83) $t(30) = 4.06$, $p < .001$ for understanding PA concepts. There was also a significant difference in the post-survey (M=3.63, SD=0.57), compared to the pre-survey (M = 3.01, SD = 0.93) $t(30) = 4.85$, $p < .001$ for

confidence in teaching PA. Table 5 displays the comparison means from pre-survey to post-survey for further discussion.

Table 5

Mean Likert Scale Scores for ***Phonological Awareness Concepts***

Questions	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey
	Understand Concept	*Understand Concept*	*Confidence Teaching*	*Confidence Teaching*
	M	*M*	*M*	*M*
What is a phoneme?	3.97	4.32	3.84	4.26
What are the features of phonemes (characteristics of articulation)?	3.00	3.77	2.77	3.58
What does the phonological processor do?	2.77	3.23	2.45	3.10
What is the hierarchy of phonological processing skills?	3.03	3.42	2.94	3.58
How is a sound wall used for instruction?	2.42	3.03	2.35	3.00
What is phonemic awareness?	3.97	4.35	3.71	4.29
Total M	3.20	3.69	3.16	3.63

Note. N=31. All means are rounded to two decimal places.

In this section of the survey, the greatest increases in the means of the Likert scale data for confidence in teaching included the features of phonemes (.81). The next highest areas of growth were the role of the phonological processor (.65) and use of sound walls (.65). These increases align with the ongoing PD on sound walls, phoneme manipulation, and PA instruction. Additionally, there was a focus on analyzing results from the Phonemic Awareness Screening Test (PAST) during PD. Data results were used to group students and plan for flexible, small-

group instruction. Teachers in the focus group discussions overwhelmingly expressed confidence in understanding and applying PA. Many teachers spoke to their growing understanding of PA:

> I taught kindergarten for 15 years and I thought I knew phonemic awareness and phonological awareness. I thought I had a really great understanding and now it's like, "oh, but there are other things to consider." I had that kind of top surface knowledge and now it's much deeper. (Teacher 2C)
>
> And realizing...that all kids benefit from phonemic awareness because in the past it was always just my lowest of the low who would be getting that isolated skill work, and now I know all kids can use sound manipulation and those skills. (Teacher 1C)

Additionally, the reading team members discussed their shifts in instruction based on their own growing understanding. Teacher RC2 shared:

> My biggest shift in intervention was using manipulatives for phonemic awareness practice...I took little fuzzy pom poms to represent sounds, and it made a huge, huge difference to have the sounds of syllables in words represented for my students who were struggling, and they made some good progress with their phonemic awareness that way.

Teacher RC1 added:

> We implemented the Kilpatrick drills with all of our students in K through three at the start of our intervention groups, and kids loved it. We saw great growth too. We were able to progress through the levels, and then we saw the results on the PAST too.

Teacher RT2 further discussed her use of sound walls and sound cards to support students who struggled with the articulation of sounds.

> Also, the use of the sound wall cards was extremely helpful for students, especially my English learning students and those who have been remote learners for a year plus, to see and hear the correct articulation of some sounds they experienced difficulty with.

Teacher 2F also described the benefits of using sound cards to support students with mouth formation and articulation of sounds not in their home language. Additionally, I had the opportunity to observe a coach providing explicit instruction, using a sound card picture of the mouth and describing the articulation of the mouth formation in making the unvoiced /th/ sound. This instruction supported the learner in making that sound through repeated practice.

Many teachers reported incorporating a scope and sequence of PA drills into daily whole and small-group instruction and a better understanding of what that instruction should look like. Teacher 1B stated, "I remembered one of the PDs that stuck out to me was you want to teach things in order, but that doesn't mean you can't do things simultaneously, like phonemic awareness and phonics together." This changed how she approached small group instruction, applying varied types of practice in each session by incorporating PA drills and phonics skills flexibly. This is an important understanding represented in the reading rope that skills related to word recognition and comprehension should be taught simultaneously, not sequentially as the common phrase, s*tudents move from learning to read to reading to learn*, may imply.

Confidence in Teaching Phonics

Two more *paired sample t-tests* (n = 31) were calculated to determine whether there was a significant difference between understanding phonics concepts from pre-survey to post-survey and confidence in teaching those concepts. There was a significant difference in the mean of the post-survey (M = 3.88, SD = 0.46), compared to the pre-survey (M = 3.16, SD = 0.91), $t(30) = 5.10$, $p < .001$. The results of the second t-test on confidence in teaching showed that the post-survey was significantly different (M = 3.92, SD = 0.43), compared to the pre-survey (M = 3.03, SD = 0.93), $t(30) = 5.96$, $p < .001$. These results suggest that there was a positive and significant impact on teachers' content knowledge and confidence in teaching phonics concepts from pre-

survey to post-survey, following year-long professional development. Table 6 provides a visual display of the comparisons between the means from pre-survey to post-survey.

Table 6

*Mean Likert Scale Scores on Understanding and Confidence in Teaching **Phonics***

Questions	Pre-Survey	Post-Survey	Pre-Survey	Post-Survey
	Understand Concept	*Understand Concept*	*Confidence Teaching*	*Confidence Teaching*
	M	*M*	*M*	*M*
What is the alphabetical principle?	3.52	4.06	3.43	4.03
What is systematic, explicit phonics instruction?	3.58	4.06	3.42	4.10
How are phoneme-grapheme correspondences mapped?	2.87	3.77	2.71	3.84
How can regular parts of words be used to teach irregular words?	3.26	4.03	3.16	4.06
How is morphology used in phonics instruction?	2.84	3.65	2.71	3.65
How is orthography used in phonics instruction?	2.88	3.68	2.74	3.84
Total M	3.16	3.88	3.03	3.92

Note. N=31. All means are rounded to two decimal places.

There were two areas of phonics in which teachers' confidence in teaching grew by more than a full point on the means of the Likert scale questions: orthography (1.18) and phoneme-grapheme mapping (1.13). Again, these results are consistent with the considerable time spent on these understandings. These results are closely related because the understanding of phoneme-grapheme mapping leads to a better understanding of the orthographic system (spelling), one of the four systems in phonics.

Implementing a systematic phonics program was the shift in which all kindergarten through grade two teachers in the focus groups felt most confident. It aided in increasing teachers' content knowledge and confidence. Not only were teachers feeling confident, but they also noted observing their students transfer and apply phonics skills to reading. Teacher 1B shared her thoughts which were representative of what others expressed:

> But with everything we are doing now with Fundations, that has made a huge difference...it just all comes together now. That makes me feel like, "wow, they learned that in Fundations, and now they are doing it when they're reading this book."

Teacher 2F added:

> Just to speak to that success in the classrooms, I can't walk my kids down the hallway without them pointing out the words all over the hallway. They'll say, "That's a digraph." To hear kindergarteners say, "That's a digraph," I thought that was pretty neat.

Participants discussed the many benefits of having a common language, routines, and strategies across the grades. Students were excited about their learning, and teachers were seeing the transfer to reading and writing. Teacher 1C stated:

> The Fundations program has been the biggest positive shift for myself as a second grade teacher. Fundations made it easy because it's all there for you... it's easy to follow, and the kids buy into it; they like it. So, that made that part of the instruction easy and then you could just pull kids using your data from Fundations. I used a lot of that too. It just made it easy to implement into your everyday instruction.

In addition, several teachers reported that there was a greater focus on phoneme-grapheme mapping, which helps readers develop orthographic mapping, contributing to graphemes (letter patterns) being saved to memory and retrieved for decoding and reading. Phoneme-graphing mapping was an instructional approach used in several of our PD sessions to

practice the skill with teachers, demonstrating how to use it as an instructional routine and incorporate it into small group instruction.

Teacher 2A described her implementation of a three-day small-group instructional routine that her team was using:

> It was a phonological awareness drill, a phoneme-grapheme mapping activity, a letter drill, going back into the book to read, and then sentence strips cut up to put in order on day three. But it was such an easy routine, so if you do nothing but that you know you're giving good instruction. And then, from there, once you get comfortable, you can bring in other elements. It could be the same every week if that's all that you're comfortable with, but you know that it's good instruction.

Teachers also described using decodable texts to allow students to apply phonics skills to read successfully. Teacher RC1 elaborated on what she had incorporated into her intervention instruction:

> We developed lesson plans that were centered more around skill...and we used a lot of decodables this year...using those really allowed students the time they needed to practice the phonics skills. In addition, we used phrases that they would see in the text prior to reading the text, dictation, and using phoneme-grapheme mapping. We did a lot really targeting those phonics skills and using decodables to support the phonics skill development.

Teacher RC3 applied this work to interventions with grades four and five students. She shared that she has seen surprising growth from her focus on phonics and morphology.

> But primarily, it's the tier three students I did a lot of the word work with. We did syllable types, morphology, and real targeted word work, and I devoted more time to that than comprehension. But my end-of-year i-Ready results showed improvement in all areas

> [PA, phonics, high frequency words, vocabulary, comprehension] so it really proved to me that for those students that they needed to have that foundation first.

Finally, Teacher RT2 articulated a significant shift we have been making in our curriculum and in our instruction that speaks to the importance of explicit decoding instruction as opposed to less effective strategies such as guessing and memorization:

> At one point in my teaching career, I encouraged students to rely on pictures and guessing to figure out words as well as memorizing words and to ask questions like, "Does it look right?" or "Does it sound right?" Reading, unlike language, is not a natural process. Thanks to the shift we have been making, I now know that teaching phonics explicitly and systematically is the key to reading success. When my students read at this point in my career, they rely on sounding out words to decode and have learned the syllable types to help them break down multisyllabic words.

These strategies (i.e., using the first sound or the context to guess the word) had previously been taught in our curriculum and were a big shift for teachers. Nevertheless, all participants in the focus groups reported making this change and understanding the importance of readers attending to the letters and sounds in the words when decoding. Teacher 2C elaborated on this as she discussed letting go of the strategies she found on Teachers Pay Teachers and replacing them with strategies supported by research. She also described the importance of building a common language across classrooms. Teacher 2E further discussed the importance of using the same terminology and strategies for decoding:

> Now with the changes going back to kindergarten and first grade and second grade, we're all using the same language, so it's not like in second grade…what's my teacher going to tell me about this year? We are going to keep learning on the same track.

This teacher was referring to the "cutesy" word-solving strategies and correlating visuals and songs that could be purchased such as Eagle Eye (use the picture to guess) and Tryin' Lion (try different words in the sentence to see if they make sense). Teachers have removed these from instructional practices and now focus on explicit decoding strategies.

Confidence in Administering Assessments and Data-Informed Instruction

As the 2021-2022 school year began, CORE reading assessments (phonics, oral reading fluency, and comprehension) and the PAST (PA assessment) were implemented for the first time. Teachers were trained in these assessments within the PD plan, and they requested follow-up training to support analyzing the data. Additionally, teachers administered the unit assessments in Fundations. Teacher 1A said she used the test tracker (the Fundations assessment data) to inform instruction and reteach if needed. She also mentioned using the PAST, the CORE, and the PA assessment data to "fill in those holes." Teacher 2C explained her understanding of how this data helps to identify the next steps for instruction:

> Over the past couple of years, we started making the shift to the science of reading and different assessments like CORE and PAST. I got a better understanding this year about why and how it all comes together, especially even at the second-grade level, because most of the students you assume come in with that solid background. This is why we're getting these assessments to find out exactly where that hole is and then what do we do going forward to help that student progress and get...more strategies...that we can implement in the classrooms to really build those skills that they're missing.

All teachers participated in sorting, color coding, and analyzing the assessment data in Google Sheets to inform instruction during PD. Teacher 1D stated, "The assessment data helps drive the small groups. I like getting the new data each time [1E: me too]. It gives me a better understanding of how I should make my groups." Teachers also reported that the data sheets

created in Google Sheets were helpful in this process. The data sheets were conditionally formatted and color-coded to identify students as having attained mastery, those making progress, and those needing targeted support. Teacher 1B stated,

> I really liked the way that the data was set up and we like how it was formatted. The conditional formatting and the colors, we became obsessed with it. It was just so clear to see right at a glance who needed what [lots of agreement]. I think that we've loved having all of this data. It's amazing and I think that's something that we were really lacking in the past.

Previous assessments used in the district produced far less actionable data.

Teacher 2E shared how beneficial it was for special education teachers to have that same data to support the work of the classroom teacher and how the data and skills-based discussions have become more cohesive. She stated, “We’re not talking about apples and oranges anymore.” Of course, there are other assessments involved when it comes to special education; however, it provided a common starting place and shared classroom-level data that both teachers and specialists could use to inform instruction.

Teacher 2D reflected:

> This comes back to knowing your students as readers and learners, and I feel like it always circles back to being an effective classroom teacher. Now I feel stronger with assessments. At the beginning of the year, it was a different story (laughs). But now, I feel much better, more comfortable, and more confident.

Teacher 2D further explained how he used the data to determine what to teach next and target skills, a similar sentiment expressed by all teachers participating in the discussion.

Confidence in Making Instructional Decisions

One promising finding was the reported confidence in teachers' abilities to make sound instructional decisions (i.e., knowing what they are doing and why). Teacher 1B's comment reflects what many shared: "I feel stronger when I'm making decisions and when I'm planning." Many teachers specifically expressed feeling confident in their ability to respond to students.

> Having Fundations is really helpful, and all the other materials, but now I know what to use and when to use it instead of just blindly following a curriculum. I think I feel better about that instead of just thinking, "Well this is what I am supposed to be teaching, I'm just going to follow this." (Teacher 2A)

Components of the program and supplemental materials, such as decodable texts, fluency charts, and strategies to support small group instruction, were a heavy focus in the PD plan. A similar sentiment was reported when discussing PA instruction. Teacher 2C shared, "If you need to take a break and help your students with phonological awareness or a specific decoding skill, you do that for a day, and you'll still get through it and everyone will be a better reader and learner for it." Teacher 1B felt confident in grouping her students flexibly based on data and informal observations. She affirmed, "I just feel more confident...I can switch up my groups today. I could pull different groups as needed and have that flexibility." Even Teacher 1E, a newer teacher, was able to describe how she was using data for flexible grouping:

> It's [the data] obviously really helpful. I have a student who is in a comprehension group, but she's also in a group for controlled vowels. She just doesn't have some of the phonemic awareness but she's also a reader, so I'm trying to be flexible with that.

Teachers also expressed confidence when speaking to parents about their instruction and instructional decisions. Teacher 2A shared a story about a challenging encounter with a parent and how, because of PD, she could now effectively answer questions with confidence.

> A couple of years ago I had a parent post something on our communication app, for everyone to see, saying that they didn't think the way I was teaching writing was appropriate. I remember being so upset by it and very defensive, and I didn't know what to do...but if that happened now...I would be like, "Oh, this is an opportunity to explain why I am doing it this way," and I would stand by all of my instructional choices. Before I would think, "Am I doing something wrong?" And now I know this aligns with the science; this is why I am doing it.

Likewise, Teacher 1B expressed, "Especially at the end of this year, I felt very confident discussing and explaining student data with parents. It was great to have the knowledge and tools to share with families." Although teachers' confidence grew in the areas initially targeted in the PD plan, they also expressed confidence in other areas (e.g., using assessment data) because of the PD. Importantly, they also gained confidence in their overall approach to teaching and their ability to respond to students' needs.

Research Question 3: What were teachers' perceptions of the year-long PD on the SoR?

Throughout the focus group discussions, there were opportunities for participants to reflect on their experiences with PD. Questions were specific to the resources and materials provided, coaching support, the impact of COVID-19, and anything that stood out about the PD. The following themes emerged.

Most Engaging Professional Development

The district English language teachers attended the PD and co-presented strategies at one of the sessions focused on oral language and vocabulary. This was a session not originally in the PD plan; however, teachers were requesting support in the exit slips, so we adjusted the plan and sought out the expertise of our EL teachers for collaboration. Teacher 1F expressed:

> I think because our EL population is growing so much...it was nice this year to be included in some of the PDs and, moving forward...being invited to some of those planning meetings and even just sitting and listening and then chiming in with a little EL piece for everybody, I think would be beneficial too.

Teacher 2F stated:

> I appreciated the opportunity to make that connection between the science of reading and that PD with the English learners because I know most of the classrooms have a majority of English learners, and when [Teacher 1D] mentioned the text comprehension...that piece isn't going to build without our English learners having that strong oral language, that strong piece that they need to make those connections and build comprehension.

The PD delivered collaboratively by the reading coaches, and the English language teachers on oral language and vocabulary proved to be among the most popular, as identified in teacher exit slips and focus group discussions. The reading teacher focus group reflected on this PD specifically. Teacher RC2 stated, "It was really helpful to add the language and EL component to

this year's PD. The ingredients of language refresher was very helpful. I also incorporated more routines with word banks, labeling, and total physical response into my instruction." RC1 added, "It brought what we were doing to the next level, and so many EL strategies apply to all of our learners. Getting their insights and bringing it back to us as reading teachers, I thought was really helpful."

This PD was planned for a three-hour half-day session; therefore, it was intentionally planned to be interactive and involve teachers in the learning, so they were not listening to content for extended periods. Teacher RC2 expressed, "I think that PD we did with EL was probably one of our best [agreement]. I think because we were paired with EL, but we also had a variety of activities to do which I think engaged everyone around it."

Teacher RT3 added:

> I loved that one, and I agree with the engagement because you sit through PD's and people tell you something and teach you something and then you walk out, and it doesn't stick. It was designed well because I felt like you gave a decent amount of information but then it broke into an activity, and then information that broke into an activity again, and the teachers were interacting with each other. I think that definitely was effective. When you had to actually do it, it just made it stick more and then helped me figure out how I might do it in my own room.

The success of this responsive PD session was attributed to the balance of information delivered with the active engagement of teachers in applying the learning through some of the LETRS activities, strategies for English learners, collaboration, and lesson planning.

Attitudes Toward PD During the COVID-19 Pandemic

The PD plan took place at a time when the COVID-19 pandemic was still affecting education: students and staff were dealing with masking, quarantining, and social distancing during the school year in which this study took place. At the end of each focus group, I asked the question: *How did the COVID-19 pandemic impact your attitude toward or feelings about PD over the past year?* This elicited vastly different responses from the teachers at each elementary school. When I asked this question at Elmhurst, this was the first teacher's response:

> With COVID, I felt like my attitude shifted because I wanted more PD. I knew that some of my kids were coming in with a deficit, for lack of socialization. I don't know what they were doing at home in terms of actually reading...so I was like, please help me find ways that I can get them back on track or where they need to be, and for the most part, they are in a pretty good place (Teacher 4D).

Teacher 2C reported:

> And having the PD kind of acknowledged that everyone's overwhelmed, we know that some of our students hadn't set foot in the building in almost a year, a year and a half, knowing they had these big holes. Ok, so now we are going to look at where they are, this is how we are going to find out exactly where they are and what's missing, and then... bringing it together. That's the way it was done. I just think it was like, "Phew, ok, we can do this!"

The discussion that followed focused on a few challenges, like increased behaviors and socialization challenges. However, it was mostly focused on the positive aspects of the PD and the desire to meet the students where they were to do what was needed to support them. Teachers also shared how the PD was beneficial. For example:

> I think getting PD that was straightforward with explicit strategies was helpful. You don't need to focus so much on trying to find resources. So we could just focus on executing it. But I also think that having PD that's very hands-on and having us working on materials we were going to use was helpful. I just think everyone still feels a lot of stress, so knowing that this time was meaningful and useful was helpful (Teacher 2A).
>
> I think being in person was great. I was so tired of talking to a screen, all day, every day, for every single thing that we did, that being back in person, using materials, having it be engaging and interactive, that's what I liked the most. (Teacher 2E)

Teacher 2B shared, "Even just the time when we could come together and talk about our data, come with all of our spreadsheets and look at it, color-coded, and grouping students. That was very helpful." Teachers reflected on the beneficial components of their experiences with PD. They explained that the PD was focused, engaging, and meaningful. They appreciated being able to work collaboratively and discuss data.

The coach's response to the question was aligned with what the teachers had expressed, despite not being in the same room (she was in the reading staff focus group).

> I will be honest, I was pleasantly surprised that it didn't put the teachers into a tailspin a little bit. Maybe a little in the beginning. It really didn't fluster them. I wasn't sure how having PD once or twice a month and then learning new things would really bother them.
>
> But they went with it. I was really, really impressed. Very impressed. (Teacher RC2)

Despite the challenges of the COVID-19 pandemic, this group of teachers collectively expressed optimism and a desire to meet the needs of their students.

When I asked the same question at Pinehurst, the first participant's response was the following:

> I think we're just overwhelmed [agreement], and I feel like this was like two different years. We had the first part where everyone was separated, we still had masks. It was totally different; like don't come near me, don't let the kids read together. And then we shifted into more normal. So everything felt very overwhelming. I always love PD. I love learning new things. But having it during our planning time was...sometimes we were like, "Ugh, okay, I need to get this other stuff done." So I don't know if that's Covid related or just, you know, we always want that planning time, but it just kind of exacerbated those feelings. (Teacher 1B)

The next teacher (1C) spoke about a traumatic event that had happened at the school and how it had an impact on her level of anxiety being at school every day. As the discussion continued, teachers spoke of feeling "overwhelmed" and lacking time. Teacher 1A shared, "Like I said, we welcome the shift; we know the shift needs to happen. But it combined with the pandemic and other events and the mental health of teachers, and the mental health of kids just added another layer." Teacher 1D further asserted, "So I think it also impacts all the kid's mental health. So as much energy as we want to put into PD, I'm so drained." These teachers had that same desire to help students, but they perceived these obstacles to be a significant challenge, and the mental health of students and staff was mentioned several times. The coach's response was reflective of what the teachers had expressed:

> It was a different situation at our school. Our teachers participated in PD during their plan time which, I believe, affected their mentality or their openness because we were taking away time that they needed. Even though it was valuable professional development, the sense I got was that it was too much; it was too overwhelming. Teachers during the meetings were participating and seemed open and seemed willing to learn and make these shifts, but just hearing some of the feedback from teachers, it was that it was too much

> this year given that there was so much going on with the pandemic, and they had so many other things to worry about. They didn't want any changes. (Teacher RC1)

The teachers in the two schools with similar PD experiences had very different emotional responses to the PD and the work. The teachers at Pinehurst used the term "overwhelming" 13 times during the discussion, while the teachers at Elmhurst only mentioned it twice.

Some PD was delivered during the school day to maintain ongoing learning and discussions. Due to a high number of teacher absences, substitute coverage became a challenge. To solve this problem, Pinehurst had a dedicated monthly data team meeting during their planning time. They used that 45-minute period for SoR PD which negatively impacted attitudes toward PD. Elmhurst approached the problem in a way that did not impact planning time, enlisting the support of other staff in the building for coverage and moving some of the PD hours to school-based early release days. Elmhurst also prioritized the PD, allowing for PD to be two times a month, usually for an hour to an hour and a half. As a result, Elmhurst was able to schedule 16.75 hours of PD, whereas Pinehurst scheduled 9.25 hours of PD per grade level. As mentioned previously, schools inevitably have different needs and priorities and must be responsive to them.

Another surprising finding was revealed through a closer look due to conflicting data in the Pinehurst focus group transcripts. Pinehurst teachers mentioned being ready to do the work "next year" eight times during the focus group conversation. Despite teachers reporting that they were too overwhelmed in the 2021-2022 school year to make changes, evidence suggested that teachers were making shifts and "doing the work." Many instructional shifts were incorporated into the curriculum: Fundations, PA drills, assessments, decoding strategies, and more. Teachers also spoke about using data to inform instruction and the flexible grouping of students for skill or strategy-based small group instruction.

To look deeper into the data, I reviewed exit slip responses about what teachers said they were implementing. The exit slips were optional, so the teachers who answered the questions chose to do so. Teacher 1B reported employing small skills-based groups, using decodables, and incorporating phoneme-graphing mapping into instruction. Teacher 1A shared that she was using skills-based small group instruction based on student needs, using decodables, and cut up sentences (a strategy used for building sentences, increasing fluency, and supporting comprehension). She also wrote, "I have put up the sound wall kid lips cards for the letters I have taught and I am introducing them to the students." Teacher 1E reported using flexible grouping based on needs, orthographic mapping strategies, and Elkonin boxes. Each of the teachers shared specific instructional changes based on PD that impacted student learning positively.

Attitudes Toward Coaching During the COVID-19 Pandemic

Teachers in the focus groups were also asked whether or not the elicited coaching support and to talk about it if they did. Again, there were distinctly different attitudes toward coaching, despite having talented, knowledgeable, and well-respected coaches in both schools. Although both schools reported consulting the coach often with questions, Elmhurst teachers enlisted more support through modeling in the classroom. They also had a more positive outlook toward coaching during the 2021-2022 school year.

All Elmhurst teachers involved in the focus groups reported using the coach, including the specialists, though there were varied levels of involvement. All teachers reported consulting with the coach when questions arose about new learning, finding resources, implementing instructional strategies, and assessments.

All classroom teachers in the focus group sought opportunities to have the coach model lessons in their classrooms. These proved to be positive experiences. Teacher 2A spoke about a menu of topics the coach supplied which inspired her to ask for coaching:

> [The coach] came in and did a multiple meaning words lesson for my whole group because I think there was a list of topics that she put together...when I saw multiple meaning words, I thought, "Oooh, I don't know how to teach that." That's really important, especially with English language learners so [the coach] came in and did a lesson and I reinforced some of the things that she talked about with my kids. So that was really helpful.

Other examples included:

- A kindergarten teacher elicited the coach's help in meeting the needs of her students performing above grade level, to be able to challenge them appropriately. The coach also spoke about modeling an oral language strategy in kindergarten classrooms.
- A first-grade teacher observed the coach modeling small group instruction over three days to see the full routine.
- A second-grade teacher had the coach model various lessons throughout the year.
- A third-grade teacher had the coach model a decoding strategy and then transitioned to having students teach others how to do it. The teacher also had the coach model a morphology lesson, in which he reported, "It was so cool to see them so engaged like that, and that's what got them started on this trend of wanting to know more about the words they see." (2D)

Teacher RC2 reported, "In the beginning, most of my coaching was around, what did it look like. They wanted to make sure they were doing it correctly. The decodable routine, just teaching with the decodables. That sort of thing." She explained how many teachers wanted to try things on their own and then came back with questions and seeking advice or materials. She also reported supporting teachers with administering and analyzing assessments and the work of grouping students for differentiated instruction.

At Pinehurst, the discussion about coaching focused more on why they did not enlist coaching support than why they did. Teacher 1A described her reasoning for not using coaching support: “I know we have wonderful people that are there to help us. I know that whenever I have a question, she's [the coach] right there but just finding the time to...use the coaching is the why not.” Teacher 1B added that if her only job was to teach reading, she would have the coach in her room every day. She went on to explain her other responsibilities as a teacher and cited her time in PD as being like coaching. Teacher 1E explained how she leaned on coaching at the beginning of the year as she was learning new assessments but then followed with, “Just as others have said, I would have liked to have more time, but it was a way to not overwhelm myself.”

The participants added that they often sought the coach’s input when looking for strategies to support individual students or their struggling students. Teacher 1C explained:

> I found that [the coach] had an open door and I didn't need an appointment. I could go in whenever I had a moment and just say, “Hey, this kid…” and we would just have a conversation, and she would help me by saying, “This is where you should really focus.” Just because time is limited, that's how [the coach] was helpful.

Teachers also commented on how much she helped them “on the fly” or in the moment at meetings. All comments about the coach and her availability and support were positive. Teachers also mentioned how often she checked in with them to see what they needed.

Despite the statements that little coaching was employed at the school outside of meetings and discussions, I observed what the coach reported:

> There were a lot of teacher requests for support with the sound wall. It was new this year and teachers didn't feel comfortable implementing it right away so they requested a lot of support in that area…seeing how it should look in the classroom, how to use it, how to

> incorporate it with Fundations, which we're already doing, so that was one major piece. Another piece was the assessments. The assessments were new, so teachers requested a lot of modeling, help scoring, interpreting the data, putting it in the spreadsheets, and making groups. And then also accessing the materials as we were delivering PD and talking about instructional shifts and research. We wanted to make sure that teachers had what they needed to follow up in their classroom. So, I did guide teachers through a lot of accessing relevant materials and resources to support their students. (Teacher RC1)

The coach also modeled phoneme-grapheme mapping in third-grade classrooms. It is possible that the members of this focus group were not representative of the teachers who sought out coaching, or perhaps there were varied definitions or understandings of the term "coaching" at play. Nevertheless, Teacher RC1 also reported:

> Teachers were overwhelmed given the ongoing pandemic. Teachers seemed to feel like they had a lot on their plate and coaching would be one more thing that they had to manage or fit in. It wasn't something that they were asking for. I reached out continuously and offered help and support in many different ways, but one challenge was kind of getting teachers open to the idea of, "Let's work together on this. Let's try this new routine…Do they want help finding the resources?" But then that next step, they just wanted to try it out on their own.

As was previously uncovered, perhaps teacher well-being interfered with teachers recognizing the work they did with the coach and the work they did to improve instruction.

Independent Professional Learning

One of the open-ended questions on the post-survey asked teachers if they found the resources in the SoR Google Classroom helpful and asked teachers to explain. An SoR PD Google Classroom was designed to provide professional learning opportunities including

webinars, articles, videos, podcasts, and more. Of the 31 survey participants in this study, 27 responded with "yes" or otherwise expressed that they used the SoR Google Classroom for professional learning. Teacher 2D commented, "Yes, I often found myself quickly referencing resources from the SOR Google Classroom. I did also really benefit from the Google Drive resources for specific third-grade resources." Teacher 2A responded, "Yes, I found the Google Classroom helpful. It helped me to bring the scientific information I learned to practice in my classroom."

Teacher 1D reported:

> I did! I happen to be learning more about SoR as I am in special education graduate classes. I have found this helpful since it is like I am learning it twice and using the skills while teaching. I have found myself highly interested and even seeking other information such as podcasts on all the topics in PD and in graduate class. Things are "clicking" more than ever!

These quotes represent the types of comments made; however, of the 27 participants who said they used the resources in the Google Classroom, eight expressed that either they did not have enough time or would have liked more dedicated time to do so. Additionally, three of the participants found the number of resources "overwhelming." Teacher 1A expressed:

> The SOR Google Classroom is a great resource. However, I did not feel as though I had adequate amount of time this year to really explore all the resources that were posted in the classroom. I was aware that resources were added often, but it felt impossible to keep up with them throughout the year. I would have appreciated having dedicated time set aside for this important SoR training and shift in instruction.

Two of participants responded with “somewhat,” one citing time as an issue and the other finding the resources overwhelming. One participant commented, “Unfortunately, I did not utilize this resource as much as I would like.”

Despite a challenging year, most teachers in the survey expressed that they engaged in professional learning, independently accessing and using the resources provided in the SoR Google classroom. They often used the resources to follow up on what they had learned in PD or to solidify their learning.

Summary

Research Question 1 sought to show whether there was a relationship between teachers' understanding of the concepts and their confidence in teaching them. There was a strong correlation between them. Although one cannot be said to cause the other, these results can be used to predict that as teachers’ understanding of concepts increases, their confidence in teaching those concepts also increases.

When examining Research Question 2, the results showed a significant difference between the pre-survey and post-survey in all three areas (reading theories and models, PA, and phonics) for teachers' understanding of the concepts and their confidence in teaching or applying them. These findings suggest that the year-long professional development in the science of reading significantly impacted teachers' understanding of concepts and confidence in teaching those concepts. Focus group discussions supplied insights into teacher attitudes toward the PD, the instructional shifts made, and the levels of coaching employed. Both successes and challenges were revealed through the discussions.

Overall, these results suggest a positive impact of the year-long PD program. Teacher perceptions of their understanding of concepts related to the science of reading and their confidence in teaching those concepts increased significantly. These results are promising and

suggest that targeted professional development should remain ongoing with the goal of continued teacher growth. A logical next step would be to evaluate the relationship between teacher improvement and student achievement.

CHAPTER FIVE – CONCLUSIONS AND RECOMMENDATIONS

Overview of the Study

As teachers, schools, and districts embark on the challenging work of closing the gap between instructional practices used to teach students to read and the SoR, there are significant implications to consider from this study and those that came before it.

> There have been literally thousands of research studies in the last four decades on all aspects of reading, but only small bits and pieces seem to make their way out of the scientific journals and into our K-12 classrooms. Schools have a responsibility to teach students to read in their early schooling years. (Kilpatrick, 2015, p. xvii)

With stagnant NAEP scores nationwide and gaps in learning resulting from the COVID-19 pandemic, the time to act has never been more critical. The adverse life outcomes for students who do not become proficient readers are well-established in the research (EAB, 2019; Kilpatrick, 2015, 2016; Moats, 2021; Seidenberg, 2017). This change process must start with leaders and decision-makers who fully understand the research. Strategic professional development aligned to the SoR, with consideration given to the local context and the input of teachers themselves, can pave the way toward lasting change. Districts currently making changes or planning to do so in the next few years must also consider the impacts of the COVID-19 pandemic on teachers, students, and the community at large.

This mixed methods study incorporated an action research design to answer the following research questions:

1. What is the relationship between teachers' understanding of the foundational skills of reading and teachers' confidence in teaching the foundational skills of reading?
2. What impact does strategic and ongoing PD in the science of reading have on teachers' practice?

a. What was the impact of PD in the science of reading on *teachers' perceptions of their knowledge* related to the foundational skills of reading?
b. What was the impact of PD in the science of reading on teachers' *sense of self-efficacy* in teaching the foundational skills of reading?

3. What were teachers' perceptions of year-long professional development in the science of reading?

Discussion of Findings

A summary and brief discussion of the findings are provided below as a point of context and reflection on the outcomes, the successes and challenges, and what may have influenced them.

Correlation Between Content Knowledge and Application in the Classroom

The results of this study indicated a strong correlation between teachers' perceptions of their content knowledge and confidence in applying that knowledge in the classroom, both prior to the PD plan and after it was completed. These findings support Bandura's research on self-efficacy (1997). In this context, increased confidence in application in the classroom may be attributed to hands-on, collaborative learning activities and lesson-planning experiences during PD. Coaching support likely also played a role in teachers' confidence in the application. However, the correlation may also indicate an experienced, veteran staff that has built confidence in their teaching abilities, allowing them to adjust practices more quickly once they understood why and how.

Although there was a strong relationship between content knowledge and confidence in applying that knowledge, it may be limited to the context in which it occurred. Most teachers in the study had more than ten years of experience. These results may not be as strong with less experienced teachers.

Year-long PD in the SoR Had a Significant Impact, Despite Challenges

The results from the survey demonstrated statistically significant improvements in teachers' knowledge and application of skills related to the SoR. Data collected from the focus groups supported these findings. The results are noteworthy, given that teachers faced unprecedented challenges during the COVID-19 pandemic, particularly in the early grades. Teachers were tasked to teach children letter sounds and pronunciations in masks. They had some students in their classrooms sitting at desks while others were at home on a computer screen for more than a year before this study. However, as teachers faced the added challenge of aligning their instructional practices with the SoR, they engaged in PD and made significant changes despite feeling overwhelmed.

Alignment of Instructional Practices to the SoR

This study aimed to engage teachers in growing a deep understanding of the SoR and aligning instructional practices to research when teaching the foundational skills of reading. Teachers in the focus groups reported making the following instructional shifts, observed in classrooms by the literacy coaches and the language arts coordinator:

- ***Incorporating Daily PA Instruction:*** increased explicit whole group instruction using a scope and sequence of skills and incorporated these skills into small group instructional routines K-3. Phonemic awareness was one of the five reading skills proven through research to positively impact reading achievement (Ehri et al., 2001; NICHD, 2000; Shanahan, 2005; Shapiro & Solity, 2008).
- ***Implementing Sound Walls and Articulation Instruction****:* moved away from word walls in all grades, replaced them with sound walls in some K-2 classrooms, and implemented articulation instruction of sounds before teaching each letter in K-1. The use of sound walls and articulation instruction are high-leverage

approaches to promote PA instruction and support letter-sound relationships (from speech to print) and spelling (Moats, 2020; Moats & Tolman, 2009).

- ***Incorporating Phoneme-Grapheme Mapping into Instruction:*** incorporated this instructional strategy in whole and small group instruction to strengthen orthographic mapping and grow sight word vocabularies K-3 (Ehri, 2020, 2022, Kilpatrick, 2016).
- ***Teaching Explicit Decoding Strategies:*** eliminated the teaching of strategies that took a reader's attention away from text (such as guessing or looking at the pictures) and focused explicitly on teaching letter-sound relationships and decoding strategies K-3. Once students understand the phoneme-grapheme relationships, they learn to blend the sounds to make words, eventually retaining them as sight words (Ehri, 2020, 2022, Kilpatrick, 2016).
- ***Using Decodable Books:*** used decodables as one aspect of instruction in whole and small group settings to provide opportunities for students to apply and practice phonics strategies with students learning to read. Decodable books provide an opportunity for students to apply newly learned skills with success and encourage the sounding out of words and fluency (Blevins, 2021; Shaywitz & Shaywitz, 2004).
- ***Implementing Skill/Strategy Groups Based on Data:*** recorded and sorted data in Google Sheets to create flexible groups for targeted phonics and PA instruction K-3. This evidence-based skill/strategy instruction replaced guided reading practices with leveled books, not supported by research (Doubet, 2022).
- ***Using an Instructional Routine for Teaching Words with Irregular Patterns:*** used an instructional routine grounded in research over rote memorization of

> words. This routine incorporated teaching the decodable parts of the word, identifying the irregular letter(s), hearing the word, saying the word, spelling the word, writing the word, and using it in a sentence to provide context (Farrell, Hunter, & Osenga, 2019).

These shifts in instructional practices further demonstrated significant growth in understanding the research and implications on classroom practices; however, there remains room for growth as we continue our learning journey.

Scheduling Ongoing PD

To deliver ongoing, responsive PD, "collaboration days" were implemented to supplement the district PD days. In the K-3 schools, collaboration days were designed to provide monthly substitute coverage, allowing each grade level to have 90 minutes for PD and time to collaborate. With five to six classroom teachers per grade, the availability of substitute coverage became a major obstacle. At the same time, the COVID-19 pandemic continued to require teachers to quarantine for multiple days at a time. This prompted the need for building administrators to problem-solve creatively to prioritize time for PD during the school day.

There were many similarities in implementation between Pinehurst and Elmhurst, yet some notable differences. Teachers demonstrated positive self-reflection and growth in both schools, but the narrative revealed significant differences in mindset and, to some degree, levels of implementation. There were challenges to both schools regarding time, including canceled PD due to a lack of subs, varied social distancing and masking requirements, and a need to restructure how PD was planned and implemented.

After canceling PD early in the school year due to a lack of substitute coverage, the principal at each school worked creatively to move PD forward. As previously mentioned, the

principals at both schools faced varied needs, schedules, and priorities that impacted these decisions.

At Elmhurst, several adjustments were made to accommodate PD time, including using internal staff to provide classroom coverage and moving some of the PD to school-based PD days. These shifts allowed for 60-to-75-minute sessions one to two times a month (which was more time than initially requested). The focus group discussions revealed teachers' acknowledgment of the urgency for change and persistence within PD experiences and implementation to improve instructional practices.

At Pinehurst, PD was moved to a monthly data team time already scheduled during planning time, preferred by teachers over after-school time. Given the ongoing focus on data in the sessions, this option made sense. It allowed for a few monthly 45-minute sessions for each grade level. The loss of planning time during the COVID-19 pandemic proved to be an added stressor that had a negative impact on teachers. Throughout the focus group discussions, teachers expressed feelings of fatigue and being "overwhelmed" by the learning. With the shortened time, there was also less time for collaborative conversations, and teachers felt rushed.

The key differences between the two schools were the amount of time allotted for PD and the time of day in which it took place.

- ***Amount of Time****:* Elmhurst was able to schedule additional time, allowing for seven more hours of PD across more days. Both schools received equitable content; therefore, the amount of time for application, practice, and discussion was reduced for Pinehurst. According to Bandura (1997), these are critical components for achieving mastery experiences and increasing self-efficacy.
- ***Time of Day****:* Elmhurst was able to schedule one hour or more for each PD session occurring during the day with coverage for teachers. Pinehurst had approximately 45 minutes, and the

PD took place during teachers' planning times instead of an after-school meeting. Although this was the teachers' preference given the option, all teachers in the focus group at Pinehurst discussed the negative impact of losing planning time and feeling rushed during the PD.

The Impact of the COVID-19 Pandemic Differed Between the Two Schools

This study occurred amid the ongoing COVID-19 pandemic (2021-2022), when social distancing, masking, quarantining, and extended absences of students and teachers were ongoing. The two schools had very different experiences related to the pandemic, likely affecting attitudes toward PD and coaching.

- ***Elmhurst:*** More students opted to learn from home during the 2020-2021 school year preceding the study. This left only 6-8 students in each class for in-person learning, potentially reducing teachers' stress and increasing their feelings of safety. Following the 2021-2022 year of PD, teachers in focus groups did not mention concerns about the mental health of teachers or students, only occasionally feeling overwhelmed.
- ***Pinehurst:*** During the 2020-2021 school year preceding the study, most students attended school in person, making social distancing challenging in classrooms, the lunchroom, and buses. Larger classes of in-person learning may have contributed to teachers' stress during the pandemic. Most teachers in the Pinehurst focus groups mentioned concerns about teachers' and students' mental health and well-being. Teachers also spoke about a traumatic experience at the school during the study, which added another layer of stress not experienced by Elmhurst's teachers.

Given my observations at Pinehurst, I am inclined to reflect that the "overwhelmed" feelings likely hindered teachers' abilities to recognize the positive aspects of their instruction and accomplishments. Throughout the focus group discussion at Pinehurst, teachers reported that they would implement changes "next year" and often failed to recognize the many ways they

were already implementing changes. For example, all kindergarten through grade two teachers were fully implementing Fundations. Most spoke about using data to inform small group instruction and employing instruction targeted at the skills students needed. Many mentioned flexible grouping of students. Most teachers reached out to the coach for information and support, to ask questions, and for resources. This evidence suggests that most teachers at Pinehurst implemented more instructional strategies and approaches supported by the SoR than they recognized.

Limitations

As an action research study, one of the limitations of this study is that it was influenced by factors outside of my control, such as time, use of resources, and levels of implementation. This caused differences in how the PD plan was implemented in each of the two schools and how the coaching was implemented. Additionally, the context of the study is limited due to the small suburban population of the two elementary schools. This study took place during the COVID-19 pandemic; therefore, several challenges presented themselves, including teacher absenteeism, canceled PD due to a lack of substitute teachers, and teacher fatigue.

Another limitation of the study is that it does not measure or make any comparison to student achievement. Although positive student outcomes were observed and identified in the data, it was not included as a component of this study.

Finally, because the data gathered for analysis were generated through surveys, actual practice in the classroom could vary from self-reported practices. Teacher responses may have been subject to self-report bias (Donaldson & Grant-Vallone, 2002). The surveys collected teacher identification; therefore, they may have reported themselves more positively than was factual. The use of multiple forms of data collection was used to increase the validity of the results.

Delimitations

This action research approach aimed to design and implement a responsive PD plan to close the gap between research and practice as it relates to the SoR and enact shifts in teacher knowledge and practice. As such, this study sought to measure the outcomes of the PD plan on the teacher's understanding of the SoR and the application of this understanding to instructional practices. A survey gathering teachers' perceptions of their understanding and skills was purposeful to be non-threatening and reduce potential stress. Additionally, the topics on the survey were related to content in the LETRS workbooks, which reflected the content intended to be covered. Due to the responsive nature of the PD, other areas of reading were covered in the PD but not included in the survey.

Discussion and Recommendations for Designing Responsive PD on the SoR

There is significant research on the factors contributing to effective PD. The key factors supported by the research were provided in Figure 3: *Building a Professional Development Plan Aligned to Research.* Designing and implementing an effective, responsive, ongoing PD plan that changes long-held beliefs and practices is challenging. When the success of our students hangs in the balance, it becomes essential to do it well. Reeves (2010) states:

> The greatest frustration for school leaders and classroom educators is the difference between what we know and what we do. We know what effective professional learning looks like. It is intensive and sustained, it is directly relevant to the needs of teachers and students, and it provides opportunities for application, practice, reflection, and reinforcement. (p. 23)

The purpose of the next section is to provide recommendations that may support other districts embarking on the journey of training teachers in the SoR, particularly those interested in designing PD that is responsive to the teachers in their unique context. Programs may be one

piece of the puzzle, but as is commonly said, "Programs don't teach children, teachers do." As such, it is crucial to invest in teachers through PD. Just as programs need to be adjusted and tailored to the needs of the students being taught, PD needs to be designed and tailored for the teachers in their unique context. "Teacher professional learning 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, p. 7).

Leadership must prioritize the structures that support PD on the SoR. If the PD is necessary, it must be supported by the structures that make it successful. Time was one of the more significant themes from the focus group discussions – not enough time for planning, reflecting, learning, and applying. This study supports designing PD that frees up teachers with time to learn, apply, process, and reflect without feeling rushed, whether it be during the school day or after school. If during the school day, schedule PD with minimal impact on classroom instruction. Time must be prioritized. The following recommendations are based on the findings of this study and should be considered during the design of responsive, professional learning.

Prioritize Teacher Well-Being in PD, Especially in a Post-Pandemic World

Teachers are human, and they have their own personal struggles. Many teachers and families experienced trauma at some point during the COVID-19 pandemic. Teachers in this study expressed feeling overwhelmed by PD, yet responsible to the students they served. So how can we continue to grow and learn while being responsive to teacher well-being? Establishing psychological safety, communicating with compassion, and building an environment that promotes growth from stress are essential.

Establish Psychological Safety

For teachers to be productive and open to learning in PD and school settings, they need to feel psychologically safe. Leadership plays a vital role in creating an environment that supports

teacher needs during times of change. According to Creekmore and Creekmore (2022), trust, compassionate communication, and inclusivity are key factors in creating a psychologically safe space. "Planting and cultivating seeds of trust—so that members of the community trust others will do their part and 'have their back' if necessary—is essential" (Creekmore & Creekmore, 2022, p. 44). Creekmore and Creekmore further posit that teachers need to feel safe, respected, and valued in an inclusive environment. They also need to feel their voices are listened to and that they matter.

Honor Where Teachers Are Now and Communicate with Compassion

Many teachers who listened to Hanford's podcasts about teachers using ineffective classroom practices and the negative impact on student learning shared feelings of guilt and shame. I witnessed it on social media, heard it from teachers, and felt it myself. When communicating the need for change, acknowledge all the great work teachers are doing and will continue to do. Acknowledge the challenges and define what will be done about them (Kise & Holm, 2022). Avoid blame. It is not productive. In developing the PD to kick off the year-long plan, we deliberately established a sense of urgency while avoiding blame and communicated, "We are in this together. We will learn and grow together." The overarching theme of the kick-off PD was, "Know better, do better." Once we had a better understanding of the research, we would do better, together. This was one of the ways that we worked to build trust and communicate with compassion in the PD design.

Build an Environment That Promotes Growth from Stress

Another significant factor in teacher well-being and sense of self-efficacy is the environment in which teachers work and learn. Despite teachers often wanting to work independently when stressed, they must spend time with others. "Stress is inevitable for human beings who have goals and relationships. But one major characteristic of those who exhibit

hardiness, defined as the capacity to grow from stress, is that they do not isolate themselves" (Kise & Holm, 2022, p. 35). Creating opportunities for smaller grade-level teams to discuss, take risks, and design lessons collaboratively is important. High-quality teachers also need to feel connected to others in their workplace (Mielke, 2022). Encourage community-building activities.

Additional suggestions to district and school leaders for supporting well-being and creating a safe environment through the design of PD include the following:

- Narrow the number of initiatives in any given year to avoid the emotional exhaustion of teachers and initiative fatigue (Kise & Holms, 2022; Mielke, 2022). "One of the best ways to reduce initiative fatigue is to focus on practices instead of programs (Mielke, 2022). Make the SoR a top priority.
- Provide opportunities for teachers to gather in smaller groups to participate in meaningful activities and discussions.
- Promote a culture of curiosity and lifetime learning that values growth.
- Be compassionate and empathetic when communicating with teachers (Creekmore & Creekmore, 2022).
- Establish trust. Say what you mean and mean what you say. Follow through on what you say you will do (Creekmore & Creekmore, 2022).
- Follow up after PD with individualized communication to check in, praise and acknowledge accomplishments, and listen to what teachers may need (Mielke, 2022). Highlight what teachers do well.
- Ensure that teachers know the matter to the students and to the school community. They benefit from a sense of belonging and the knowledge that their work makes a difference (Donlan & Wilfong, 2021).

“Outstanding educators need to know their contributions are seen. In addition, they deserve to know that they figure into ongoing school-improvement plans” (Fisher & Frey, 2022). Let teachers know they matter.

Establish a Clear Purpose and Set Goals at the Onset of Year-Long PD

Establish a clear need for PD (through data when possible) and communicate goals and expectations. Transparency is important. Teachers need to understand why they are being asked to engage in learning and the expected goals or outcomes of the PD (Aguilar, 2022). Use a pretest to gauge the needs of teachers to target and personalize learning experiences (Reeves, 2022). The pre-survey in this study informed the areas to target through PD. The post-survey informed PD offerings in the following year, providing the data needed to personalize learning and offer differentiated PD. Reeves posits that beliefs do not need to change before practices are changed when engaging in PD. "The feelings and attitudes may or may not follow, but the immediate imperative for equitable practices is now—not after the elusive and often illusionary buy-in of staff" (2021, p. 46). Establish a clear purpose, set goals, and enact change.

Incorporate Teacher Input Throughout the PD Design Process

Responsive PD allows for a design that can be personalized to the needs of teachers in their specific context. In this study, if the PD design relied strictly on LETRS materials or other PD providers, significant opportunities for meeting teachers' needs would have been missed. It would have limited teacher voice and choice. Had the design of the PD not been responsive to teacher input, we would not have focused on EL strategies, oral language and vocabulary, and the targeted data work we did to inform instruction. These were not in our initial plan and resulted in the most powerful sessions in the PD plan, as identified through the focus group discussions. Teacher input and feedback were integral and necessary to the development of an effective PD plan.

Surveys and exit slips proved to be effective ways to gather the information to plan for PD. Throughout the study, this information was invaluable in the planning process for each PD

session. Moreover, this created a cyclical, iterative, responsive approach to the design. It also directly informed the work of the coaches, knowing who wanted additional support, who needed resources, what strategies teachers were trying out, and the logical next steps. Responsive PD increased teacher engagement. At least a portion of each session was directly related to what teachers wanted to know and do.

Create Conditions That Build Efficacy

Teacher challenges will inevitably occur when providing PD with the goal of enacting change. Mielke (2022) posits, "If we want teachers to persevere through challenges, we need to create conditions that build efficacy: that involves coaching, time, and support" (p. 21). He identified inefficacy as a major contributor to teacher stress and burnout. Building efficacy requires building confidence and competence through mastery experiences which are attained through high-quality PD.

> High-quality coaching provides *social modeling* through observing oneself or others, *mastery experiences* as teachers find success with new skills, and *verbal persuasion* through supportive dialogues with coaches and colleagues. Plus, effective coaching adds *emotional arousal* through affirmation and constructive feedback on what one is doing well. (Mielke, 2021, para. 12)

Building self-efficacy in instruction was a desired outcome throughout this study. Data demonstrated that significant gains were made resulting from PD that was rooted in research, responsive to teachers, and delivered in a safe, supportive environment.

Enlist the Collaborative Work of Coaches to Design and Implement Responsive PD

The development of coherent, responsive PD was challenging, time-consuming, and relied heavily on the work of coaches. Employing the support of coaches in both the design and delivery of PD allowed for a more personalized, personal experience. Coaches who have well-established relationships with the teachers can provide powerful input.

During the planning process, well-trained coaches bring individual strengths, areas of expertise, and knowledge about the teachers they work closely with daily. "To recognize collective design, we should incorporate different perspectives and needs assessments. Remember, that voice is meant to inform and provide context; decision making is meant to move something forward" (Ende, 2021, p. 42).

Make coaches available to teachers to provide ongoing follow-up to PD through answering questions, finding resources, modeling instruction, co-teaching, supporting the assessment and data process, and more. Neither coaching nor PD would have been as effective on its own. As stated by RT1:

> For me, another valuable resource was the coach. The coach had all the training and the resources that she needed from [the language arts coordinator's] support and then just helped us figure out where to go and how to get those resources. Because don't forget, we not only, as interventionists, we're working with students, but we also have tutors and other people that are working with students, and we want to make sure that the instruction is parallel and that every child is getting what they need. So, the coaching and the training was a huge resource for me as an interventionist.

Coaching support was invaluable to teachers and specialists alike. Coaching support following PD was a critical component for mastery experiences to be successful and for instructional shifts to occur.

Build Partnerships with Those in Related Areas of Expertise to Add Value to PD

In this study, the contributions of our EL teachers produced an understanding of the SoR that our reading experts alone could not have done. "The literature demonstrates that expert supporters can play a critical role in creating effective PD" (Darling-Hammond et al., 2017, p. 13). Not all literacy experts are coaches. The PD plan in this study was strengthened by involving our EL teachers. There was a growing population of English language learners, diverse backgrounds, and students new to the country in Pleasantville Public Schools. Teachers requested support to better meet these students' varied and unique needs. The EL teachers in both schools were TESOL trained and held a level of expertise that the coaches and I did not.

Other experts to consider in PD design or delivery includes special education teachers and individual classroom teachers with expertise and training. Partnering with other experts in the schools can be highly effective and beneficial for all involved.

Use Formative Data to Drive Instructional Decision-making as a Component of PD

Data discussions, especially around early reading skills, should be a regular, dynamic component of PD. Students gain skills in reading at a relatively fast pace. Thus, incorporating opportunities to look at varied assessments that produce information on different skills is imperative to plan for instruction. For example, a first-grade teacher might look at a PA assessment to determine areas for focus, a phonics assessment to determine the progression of skills, and an oral reading fluency assessment to determine skills related to word reading, accuracy, and fluency. Time for data sorting, review, and analysis informs the next steps for instruction and instructional groupings. Flexible grouping facilitates differentiated learning and access to equitable learning opportunities. It also promotes student growth (Doubet, 2022).

In an extensive review of the literature, including quantitative experimental studies, Black and Wiliam (2010) concluded, "innovations that include strengthening the practice of

formative assessment produce significant and often substantial learning gains" (para.12). In this study, supporting teachers through PD to sort and analyze the data themselves empowered them to use it more actively to guide their instructional decisions.

Incorporate Evidence-based Practices Aligned with Research

Designing responsive PD for teachers must also incorporate a coherent learning sequence based on research and evidence-based practices. Aligning instructional practices with research is not likely to be accomplished without a focus on evidence-based teaching practices. It is also important to start with the end in mind by determining the student outcome goals and then planning a course for achieving those goals. "We should be asking questions such as: What do we want our students to accomplish? What evidence supports the effectiveness of this innovation? And how good is that evidence?" (Gusky, 2021, p. 56). Identifying and communicating these practices with teachers can help eliminate practices not aligned with research.

Incorporate Learning That Actively Engages Teachers and Promotes Application of Skills

According to Darling-Hammond et al. (2017), “Active learning, in sharp contrast to sit-and-listen lectures, engages educators using authentic artifacts, interactive activities, and other strategies to provide deeply embedded, highly contextualized professional learning” (p. 7). Short and Hirsh (2023) suggest that this is best done using curricula and materials that will be used in the classroom, allowing teachers to practice and experience them before implementation. According to ASCD:

> Professional development is more effective in changing teachers’ practice when it is organized around the collective participation of teachers (from the same school, department, or grade levels), focused on active learning activities (teachers are allowed to apply what they are learning), and coherent (aligned with teachers’ professional

knowledge or community, as well as with state or district standards and assessments). (para. 7)

In this study, the most positive feedback and experiences noted by teachers were those in which they participated in the learning activities, tried out new strategies, and had time to plan lessons based on new strategies learned.

Differentiate PD Once Foundational Understandings are in Place

The SoR and its implications for instruction may be entirely new learning for many teachers. As such, building a shared understanding of the SoR requires some level of PD for all. Pleasantville took this approach in year one and moved to differentiated PD in year two (the year following this study). In that following year, some PD days remained consistent for all. In others, teachers could choose their sessions, allowing them to continue to learn at a basic level when the learning still felt new or to learn at a deeper level when the basics were mastered. Teacher feedback was used to determine the offerings. For example, there were varied levels of the implementation of sound walls in year one, so basic and advanced sessions were offered. Differentiated PD has proven to be successful in addressing the varied needs of teachers.

Implications for Other Districts Engaging in PD on the SoR: What should be prioritized?

Based on the findings in this study and the recommendations outlined, the following are intended to summarize the recommendations and provide a clear set of implications for engaging in this work:

- Be responsive to teacher input and feedback throughout the design and implementation of the PD process.
- Build partnerships with other experts in the school, such as EL teachers, special education teachers, and teacher experts, to meet the diverse needs of teachers and students.

- Allocate for a highly qualified and trained coach to support the goals and implementation of the PD.
- Dedicate time for coaches to be involved in the design and delivery of the PD plan and provide ongoing support to teachers.
- Dedicate enough time for learning, applying, and processing throughout the year.
- Incorporate evidence-based strategies and resources from various reliable resources when planning PD. Be careful consumers of these resources.
- Make evidence-based resources to support skill/strategy-based small group instruction readily available so teachers do not seek them out on their own. Perform quality reviews before they are in the hands of teachers.
- Align instructional and curricular materials to research.
- Incorporate research into PD design and delivery.
- Encourage principals' attendance at PD to demonstrate commitment to the work and to learn alongside teachers so they are able to provide meaningful guidance and feedback to teachers.
- Incorporate data discussions and planning for instruction.
- Attend to teacher well-being. Create an environment that promotes psychological safety, trust, belonging, and compassionate communication in PD and in the larger school/district community.
- Let teachers know they matter and that they make a difference for their students and the professional community.

Recommendations for Additional Research

- Examine the optimal structures for implementing change amid crises. In a post-pandemic world and considering the need for districts to align instructional practices in reading to the SoR, this has become a pressing need.
- Examine the impact that teacher wellness has on the success of PD. In this study, one school, having experienced higher levels of stress and trauma, did not feel as successful following PD and felt the PD to be overwhelming. Understanding the impact of stress may help inform strategies to mitigate negative experiences or attitudes.
- Perform a longitudinal study on the impact of school-wide or district-wide PD in the SoR on student achievement over time.
- Examine the impact of phonics and reading programs identified as being aligned to the SoR on student achievement. Between 2019 and 2023, at least 16 states have passed legislation or created policies mandating districts to use or eliminate specific phonics and/or reading programs. If the goal is alignment to the SoR, then these programs must be reviewed for alignment with both standards and research. They should also be studied for their impact on student achievement over time. This would support states and districts in making informed decisions about purchasing and implementing programs.
- Examine the effectiveness of teacher-developed curricula (exclusive of phonics) aligned to standards, evidence-based practices, and the context of their community versus commercially developed programs designed for the masses.
- Conduct additional studies on responsive PD design and implementation aimed at changing instructional practices within and outside of the context of the science of reading.

- Conduct studies on the success or failure of the varied legislative decisions related to the SoR across the states. Some states have mandated programs, assessments, or PD, while others have yet to pass any mandates. Studies on these outcomes could inform future legislative decisions.
- Examine the effectiveness of teacher-developed curricula aligned to standards, evidence-based practices, and the context of their community versus commercially developed programs designed for the masses. Research supports the need for explicit, systematic instruction in phonics through a program. Schmoker (2023) agrees but promotes the need for a coherent curriculum developed by teachers that can be created in a short period of time with minimal funding in other areas.
- Examine the role of the principal in the PD process and ways to support changes in instructional practices.
- Conduct additional studies on responsive PD design and implementation aimed at changing instructional practices within and outside of the context of the science of reading.

Contributions of the Study

This study contributes the following to the broader research community:

- It honors the foundational work of Bandura and the Social Cognitive Theory and other prominent researchers on professional development.
- It provides a synthesis and road map for others looking to provide professional development with an end goal of making change.
- It provides a model for using teacher input as a driver in developing professional development.

- It promotes the importance of flexible professional development that is designed to meet needs of a local context and the people in it.
- It values teachers as professionals and change-makers in professional development design.

Impact of the Research Study on the Scholar-Practitioner

My personal learning journey to gain a deep understanding of the SoR and its implications on instructional practice continued as I began my doctoral studies. It was then that my problem of practice became clear. Listening to teachers and hearing their stories provided further motivation. Prior to this study, following a PD session on closing the reading gap delivered by Louise Spear-Swerling, teachers began to recognize that they were using instructional strategies in their practice that were identified as being detrimental to struggling readers. It sparked conversations about wanting to know more and wanting to make a change. In conversations following later PD sessions, teachers were genuinely concerned that their teaching was "wrong." Their deep levels of concern and the onset of the COVID-19 pandemic made the PD on the SoR imperative.

Although the ongoing pandemic was a less-than-ideal time to take on PD, many teachers welcomed the new learning and desired to help their students. It was also a time when I realized the importance of teacher input and staying connected with what they were going through and what they needed. I had always sought teacher input in curriculum, but not necessarily in the PD process. There was a turning point for me early in this study when it became clear that to train teachers effectively, they needed a voice in the whole process. This became a key consideration in the PD design. The exit slips were an integral component of not just monitoring what teachers were learning and doing but also determining the needs in the moment and responding to those needs. It changed how I view PD, and the role leaders and teachers play in designing it.

I recently sat with a team of teachers who wanted to give input on the changes and ideas they had for improving their next reading unit. They also expressed how much they appreciated being heard and having their ideas valued by a leader. Not only was it affirming our work, but it also revealed how invested teachers were when they felt they were part of making change and the decision-making process. The lessons I take away from this study and from the teachers that participated in it are immeasurable. We will continue on this learning journey together.

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Appendix A

2021 Reading Pre-Survey

The purpose of this survey is to develop a meaningful year-long PD plan for next year that is based on research, data and incorporates the interests of teachers teaching foundational skills (YOU). A secondary purpose is to measure the effectiveness of the PD plan at the end of next year. The questions will ask you to self-reflect on concepts related to reading theories and models, phonological awareness, and phonics (reading foundational skills). Many of the concepts below may be unfamiliar to you and that is ok! We will be taking a journey together next year to deepen our understanding of the science of reading and the research on teaching reading. At times, questions may appear to be repeating, but you are asked to rate some of the topics for two different purposes: 1) understanding and 2) confidence in teaching the concept (self-efficacy). The survey should only take about 12 minutes and you may choose to discontinue at any time. Thank you for your participation! Upon completion, I will send you an advance copy of LETRS: An Introduction to Language and Literacy which will be the focus of PD in the 2021-2022 school year.! You will also be put into a raffle for prizes at the August PD! * This form is automatically collecting emails for Pleasantville Public Schools users.

How well did each level of schooling prepare you to teach reading? Please select ONE response per question. (1 = least prepared and 5 = most prepared).		
Undergraduate	1 2 3 4 5	1 2 3 4 5
Graduate	1 2 3 4 5	1 2 3 4 5
Post-Graduate	1 2 3 4 5	1 2 3 4 5
Rate your preferences for how PD is delivered (1 = least preferred and 5 = most preferred). Please select ONE response per question.		
Self-paced and available online	1 2 3 4 5	1 2 3 4 5
Coaching Support	1 2 3 4 5	1 2 3 4 5
Grade Level Meetings	1 2 3 4 5	1 2 3 4 5
Full Day Sessions	1 2 3 4 5	1 2 3 4 5
Half-Day Session	1 2 3 4 5	1 2 3 4 5
Multi-Level Sessions	1 2 3 4 5	1 2 3 4 5
If you have another preference, please list it below.		

Appendix A (Cont.)

	How FAMILIAR are you with each theory or model? Please select ONE response per question.	To what extent does this theory or model INFORM your instruction? Please select ONE response per question.
1 = not at all 2 = somewhat 3 = adequate 4 = confident 5 = superior		
The Simple View of Reading	1 2 3 4 5	1 2 3 4 5
How the Brain Learns to Read	1 2 3 4 5	1 2 3 4 5
Ehri's Phases of Reading Development	1 2 3 4 5	1 2 3 4 5
The Four-Part Processing Model for Word Recognition	1 2 3 4 5	1 2 3 4 5
Scarborough's Reading Rope	1 2 3 4 5	1 2 3 4 5
	What is your level of UNDERSTANDING of the following phonological awareness concepts? Please select ONE response per question.	What is your level of CONFIDENCE IN TEACHING the following phonological awareness concepts? Please select ONE response per question.
1 = not at all 2 = somewhat 3 = adequate 4 = confident 5 = superior		
What is a phoneme?	1 2 3 4 5	1 2 3 4 5
What are the features of phonemes (characteristics of articulation)?	1 2 3 4 5	1 2 3 4 5
What does the phonological processor do?	1 2 3 4 5	1 2 3 4 5
What is the phonological processing continuum? (the hierarchy of skills taught)	1 2 3 4 5	1 2 3 4 5
How is a sound wall used for instruction?	1 2 3 4 5	1 2 3 4 5
What is phonemic awareness?	1 2 3 4 5	1 2 3 4 5

Appendix A (Cont.)

	What is your level of UNDERSTANDING of the following phonics concepts?	What is your level of CONFIDENCE IN TEACHING the following phonics concepts?
1 = not at all 2 = somewhat 3 = adequate 4 = confident 5 = superior		
What is the alphabetic principle?	1 2 3 4 5	1 2 3 4 5
What is systematic, explicit phonics?	1 2 3 4 5	1 2 3 4 5
How are phoneme-grapheme correspondences mapped?	1 2 3 4 5	1 2 3 4 5
How can the regular parts of words be used to teach irregular (heart) words?	1 2 3 4 5	1 2 3 4 5
How is morphology used in phonics instruction?	1 2 3 4 5	1 2 3 4 5
How is orthography used in phonics instruction?	1 2 3 4 5	1 2 3 4 5
Open Response: Are there other topics in which you would like professional development? If so, what are they?		

Appendix B

2022 Reading Post-Survey

The purpose of this survey is to determine the impact of a year-long professional development plan on teacher content knowledge and self-efficacy in instruction related to the science of reading and to inform next steps.

The questions will ask you to self-reflect on concepts related to reading theories and models, phonological awareness, and phonics (reading foundational skills). At times, questions may appear to be repeating, but you are asked to rate each of the components for two different purposes: 1) understanding and 2) confidence in teaching the concept (self-efficacy). The survey should only take 6-8 minutes.
Thank you for your feedback!

* This form is automatically collecting emails for Pleasantville Public Schools users.

	How FAMILIAR are you with each theory or model? Please select ONE response per question.	To what extent does this theory or model INFORM your instruction? Please select ONE response per question.
1 = not at all 2 = somewhat 3 = adequate 4 = confident 5 = superior		
The Simple View of Reading	1 2 3 4 5	1 2 3 4 5
How the Brain Learns to Read	1 2 3 4 5	1 2 3 4 5
Ehri's Phases of Reading Development	1 2 3 4 5	1 2 3 4 5
The Four-Part Processing Model for Word Recognition	1 2 3 4 5	1 2 3 4 5
Scarborough's Reading Rope	1 2 3 4 5	1 2 3 4 5

Appendix B (Cont.)

	What is your level of UNDERSTANDING of the following phonological awareness concepts? Please select ONE response per question.	What is your level of CONFIDENCE IN TEACHING the following phonological awareness concepts? Please select ONE response per question.
1 = not at all 2 = somewhat 3 = adequate 4 = confident 5 = superior		
What is a phoneme?	1 2 3 4 5	1 2 3 4 5
What are the features of phonemes (characteristics of articulation)?	1 2 3 4 5	1 2 3 4 5
What does the phonological processor do?	1 2 3 4 5	1 2 3 4 5
What is the phonological processing continuum? (the hierarchy of skills taught)	1 2 3 4 5	1 2 3 4 5
How is a sound wall used for instruction?	1 2 3 4 5	1 2 3 4 5
What is phonemic awareness?	1 2 3 4 5	1 2 3 4 5
	What is your level of UNDERSTANDING of the following phonics concepts?	What is your level of CONFIDENCE IN TEACHING the following phonics concepts?
1 = not at all 2 = somewhat 3 = adequate 4 = confident 5 = superior		
What is the alphabetic principle?	1 2 3 4 5	1 2 3 4 5
What is systematic, explicit phonics?	1 2 3 4 5	1 2 3 4 5

Appendix B (Cont.)

How are phoneme-grapheme correspondences mapped?	1 2 3 4 5	1 2 3 4 5
How can the regular parts of words be used to teach irregular (heart) words?	1 2 3 4 5	1 2 3 4 5
How is morphology used in phonics instruction?	1 2 3 4 5	1 2 3 4 5
How is orthography used in phonics instruction?	1 2 3 4 5	1 2 3 4 5
Open Response: Did you find the SOR Google Classroom resources helpful? Please explain your response.		
Open Response: In what areas do you want to continue to expand your learning or improve your practice?		

Appendix C

Exit Slip Questions (2-3 per session)

What grade do you teach?

What will you try based on today's new learning?

What have you tried or implemented since the last PD?

What would you like to learn more about in the next session?

What would be most helpful to learn more about in the next session?

What is something that you learned in PD this year that is going well in your classroom?

What do you still want to learn more about or have time to practice?

Is there something you would like coaching support with at this time? If so, please write a brief description below.

What are the biggest changes you have made in your teaching to this point?

What changes have you seen make the biggest impact on student learning?

What shifts have you made that you feel most confident about?

Appendix D

Institutional Review Board Approval

UNIVERSITY OF ARKANSAS

To:	Mary K. Schaefer
From:	Douglas J Adams, Chair IRB Expedited Review
Date:	05/13/2022
Action:	**Expedited Approval**
Action Date:	05/13/2022
Protocol #:	2203393647
Study Title:	Science of Reading PD
Expiration Date:	04/10/2023
Last Approval Date:	

The above-referenced protocol has been approved following expedited review by the IRB Committee that oversees research with human subjects.

If the research involves collaboration with another institution then the research cannot commence until the Committee receives written notification of approval from the collaborating institution's IRB.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date.

Protocols are approved for a maximum period of one year. You may not continue any research activity beyond the expiration date without Committee approval. Please submit continuation requests early enough to allow sufficient time for review. Failure to receive approval for continuation before the expiration date will result in the automatic suspension of the approval of this protocol. Information collected following suspension is unapproved research and cannot be reported or published as research data. If you do not wish continued approval, please notify the Committee of the study closure.

Adverse Events: Any serious or unexpected adverse event must be reported to the IRB Committee within 48 hours. All other adverse events should be reported within 10 working days.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, study personnel, or number of participants, please submit an amendment to the IRB. All changes must be approved by the IRB Committee before they can be initiated.

You must maintain a research file for at least 3 years after completion of the study. This file should include all correspondence with the IRB Committee, original signed consent forms, and study data.

cc: Kara A Lasater, Investigator

Appendix E

Study Consent: Verbal Recruitment [verbal recruitment for signed consent forms]

Today I am asking you to complete a reading survey, much like the one you completed at the end of the 2021 school year. This information will be used to measure the impact of professional development in the science of reading this year and to inform the next steps.

This is also a topic I have been studying in my doctoral program. I am in the Educational Leadership program at the University of Arkansas. For your dissertation, the program encourages you to select a problem of practice, or research topic, based in your field of work. In alignment with the work, we have been doing this year, the purpose of my study was to develop and implement a professional development plan that would support teachers in making instructional shifts in alignment to the science of reading. The goal of this study is to determine the impact of professional development in the science of reading on teachers' content knowledge and self-efficacy, or your confidence in applying reading theories and models, phonological awareness, and phonics in the classroom. One of the ways this will be done is by pairing the data from last year's survey with this year's survey and measuring the differences to determine if they are statistically significant. In order to do this, I would need your consent to be a part of this study and to use your data.

I am inviting you to participate in this study by allowing me to use information from last year's survey, this year's survey, and the exit slips you completed. The exit slips will be reviewed and coded to look for patterns in what was implemented and what teachers had an interest in learning more about. It is your choice as to whether or not you participate and will have no impact on our work together moving forward. I have provided you with a file folder that contains two consent forms. If you choose to participate, one copy is to keep for your records, and one is to be signed and returned to me.

You may also be asked to participate in a focus group, which is also optional. In addition, if you would be willing to participate in a 45-minute focus group, check the box at the bottom of the form. The purpose of the focus group is to gather more in-depth information about the process and teacher experiences this year. Do you have any questions at this time?

Now I will give you time to complete the survey and to read the consent form. If you have any other questions, please ask. To protect your confidentiality, you can do one of three things by the end of this session: 1) return the folder with one form signed, 2) return the folder with forms not signed, 3) take the folder with you to think about it and then either return it to me signed or discard of it by [date].

If you do choose to participate, be sure to sign the bottom of the form and check the box if willing to be in a focus group. Thank you.

Appendix E (Cont.)

Study Consent Form

Science of Reading Professional Development
Consent to Participate in a Study
Principal Researcher: Mary Schaefer
Faculty Advisor: Kara Lasater, EdD

Invitation to Participate

You are invited to participate in a research study to determine the impact of professional development in the science of reading. This year-long plan was aimed at meeting the needs of teachers based on their input, while considering the research on effective professional development.

Purpose and Background

You have been invited to participate in a survey developed by Mary Schaefer, principal researcher. The purpose of this study is to develop and implement a professional development plan that would support teachers in making instructional shifts in alignment to the science of reading and then to evaluate its impact on teacher content knowledge and self-efficacy. The goal of this study is to determine the impact of professional development in the science of reading on your content knowledge and confidence applying reading theories and models, phonological awareness, and phonics in the classroom. The survey contains 18 questions and will take 6-8 minutes to complete. You may also be asked to participate in a focus group, which is also optional.

Voluntary Participation, Right to Discontinue, and Overview of Procedures

My participation in the focus group is voluntary and if I decide to participate in the study, or withdraw from the study at any time, I will not be penalized. Whether I choose to participate or not to participate, it will have no effect on my relationship with the researcher, who also serves as the language arts coordinator in my school district. I have the right to not answer questions for any reason or to end my participation in the study at any time. The researcher will not tell anyone else whether or not I chose to participate, including anyone in the district or at the University of Arkansas. As part of this study, I understand that my responses to the surveys and exit slips (past and future) may be included as data for this study. The principal researcher will pair data from the end of year 2021 survey and the end of year 2022 survey using teacher emails. Once the data is paired, the email will be replaced with a number to anonymize the information. The information collected will be kept confidential to the extent allowed by law and University

policy. No identifying information will be used in any reports or publications resulting from the research.

Risks and Benefits

I understand this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects by the University of Arkansas. There are no foreseen risks for those participating in the study. By participating in the study, I will contribute to the understanding of professional development in the science of reading. There are no costs associated with participation in this focus group.

At the conclusion of the study, you will have the right to request feedback about the results. You may contact the faculty advisor, Dr. Kara Lasater or Principal Researcher, Mary Schaefer. You will receive a copy of this form for your files.

For further information or questions, please contact:
Mary Schaefer, Principal Researcher, mkschaef@uark.edu
Dr. Kara Lasater, Research Committee Chair, klasater@uark.edu

You may also contact the University of Arkansas Research Integrity and Compliance office listed below if you have questions about your rights as a participant, or have concerns about, or problems with the research.

Ro Windwalker, CIP, Institutional Review Board Coordinator, Research Integrity and Compliance
University of Arkansas
irb@uark.edu

Informed Consent

I have read the above statement and have been able to ask questions and express concerns, which have been satisfactorily responded to by the researcher. I understand that by agreeing to participate, the researcher may use data collected from the survey completed in 2021, the survey completed in 2022, and exit slips. I understand that I may also be asked to participate in a focus group. I understand the purpose of the study as well as the potential benefits and risks that are involved. I understand that participation is voluntary. I understand that significant new findings developed during this research will be shared with the participants. I understand that no rights have been waived by signing the consent form. I have been given a copy of the consent form.

_____

Signature Date

Appendix F

Focus Group Consent Form

Science of Reading Professional Development
Consent to Participate in a Focus group
Principal Researcher: Mary Schaefer
Faculty Advisor: Kara Lasater, EdD

Invitation to Participate
You are invited to participate in a research study related to the impact of professional development in the science of reading.

Purpose and Background
You have been invited to participate in a focus group discussion facilitated by Mary Schaefer, principal researcher. The purpose of this study is to develop and implement a professional development plan that would support teachers in making instructional shifts in alignment with the science of reading and to evaluate its impact on teacher content knowledge and self-efficacy. The goal of this focus group is to gather more specific feedback about the professional development plan over the course of this past school year to assess the effectiveness and to inform professional development in the future. The focus group, if you decide to participate, would occur before or after school, involve 5-6 people, and be approximately 45 minutes in length.

Voluntary Participation, Right to Discontinue, and Overview of Procedures
My participation in the focus group is voluntary and if I decide to participate in the study, or withdraw from the study at any time, I will not be penalized. Whether I choose to participate or not to participate, it will have no effect on my relationship with the researcher, who also serves as the language arts coordinator in my school district. I have the right to not answer questions for any reason or to end my participation in the focus group at any time. The researcher will not tell anyone else whether or not I chose to participate, including anyone in the district or at the University of Arkansas. As part of this study, I understand that my responses may be included as data for this study. The principal researcher will facilitate the focus group and will encourage the natural progression of a conversation. The focus group conversation will be audio-recorded, and the researcher will act as a note-taker. The information collected will be kept confidential to the extent allowed by law and University policy. No identifying information will be used in any reports or publications resulting from the research.

Risks and Benefits
I understand this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects by the University of Arkansas. There are no foreseen risks to those participating in the focus group beyond those experienced in typical conversations. By participating in the focus group I will contribute to the understanding of professional development in the science of reading. The benefits may be similar to those associated with any professional conversation. There are no costs associated with participation in this focus group.

At the conclusion of the study, you will have the right to request feedback about the results. You may contact the faculty advisor, Dr. Kara Lasater or Principal Researcher, Mary Schaefer. You will receive a copy of this form for your files.

For further information or questions, please contact:
Mary Schaefer, Principal Researcher, mkschaef@uark.edu
Dr. Kara Lasater, Research Committee Chair, klasater@uark.edu

You may also contact the University of Arkansas Research Integrity and Compliance office listed below if you have questions about your rights as a participant, or to discuss any concerns about, or problems with the research.
Ro Windwalker, CIP, Institutional Review Board Coordinator, Research Integrity and Compliance
University of Arkansas
irb@uark.edu

Informed Consent
I have read the above statement and have been able to ask questions and express concerns, which have been satisfactorily responded to by the researcher. I understand the purpose of the study as well as the potential benefits and risks that are involved. I understand that participation is voluntary. I understand that significant new findings developed during this research will be shared with the participant. I understand that no rights have been waived by signing the consent form. I have been given a copy of the consent form.

_____

Signature Date

Appendix G

Focus Group Protocol

Thank you for being here today and for participating in this study. I have asked you to commit approximately 45 minutes of your time.

Background: Over this past school year, you have all participated in many professional development opportunities, had access to materials to support the process, and had access to coaching. The goal of this study is to determine the impact of the professional development plan on teacher content knowledge and self-efficacy.

Purpose: The purpose of this focus group is to gain a better understanding of your insights, experiences, and attitudes about the professional development plan this year and to determine the next steps.

Confidentiality: This focus group discussion will be audio recorded and notes will be taken to ensure that your experiences and ideas are captured. Everything that you say is confidential. I would ask that you do not share details of this discussion with people outside of this group.

Guidelines:

1. There are no right or wrong answers. I encourage you to be honest in your responses.
2. I want you to feel comfortable saying positive things as well as critical things. I value your opinions and experiences.
3. During the discussion, you are encouraged to talk to each other and build on each other's ideas. Please talk one at a time.
4. You may disagree with one another but please do so respectfully.

Focus Group Questions:

To start, tell me a little bit about your experiences in the professional development process. [Prompt: What was it like for you to participate in professional development related to the science of reading?]

1. What were some of the shifts that you made this year with your instructional strategies or in your classroom based on this year's PD?
2. In what ways has your content knowledge about the science of reading and the foundational skills of reading improved?
3. Was gaining prior knowledge about the reading theories and models important for understanding why we made instructional shifts? Please elaborate on your thinking.
4. In what ways has your self-efficacy (or your belief in your ability to implement new learning) changed?
5. Were there any shifts that you made in instruction, assessment, or pedagogy that made observable improvements in your classroom? If so, what improvements did you observe?

6. What materials or resources best supported you in making instructional shifts?

7. Did you elicit coaching support this year? Why or why not? If so, tell me about your coaching experience.
8. In what ways did the COVID-19 pandemic have an impact on your attitude toward or feelings about professional development over the past year?
9. What do you see as the next steps in your learning about the science of reading?
10. Is there any additional feedback you would like to provide that might help improve professional development in the future?

Closing: Thank you for your participation and for your valuable feedback. Your input will be used to reflect more deeply on the impact of professional development, ways to make improvements, and next steps.

Appendix H

Sample PD Plan

K-3	Know Better, Do Better (3 hours) August District PD Day Kickoff Goals		
	▪ Use survey data to establish the lack of training and PD as the problem, not teachers. ▪ Identify 7 instructional shifts to focus on in the 2021-2022 school year. ▪ Provide foundational understandings of the Science of Reading. ▪ Introduce the four underpinning theoretical models and the current research related to instructional strategies that do and do not work. ▪ Share end-of-year 2021 survey data about the knowledge of underpinning theories to establish the need for PD to close the gap between the research and instructional practices. ▪ Explore materials and instructional activities to support instruction. ▪ Engage teachers in several phonemic awareness activities. ▪ Provide a brief introduction of sound walls versus word walls. ▪ Establish expectations about assessment. *(session included a raffle for prizes and teachers received a gift pack of PA manipulatives, etc.)*		
	9/14 (45 min)	9/28 (1:15)	10/8 (45 min)
K	**Assessments and Sound Walls** ▪ Assessment Calendar ▪ PA Assessments ▪ CORE Phonics ▪ Fundations document and supporting materials Introduction to Sound Walls	**Assessments and Sound Walls** ▪ Simple View of Reading ▪ Features of Phonemes-LETRS ▪ Using Sound Walls ▪ Purpose of Assessments (CORE vs. Fundations) ▪ Phoneme-grapheme alphabet activities	**Research-based Strategies** ▪ Scarborough's Rope ▪ Oral Language: Teaching narrative text structure and story development ▪ Phoneme-grapheme mapping and alphabet activities ▪ Fluency wheel
Gr 1	**Assessment and Small Group Instruction** ▪ Assessment Calendar ▪ CORE Phonics, PAST ▪ Small Group Instruction Resources ▪ Fundations document and supporting materials	**Using Data to Inform Instruction** ▪ Simple View of Reading ▪ CORE Data Analysis ▪ Using Data to Group Students ▪ Small Group Instruction	**Using Decodable Texts** ▪ Scarborough's Rope ▪ Why decodable texts? ▪ Model decodable lesson & share routines ▪ Phoneme-grapheme mapping (How? When? What words?)
Gr 2	**Assessment and Small Group Instruction** ▪ CORE Assessments: Phonics, ORF, Maze, PAST ▪ Small Group Instruction Resources ▪ Fundations document and supporting materials	**Using Data to Inform Instruction (Gr 2-3)** ▪ Simple View of Reading ▪ i-Ready data - Grouping Students ▪ Phonics Assessments ▪ Small Group Instruction	**Sound Walls and Phonemes** ▪ Simple View ▪ Features of Phonemes-LETRS p. 70 ▪ How to create and use sound walls ▪ Phoneme-grapheme mapping

Appendix H (Cont.)

Gr 3	**Assessment and Small Group Instruction** ▪ Assessment Calendar ▪ CORE Assessments: Phonics, ORF, Maze, PAST ▪ Small Group Instruction Resources ▪ Fundations document and supporting materials		**Fluency** ▪ Scarborough's Rope/ Simple View/ How the Brain Learns to Read ▪ Fluency - What it is, how it's measured, & teaching strategies
	10/26 (1 hour)	11/2 (1:15)	11/23 (1 hour)
K	**Phoneme-grapheme Mapping/ Decodable Routines** ▪ Half Pint decodable text resources ▪ Decodable text routine options ▪ Phoneme-grapheme mapping	**Modeled Decodable Lesson** ▪ Model and role play decodable lesson and debrief ▪ Plan for small group instruction	**Planning with Decodables** ▪ Scheduling ▪ Create/organize materials for decodables ▪ Plan for small group instruction
Gr 1	**Phoneme-grapheme Mapping/ Decodable Routines** ▪ Decodable text routines ▪ Phoneme-grapheme mapping ▪ Sounds walls	**Modeled Decodable Lesson** ▪ Model decodable lesson and debrief ▪ Continuous blending strategies and ideas ▪ Plan for small group instruction	**Planning with Decodables** ▪ Small group instruction: phonics and comprehension ▪ Plan for small group instruction
Gr 2	**Fluency** ▪ Fluency: The Bridge to Comprehension ▪ Word level reading ▪ Phrasing, prosody, expression ▪ Dysfluent readers ▪ Instructional strategies	**Modeled Decodable Lesson** ▪ Model decodable lesson ▪ Plan for small group instruction	**Planning for Small Group Instruction** ▪ Review data to identify trends and focus for instruction ▪ Small group instruction: phonics and comprehension ▪ Decodable text options
Gr 3	**Phoneme-grapheme Mapping** ▪ Phoneme-grapheme mapping - model and apply ▪ Map and Swoop ▪ PAST data	**Modeled Decodable Lesson** ▪ Model decodable lesson ▪ Plan for small group instruction	**Planning for Small Group Instruction** ▪ Review data to identify trends and focus for instruction ▪ Small group instruction: phonics and comprehension ▪ Application strategies

Appendix H (Cont.)

	12/14 (1 hour)	1/14/22 (1:15) - virtual	2/1/22 (1 hour)
K	**Decodables and Sentence Level Work** ▪ Scheduling ▪ Create/organize materials for decodables ▪ Plan for small group instruction	**Decodables and Sentence Level Work** ▪ The many uses of cut up sentences with decodables or in writing ▪ Sentence expansion ▪ Review of resources and work time	**Manipulating and Using Data to Inform Instruction/ Using Cut Up Sentences** ▪ Explore the many uses of cut-up sentences (comp, vocab, fluency) ▪ Report card discussion ▪ Saving files in Google. ▪ Data sheets and sorting data to inform instruction.
Gr 1	**Data Trends and Using Decodables for Instruction** ▪ Review data to identify trends and focus for instruction ▪ Small group instruction: strategy groups ▪ Viewed Robin's videos and discussed (model) ▪ Decodable text options	**Oral Reading Fluency Assessment** ▪ Administering the oral reading fluency assessment, scoring and analyzing ▪ Analyze student assessment ▪ The many uses of cut up sentences with decodables or in writing ▪ Sentence expansion	**Manipulating and Using Data to Inform Instruction/ Using Cut Up Sentences** ▪ Explore the many uses of cut-up sentences (comp, vocab, fluency). ▪ Report card discussion. ▪ Saving files in Google. ▪ Data sheets and iReady data (instructional groupings)
Gr 2	**Small Group Instruction: Strategy Groups** ▪ Review data to identify trends and focus for instruction ▪ Small group instruction: strategy groups ▪ Viewed Robin's videos and discussed	**Small Group Instruction: Close Reading** ▪ Close reading resources ▪ Close reading planning and strategic use of resources. ▪ Use of decodables vs strategy lessons vs close reading ▪ Planning for instruction	**Manipulating and Using Data to Inform Instruction** ▪ Report card discussion. ▪ Saving files in Google. ▪ Data sheets and sorting data to inform instruction. ▪ iReady data (instructional groupings). ▪ Planning for instruction
Gr 3	**Phoneme-grapheme Mapping** ▪ Phoneme-grapheme mapping - model and apply ▪ Map and Swoop ▪ PAST data	**Modeled Decodable Lesson** ▪ Model decodable lesson ▪ Plan for small group instruction	**Planning for Small Group Instruction** ▪ Review data to identify trends and focus for instruction ▪ Small group instruction: phonics and comprehension ▪ Application strategies

Appendix H (Cont.)

	2/18/22 District PD Day 90 min.	3/18 (canceled and moved to 4/8) 1 hour 15 min	4/19 & 5/24 (45 min)
K-1	**Oral Language and EL Strategies (K-3)** ▪ Explore the "ingredients" of language (semantics, pragmatics, syntax, orthography, phonology, morphology, etymology, discourse) LETRS 19 . ▪ Reflect on where students might struggle. LETRS 23 ▪ Discover how oral language, written language, and other factors work together. LETRS 39	**Building Vocabulary (K-1)** ▪ Use of fluency charts for trick words ▪ Scarborough's Reading Rope ▪ Tiers of vocabulary words ▪ Strategy for selecting vocabulary words to teach (tier 2 words) ▪ Vocabulary Instructional Routine ▪ Picture Word Inductive Model (support for vocab, oral language, and EL's)	**Assessment and Fluency (K-1)** ▪ Ehri's Phases for Reading and writing ▪ Word reading and PA ▪ Scarborough's Reading Rope ▪ Rapid Naming Assessment ▪ Fluency strategies
Gr 2-3	▪ Discover strategies to use with EL students. ▪ Apply read aloud strategies for oral language by planning an interactive read aloud with a new book	**Vocabulary and Word Study (2-3)** ▪ Use of fluency charts for trick words ▪ Scarborough's Reading Rope ▪ Tiers of vocabulary words ▪ Strategy for selecting vocabulary words to teach (tier 2 words) ▪ Vocabulary Instructional Routine Structured Word Inquiry with Matrices and Sums	**Assessment and Fluency (2-3)** ▪ Ehri's Phases for Reading and writing ▪ Word reading and PA ▪ Scarborough's Reading Rope ▪ Rapid Naming Assessment ▪ Fluency strategies ▪ Writing a Student Learning Objective to drive instruction