THE IMPACT OF VIDEO-BASED WHOLE GROUP LESSONS ON PLACE, MANNER, AND VOICING OF SPEECH SOUNDS ON READING ACHIEVEMENT

by

Myranda Noelle Victoria

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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APPROVED BY:

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ABSTRACT

The purpose of this study was to determine if students who received video-based lessons of the place, manner, and voicing (PMV) of speech sounds demonstrated gains on reading achievement compared to students who did not receive the intervention. A quantitative, quasi-experimental study with a pretest, posttest was developed, using the instrumentation of the reading Measures of Academic Progress (MAP). This study addressed gaps in the existing research regarding the impact of video-based instruction of speech sounds on reading achievement. Participants in this study (n=136) were drawn from a convenience sample of kindergarten students attending two elementary schools within the same school district during the 2022-2023 school year. Over the 2022-2023 school year, video lessons on place, manner, and voicing of speech sounds aligned with the district's reading curriculum were provided to the experimental school's kindergarten teachers to play for their students. The control school students received standard instruction. Data was collected via a records review following the fall 2022 and spring 2023 reading MAP. Each participant served as their own control, and the analysis of covariance (ANCOVA) was used to analyze the MAP data. The results of the study found a statistically significant difference in overall reading MAP and foundational skills MAP between the control and experimental groups when controlling for prior reading achievement. This study found evidence to support the incorporation of video-based, whole group lessons of PMV on reading achievement. Recommendations for future research include expanding the current study to more schools within the district, region, and state.

Keywords: articulation, phonology, phonological processing, dyslexia, virtual learning, video learning, service delivery models

Dedication

To the amazing students with whom I have worked over the years:

You have made me strive to better myself and pursue beyond what I felt I could accomplish. Specifically, Harper, Jacob, Mason, and Dahir, but many more. You were the ones to inspire me to see the link between articulation and dyslexia. Without YOU teaching ME, this would not be possible.

To my family:

Juan: You are the love of my life and an amazing provider and leader of our family. Thank you for inspiring me to take on this endeavor. Evelyn: I love you. Thank you for allowing me a place in your life. You are one of the kindest humans I know with one of the biggest hearts. Elynor: I love you. Thank you for letting me be in your life. You are a warrior for injustice and have an amazing zest for life that inspires me. Ian: I love you so dearly. You bring me so much joy and have taught me how to love like Christ loves. Being your mother is a blessing I cherish. Mom and Dad: Thank you for always supporting and providing for me throughout my life. I am so blessed to have you as parents and do not know where I would be without you. Isaiah: I love you. I am honored to be your mother. You are the reason I went back to school, and you are the reason I am determined to succeed. You are my why.

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List of Abbreviations

American Speech-Language Hearing Association (ASHA)

Cognitive Load Theory (CLT)

Free and Appropriate Public Education (FAPE)

Individuals with Disabilities Education Act (IDEA)

Least Restrictive Environment (LRE)

Orthographic Mapping (OM)

Place, Manner, and Voicing (PMV)

Response to Intervention (RTI)

Speech-Language Pathologists (SLPs)

Speech-Sound Disorders (SSDs)

Structured Literacy (SL)

Typical Literacy Practices (TLP)

Universal Designs for Learning (UDL)

CHAPTER ONE: INTRODUCTION

Overview

Chapter One provides a background of articulation of speech sounds, phonological processing deficits, dyslexia, and video-based instruction, including an overview of the theoretical frameworks for this study. The problem statement is presented, along with the purpose and significance of the study, as well as the research questions. The chapter concludes with a list of key terms and their definitions.

Background

In March of 2020, schools across the nation began shifting from traditional, face-to-face classroom instruction towards virtual learning due to the Covid-19 pandemic (Basilaia & Kvavdze, 2020). For the 2020-2021 school year, the majority of schools across the nation relied solely upon virtual learning or implemented virtual learning for short periods throughout the school year (Rahayu et al., 2020). Virtual learning had been prevalent in post-secondary education; however, a dearth of research on the impact of virtual learning on elementary school students existed (Basilaia & Kvavdze, 2020). Although the full impact of learning loss from Covid-19 is not yet known, Rahayu et al. (2020) stated that the extent to which students were impacted varied significantly based on how instructors implemented and incorporated media and communication in their instruction.

Speech-language pathologists (SLPs) are educational professionals who have also been impacted by the Covid-19 pandemic. SLPs provide therapeutic intervention within the schools to students' individual areas of need related to a wide range of communication skills. Articulation and phonological processing are two specific areas that SLPs target in the schools. Articulation and phonological processing are similar, but distinctly different concepts (American Speech-

Language Hearing Association [ASHA], 2019). Articulation is the way in which a person pronounces words, while phonological processing is the combination of the awareness and manipulation of sounds (phonological awareness), the short-term storage of sounds (phonological working memory), and rapid recall of sounds (phonological retrieval) (ASHA, 2019). When a student has difficulties in pronouncing the sounds in words, they often have difficulties with recognizing and manipulating those sounds (Falth et al., 2017). Not only are articulation and phonological processing skills related, but direct instruction in articulation improves phonological processing (Joly-Pottuz et al., 2008; Falth et al., 2017). Conversely, incorporating direct instruction of phonological awareness skills improves both articulation and literacy outcomes (Brosseau-Lapre & Roepke, 2022).

Difficulties with phonological processing inherently lead to reading challenges, such as dyslexia (Adlof et al., 2017). Dyslexia is a specific learning disability that affects approximately 9% of school-age children in America (Cabbage et al., 2018). Dyslexia is a neurological, developmental, language-based disorder that is educationally defined as a specific learning disability in fluent reading and phonological processing (Adlof et al., 2017; Roitsch & Watson, 2019). The term dyslexia was coined by Dr. Samuel Orton in 1937, emphasizing the difficulties with reading and writing below what was expected for the person's intelligence (Shaywitz & Shaywitz, 2020). Reading fluency is broadly defined as the synthesis of reading with accuracy, rate, and prosody (International Literacy Association, 2018). Over time, without intervention, these reading challenges place the student at risk for academic failure (Adlof et al., 2017). This risk of academic failure can have lifelong consequences; a recent study by Cassidy et al. found that a dyslexia screener conducted amongst male and female prisoners indicated 47% of the

prisoners as having dyslexia (2021). Identifying, developing, and implementing interventions for students with dyslexia is therefore a critical problem to remediate in education today.

Historical Overview

The method of how to teach children to read is hotly debated in the United States and has over a century worth of shifting philosophies termed the *reading wars* (Double et al., 2019). Two main philosophies for reading are the basis for the *wars*; the whole-language based and phonics-based approaches to reading. The whole-language approach to reading developed because the ability to decode a word does not necessarily result in the individual attaching meaning to the word (Walczyk et al., 2014). Looking at the language of the text, forming personal connections to the text, and developing a deeper understanding of the text is critical for an individual to develop reading comprehension skills; this approach has therefore been supported by many researchers as the best method for teaching students to read. Edmund Huey is credited as a pioneer of the whole-language based approach to reading, with John Dewey and Edward Thorndike contributing to early reading research (Walczyk et al., 2014). Critics of the whole-language approach state that it tends to over-rely on guessing of words using context clues from pictures and text (Double et al., 2019). For some students, specifically those with dyslexia, this reliance on guessing is detrimental to their ability to learn how to decode the text on the page. Despite these criticisms, this method of instruction may be entirely appropriate for the 60-70% of students who do not require direct phonological and phonemic awareness to be successful decoders (Kilpatrick, 2016).

Conversely, the phonics-based approach to reading is based upon instruction that teaches the individual sounds, or phonemes, in a word and connects those sounds to the letter, or grapheme, that symbolizes that sound (Walczyk et al., 2014). For students with dyslexia, the

need for an explicit, phonics-based approach to reading is necessary due to their difficulties with phonological processing. The phonics-based approach to reading differs from the whole-language approach to reading where a student uses a variety of cueing systems to guess the words (Torgerson et al., 2018). As phonics skills are being established, the alphabetic principle is engaged, which helps the student in connecting words to their meanings (Ehri, 2005). Phonics-based reading instruction is vitally important for students who exhibit difficulties in phonological processing, such as students with dyslexia (Rice & Gilson, 2022).

As a result of these differences in approaches, the reading wars waged throughout the entirety of the 1900's in the United States, with literacy researchers shifting the tide between phonics and whole-language approaches every few decades (Double et al., 2019). Currently there is a shift towards phonics-based instruction being the more evidence-based practice that benefits all students, including those with dyslexia (Adlof et al., 2017). In response to this shift, many states have developed legislation specifically addressing the needs of students with dyslexia and phonics-based reading instruction. A step many states have made is instituting mandatory universal dyslexia screeners to be administered to students in kindergarten through second grade at various points of the school year. The purpose of these screeners is to assess students' current abilities across a number of tasks that are recognized as difficult for students with dyslexia-related disabilities. Additionally, legislation has been made by many states to have a mandatory increase in professional development in understanding the root of dyslexia and the interventions required to address the student with dyslexia's needs.

Corresponding with the shift towards phonics-based instruction, there has been a shift in the treatment of speech sound disorders (SSDs). According to ASHA, SSDs is an umbrella term that encompasses a person's difficulty in correctly perceiving and producing sounds (2022).

Historically, SSDs have been characterized as either “functional” or “organic”. Functional SSD indicates that the person exhibiting the SSD has no known cause of the impairment, while an organic SSD indicates that there is a development or acquired cause for the SSD, such as a cleft palate or hearing impairment (ASHA, 2022). Functional SSDs are typically broken into either *articulation*, indicating that the sound errors are motor-based, or *phonological* indicating that the sound errors are language-based. The treatment of SSDs has historically been based on a student’s difficulty in using the muscles and structures of the mouth to motorically produce a sound correctly (Maggu et al., 2021). However, this approach can neglect those who are able to physically produce the sound yet have difficulties knowing when to apply their skills because of their phonological language deficit. According to research, students with SSDs have weaker phonological skills overall than students without SSDs and have more difficulties with speech input, lexical and phonological processing, and speech output (Tambyraja et al., 2020).

SLPs are health care professionals who can function as service providers in schools to provide therapeutic intervention in SSDs along with other speech and language deficits. While SLPs are not reading instructors, over 30% of all children with speech-language deficits also have reading difficulties (McLean et al., 2021). In fact, students with current SSDs (the SSD continues to require therapeutic intervention) or resolved SSDs (the SSD has been corrected and no longer requires therapeutic intervention) are associated with having reading difficulties (Cabbage et al., 2018). Research indicates that the comorbidity between SSDs and reading difficulties is between 25-30% (Burgoyne et al., 2019). Although literacy falls under the scope of the SLP, most SLPs within the school environment do not receive the same level of training in curriculum and instruction as general education teachers (McLean et al., 2021). Direct instruction of SSDs, however, has been linked to improving reading outcomes, indicating that

SLPs are a critical component in helping students learn how to read (Wise et al., 1999; Joly-Pottuz et al., 2008; Falth et al., 2017). SLPs traditionally provide services through small groups of students pulled from their classroom in order to target their areas of need, however current research is showing that there are a variety of beneficial service delivery models that could be incorporated (Green et al., 2018; Byers et al., 2020; Rehfeld & Sulak, 2020). Currently, researchers have conducted studies regarding either the impact of small group or individual therapy sessions on the treatment of SSDs, or the impact of whole group instruction on the treatment of language disorders (Brousseau-Lapre & Greenwell, 2019; Roepke et al., 2019; Byers et al., 2020; Green et al., 2018; Lathouras et al., 2019; Phoenix et al., 2021). There is a lack of evidence regarding the impact of whole group intervention of SSDs.

Society-at-Large

Learning how to read is an important and life-altering skill. Reading comprehension and reading fluency are basic pre-requisites for productive citizens in society (Livingston et al., 2018). The ability to read is required to attend post-secondary education, work in a skilled or un-skilled trade, or even obtain a driver's license (Adlof & Hogan, 2019). Reading is a foundational skill embedded within the curriculum of any subject, in any school, in any state (Barnes et al., 2020). Even students who have natural pre-dispositions for other subject areas, such as mathematics, science, or history, will struggle in these subjects if they are unable to read easily, as these subjects require the ability to decode and comprehend texts. For a student with dyslexia, the act of reading can be slow, cumbersome, and tiring (Adlof & Hogan 2019). Over time, without intervention, these reading challenges place the student at risk for academic failure (Barnes et al., 2020). Identifying, developing, and implementing interventions for students with dyslexia is a critical problem to remediate in education today. Beyond academic challenges,

students who struggle with reading challenges often struggle with issues regarding their self-esteem, due to feeling discouraged and unintelligent (Livingston et al., 2018; Roitsch & Watson, 2019).

Theoretical Background

Cognitive load theory (CLT) states that explicit instruction reduces the cognitive burden associated with problem solving. This reduction increases a student's ability to develop and deepen their schemas, or categories, about the topic (Sweller, 1988). Sweller found that selective attention and cognitive processing capacity were inter-related so that by imposing a heavy cognitive load during an initial problem-solving task, the student would have to selectively attend to particulars of the problem. One of the implications for CLT was that when cognitive effort is spent on problem solving, it leads to goal completion, but does not necessarily lead to learning. This indicates that goal attainment and schema acquisition are two different processes. Sweller later refined his theory to develop the different types of cognitive loads, intrinsic and extraneous, that can be present in learning (2010). Intrinsic load was defined as the actual difficulty of the material itself, while extraneous load was defined as the additional factors, such as the instructional procedure, that impacts one's ability to learn the material. The purpose of CLT is to reduce the extraneous load on the student, thereby increasing the student's ability to undertake the intrinsic load. Kirschner et al. (2018) furthered Sweller's research to determine the relationship between CLT and collaborative learning. Kirschner et al. found that collaborative learning can reduce the extraneous cognitive load of learning thereby increasing the student's ability to take on the intrinsic load, where collaborative learning is defined as two or more students working to attain a shared learning goal.

When teachers implement CLT as a tool for collaborative learning within their classrooms, students are able to focus on the intrinsic load of the new information and apply this new knowledge to existing schemas to move forward in the shared learning process (Kirschner et al., 2018). As collaboration within a classroom grows, collaborative cognitive load theory (CCLT) develops, as the group of students acquire collective working memory and mutual cognitive interdependence (Janssen & Kirschner, 2020). Increasing the collective working memory helps the group of students, as each individual student is not required to remember every aspect of the learning. There is also a shared division of labor, as more individual students can divide tasks thus reducing their individual cognitive burdens. This division of labor increases the mutual cognitive interdependence principle by learning and growing in their knowledge from one another (Janssen & Kirschner, 2020). Providing opportunities for students to practice production of speech sounds collectively should increase their ability to understand the individual components of the sounds. This could develop the classroom's collective working memory, allowing the students the opportunity to learn from each other when producing and practicing speech sounds while working on phonological awareness and other associated reading tasks.

The use of technology to reduce cognitive load has become a common practice for both virtual and in-person learning environments (Lai et al., 2018; Wang et al., 2020). Providing multiple expressions of a subject area, such as with visuals as well as text, is an instructional practice used across environments to reduce the cognitive load of the task (Lai et al., 2018). Within this present study, the use of explicit video-based lessons in place, manner, and voicing of speech sounds is provided to a whole classroom in order to determine if, by reducing the

cognitive load of the task, skills related to improving phonological skills have a positive impact on reading achievement.

Problem Statement

The increasing shift from the whole-based approach towards the phonics-based approach to reading has resulted in a need for explicit instruction of the individual sounds in words (Petscher et al., 2020). This shift has also resulted in a shift in how SSDs are treated, from motor-based *articulation* skills to language-based *phonology* skills (Maggu et al., 2021). Explicit instruction of phonological processing skills may reduce the cognitive burden for students with reading difficulties, such as dyslexia, by specifically addressing their processing difficulties (Roitsch & Watson, 2019). As many students with SSDs also have difficulties with reading, SLPs are an important part of the educational team to work alongside reading teachers (Burgoyne et al., 2019; McLean et al., 2021). Research has shown that direct instruction of the production of speech sounds improves reading outcomes (Wise et al., 1999; Joly-Pottuz et al., 2008, Falth et al., 2017).

Currently, the majority of research has focused on providing direct instruction of articulation and phonology skills in small group settings, as opposed to within a whole class intervention (Brousseau-Lapre & Greenwell, 2019; Roepke et al., 2019; Rehfeld & Sulak, 2021). Research that has been conducted with whole groups, however, has demonstrated transfer effects between articulation and phonological awareness on reading (Falth et al., 2017). However, there is a lack of evidence regarding the impact targeting the articulation of speech sounds as a stand-alone whole group intervention on reading achievement. Given that difficulties with speech production upon entrance into kindergarten is a predictor for delays in reading development

(Burgoyne et al., 2019), research regarding the efficacy of whole group articulation lessons is required to address a gap in the research.

Additionally, the full impact of learning loss resulting from virtual instruction due to the Covid-19 pandemic is currently unknown (Rahayu et al., 2020). Although research has been conducted on the impact of virtual learning in secondary and post-secondary students, there is currently a lack of research on the impact of the virtual learning environment in elementary school students (Basilaia and Kvavdze, 2020). The problem is that the literature has not fully addressed how reading achievement is impacted by the delivery of whole group, video-based lessons regarding the articulation of place, manner, and voicing of speech sounds.

Purpose Statement

The purpose of this quantitative, quasi-experimental study with a pre-test, post-test design is to determine if kindergarten students who receive video-based, whole group instruction of place, manner, and voicing of speech sounds demonstrate gains on reading assessments compared to kindergarten students who do not receive the intervention. This study will use the Reading Measures of Academic Progress (MAP) assessment in kindergarten students across two different schools within the same district to determine the impact of the video lesson intervention. The independent variable will be the video-based lessons on place, manner, and voicing of speech sounds. The dependent variable will be the student scores on the Reading MAP assessment conducted in the spring and the covariate will be the student's prior achievement on the Reading MAP assessment from the fall. The sample will be from kindergarten students across two suburban elementary schools in Northwest Arkansas.

Significance of the Study

Although research is increasing in regard to virtual learning due to the Covid-19 pandemic, there is a lack of research regarding the effectiveness of video learning for elementary school students (Basilaia & Kvavdze, 2020). Most of the research prior to the pandemic had focused on the effectiveness of virtual learning in post-secondary settings. Furthermore, research has not been conducted on the impact of teaching articulation of speech sounds within whole group elementary classroom settings via a virtual learning platform. While direct instruction in articulation has been found to improve nonsense word decoding skills and improve orthographic coding (Wise et al., 1999; Joly-Pottuz et al., 2008), research on articulation instruction has focused on the impact of this instruction within small group or individual instructional settings and not within the classroom (Brousseau-Lapre & Greenwell, 2019; Roepke et al., 2019; Rehfeld & Sulak, 2021). Currently, research does not exist regarding the efficacy of teaching articulation of speech sounds as whole group instruction. Additionally, research has not been conducted on the impact of explicit instruction of speech sounds via a virtual learning platform. Furthermore, research supports that SSDs are associated with later reading challenges if the SSD is not resolved prior to reading instruction (Tambyraja et al., 2020). Although researchers have evidence that direct instruction in the production of speech sounds positively impacts the reading achievement of students in small groups, more research is needed to determine the impact of explicit instruction of place, manner, and voicing of speech sounds on reading achievement in the whole group setting via virtual lessons. Investigating how whole group classroom instruction via recorded, asynchronous lessons on place, manner, and voicing of speech sounds impacts the learning of kindergarten students compared to students who do not receive this intervention can

provide educators with evidence as to whether or not this instruction can reach their students and hopefully prevent or mitigate the effects of a student's dyslexia on reading achievement.

Research Questions

RQ1: Is there a difference in reading achievement scores among kindergarten students who receive whole group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading Measures of Academic Progress (MAP)?

RQ2: Is there a difference in reading achievement scores among kindergarten students who receive whole group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP?

Definitions

This paper has several concepts and key terms that may be unfamiliar to the reader. Following are brief definitions for these concepts.

1. *Cognitive load theory*: a theory of learning where the cognitive burden of learning is reduced by explicit instruction (Sweller, 1988).
2. *Dyslexia*: a neurologically based disorder that is defined as a specific learning disability in fluent reading and phonological processing (Adlof et al., 2017; Roitsch & Watson, 2019).
3. *Executive functions*: a set of cognitive processes that help with mental control and self-regulation (Cristoferi et al., 2019)
4. *Letter naming fluency*: the ability to name letters rapidly and accurately (Clemens et al., 2017).

5. *Phonemic awareness*: the ability to recognize and manipulate specific phonemes within a word (Kilpatrick, 2016).
6. *Phonics-based instruction*: a method of reading instruction focusing on developing phonological processing skills in children (Walczyk et al., 2014).
7. *Phonological awareness*: the ability to recognize and manipulate sound properties within a word (Kilpatrick, 2016).
8. *Phonological processing*: the ability to use the sounds in one's native language to understand and express language (ASHA, 2019).
9. *Phonological working memory*: the temporary storage of phonemes for later manipulation and use (ASHA, 2019).
10. *Phonological retrieval*: the ability to efficiently store and rapidly retrieve the written letters within a language (ASHA, 2019).
11. *Reading fluency*: the synthesis of reading with accuracy, rate, and prosody (International Literacy Association, 2019).
12. *Reading wards*: the shifting of philosophies over the past century between the whole-language based and phonics-based approaches to reading (Double et al., 2019).
13. *Sound naming fluency*: the ability to name letter sounds rapidly and accurately (Clemens et al., 2017).
14. *Speech sound disorder*: difficulties in the production of speech sounds (phonemes) across words, phrases, sentences, and conversations (Swaminathan & Farquharson, 2018).
15. *Universal Design for Learning*: a framework for curriculum and instruction that focuses on providing flexibility and reducing barriers to students (Rogers-Shaw et al., 2018).

16. *Whole-language based instruction*: a method of reading instruction focusing on children developing contextual meaning to whole words (Walczyk et al., 2014).
17. *Working memory*: the ability of an individual to retain small bits of information for short periods of time while manipulating the information (Knoop-van Campen et al., 2018).

CHAPTER TWO: LITERATURE REVIEW

Overview

The purpose of this literature review is to present the essential elements underlying the major concepts of this study involving the impact of video-based lessons on place, manner, and voicing on reading achievement in kindergarten students. The chapter opens with the theoretical framework that grounds this study. Following a review of the framework, a thorough review of the literature pertinent to this study is provided. The chapter concludes with a summary demonstrating how this study will address gaps in the existing literature and add critical research to the theory.

Theoretical Framework

The concepts of cognitive load were developed by John Sweller in 1988 and grew to become the theoretical framework of cognitive load theory (CLT). CLT was developed when Sweller and his colleagues took issue at the concept of "discovery learning" (Sweller, 1988, p. 257). Rather than allowing students to learn and grow upon their own findings, Sweller proposed the concept of explicitly instructing students to reduce the cognitive burden associated with problem solving. Indeed, Sweller found that an emphasis on problem solving interfered with learning, as the student was using a means-end approach to finding a solution rather than developing their schemas for learning. A schema was defined by Sweller to be the facility within the brain that helps the learner categorize problems. In his study, Sweller found that selective attention and cognitive processing capacity were inter-related. By imposing a heavy cognitive load during an initial problem-solving task, the student would have to selectively attend to particulars of the problem, which minimized their cognitive processing capacity and impeded their ability to develop schema around the problem. Sweller measured the impact of cognitive

load on learning in his study by having subjects complete one problem-solving task and then initiating a new task. The results found that the cognitive load of one task interfered with the subject's ability to perform on the second task. The implications for this study were that when cognitive effort is spent on problem solving it leads to the goal but not the learning; therefore, goal attainment and schema acquisition are two different processes.

Numerous studies have been conducted on CLT and advances in the original theory have been conducted (Sepp et al., 2019; Kirschner et al., 2018; Lai et al., 2019; Lee-Cultura et al., 2020; Orru & Longo, 2019; Janssen & Kirschner, 2020). The concepts of intrinsic and extraneous load were developed in response to these studies (Sweller, 2010). Intrinsic load is the difficulty of the elements that are being learned regardless of any other factors. Factors that are outside of the elements being taught, such as the instructional procedure, are considered extraneous load. Extraneous load was the impetus for the development of CLT to account for the difference between the content being presented and an individual student's ability to learn the material.

Kirschner et al. (2018) conducted a study to determine the relationship between CLT and collaborative learning. Collaborative learning was defined as two or more students working together to attain a learning goal and emphasized the extraneous cognitive load. The researchers found that, depending on the intrinsic cognitive load of the work, collaborative learning could be an effective method of reducing the extraneous cognitive load and result in more effective learning of material for the students. Other research found that cognitive load is not necessarily a negative factor in learning; rather, that it was positively correlated with children's performance (Lee-Cultura et al., 2020). Although cognitive load is not inherently harmful to learning, there is

a point where cognitive load becomes cognitive overload for children and results in the child making more errors, which negatively impacts their motivation to continuing a task.

Educators are increasingly using technology as a strategy to reduce the cognitive load for their students (Lai et al., 2018; Wang et al., 2020). Computers and other forms of technology can provide information about a topic to help the student process the information through a variety of modalities (Lai et al., 2018). Modalities such as visuals with text, auditory cues, and augmented realities are examples of how information can be provided to the student to deepen their schema development on the subject. These accommodations reduce the cognitive load and significantly impact the learning of students with reading challenges for whom decoding text alone would prove cumbersome.

The framework of CLT is specifically related to this present study as the intervention of video-based lessons of place, manner, and voicing, providing explicit instruction to the student, therefore making an effort to reduce their cognitive loads. Although the intrinsic cognitive load of the material may be great for some students, providing the explicit instruction using a video form of learning helps to reduce the extraneous cognitive load for the student (Lee-Cultura et al., 2020). The lessons provided in this study were presented to an entire classroom of students engaging in collaborative learning practice (Kirschner et al., 2018). The lessons provide visuals, text, and videos in order to provide multiple modalities of learning (Lai et al., 2018). This study can therefore add to the field of CLT by providing information regarding how video-learning effects cognitive load in students.

Related Literature

Cognitive Processes in Reading

The ability to learn is a system guided by multiple cognitive processes, including visual attention, working memory, and long-term storage and retrieval (Clark & Harrelson, 2002). In order to learn to read, a student must visually attend to the material, move the information into the working memory, and process the information for long term storage and later retrieval. Working memory is defined as the ability of an individual to retain a small bit of information for a short period of time while simultaneously monitoring, coding, and updating the information (Knoop-van Campen et al., 2018). Long-term storage and retrieval are defined as coding new information in a way that it is able to be efficiently recovered from memory for use at a later time (Avitia et al., 2019).

Executive functions are a set of cognitive processes that help with mental control and self-regulation, including working memory, inhibition, cognitive flexibility, planning, reasoning, and problem solving (Cristofori et al., 2019). The link between attention and learning to read is becoming increasingly established (Blankenship et al., 2019). An individual student's ability to sustain attention to a task, academic or non-academic, is an early risk factor for later reading and math skills (Barnes et al., 2020; Goodrich & Lonigan, 2017; Morgan et al., 2017; Peterson et al., 2017). According to research, the attention skills of a child at 10 months is predictive of their reading abilities at age 6 (Blankenship et al., 2019). Conversely, difficulties in attention skills are associated with difficulties in learning to read in the early elementary years (Shelleby & Ogg, 2019). Difficulties with attention are associated with difficulties in working memory, specifically in the development of skills such as phonological awareness (Child et al., 2020). Deficits in the area of attention are further associated with difficulties in working memory, along with reading speed and reading comprehension (Kofler et al., 2018). Co-accompanying deficits in the

phonological system, along with the executive functioning system, help explain the link between dyslexia and attention deficit hyperactivity disorder (ADHD) (Lonergan et al., 2019).

Short term memory and working memory are cognitive processes related to the executive functions cognitive processes required in reading (Peng et al., 2018). While short term memory involves passively storing information for brief periods of time, working memory requires simultaneously storing and processing the information (Cristofori et al., 2019; Peng et al., 2018). Working memory is an executive function that interacts with other executive functions, such as inhibition, cognitive flexibility, and planning (Cristofori et al., 2019). A synonym for working memory is fluid intelligence (Avitia et al., 2019). Working memory plays a key role in the reading process of decoding (reading the letters on the page) with mixed evidenced for its role in comprehension (understanding what has been decoded) (Cristofori et al., 2019; Peng et al., 2018). Nouwens et al. (2020) found that working memory had a significant contribution to decoding, as well as reading comprehension. While working memory was clearly found to have a direct impact on decoding, the researchers found that the higher the individual's working memory, the less cognitive load was exerted and, therefore, the ability to comprehend the text increased. However, other studies revealed that, while working memory increases reading speed, which could influence the individual's ability to comprehend the text, there was no direct relationship between working memory and reading comprehension (Johann et al., 2019). In the meta-analysis conducted by Peng et al., (2018) the relationship between working memory and decoding and comprehension were examined. The results of the meta-analysis found that working memory and reading were related to foundational skills in reading and decoding; however, when the individual's vocabulary and decoding skills were controlled for, there was not a relationship between working memory and reading comprehension (Peng et al., 2018).

Long term storage and retrieval is defined as an individual's ability to store a memory and later efficiently retrieve that memory (Avitia et al., 2019). Long term storage and retrieval is a process that can be practiced and improved via the strategy of "retrieval practice" (Lyle et al. 2019, p. 278). The ability to improve this process is beneficial to the individual, as when a concept has been stored and retrieved once, it has a higher likelihood of being retrieved again later. Although numerous research studies have discovered that long term storage and retrieval is one of the most important cognitive processes in learning to read, few studies have actually focused on this process (Avitia et al., 2019). Long term storage and retrieval skills have been shown to positively affect basic reading skills in students ages 6-8 and reading comprehension in students 9-13 (Zaboski et al., 2018). According to a meta-analysis, long term storage and retrieval has been shown to have the strongest relationship to reading comprehension in students ages 9-13.

Universal Design for Learning

The Individuals with Disabilities Education Act (IDEA) mandated that students with disabilities are educated in their least restrictive environment (LRE) to the maximum extent appropriate (Individuals with Disabilities Education Act, 2017). Universal design for learning (UDL) is a framework for curriculum and instruction that focuses on providing flexibility and reducing barriers for students in the general education classroom (Rogers-Shaw et al., 2018). The term *universal design* was taken from the field of architecture, where design plans that benefit people with the most physical difficulties would also benefit people with no physical disabilities (Dewi et al., 2019). Removing barriers, such as stairs, and replacing them with ramps is helpful for all humans, both those with physical impairments and those without. The concept of UDL

was taken from universal design and applied to the learning process in order to provide a framework of learning that opens access to all students.

UDL principles are a part of three distinct groups of brain networks- recognition, strategic, and affective- and play a primary role in the learning process (Hall et al., 2012). The recognition network addresses the "what" of learning. The recognition network allows for multiple means of representation by providing flexible ways for educators to present what they teach. The purpose of the recognition network is to enable the learner to identify and understand information, ideas, and concepts. The strategic network addresses the "how" of learning. The strategic network allows for multiple means of action and expression by providing flexible options for how the students learn and express what they know. The strategic network specifically addresses executive functioning skills of planning, execution, and self-monitoring. The affective network addresses the "why" of learning. The affective network allows for multiple means of engagement by providing flexible options for generating and sustaining motivation. The purpose of the affective network is to enable the student to engage with tasks and learning with the world around them, assigning emotional significance to their learning.

The integration of UDL guidelines became a way to proactively meet the needs of various learners, particularly in the wake of the Covid-19 pandemic (Basham et al., 2020). When the pandemic began, schools were forced to quickly switch from traditional methods of instruction to virtual methods of instruction yet were charged with maintaining a free and appropriate public education (FAPE) for all students with special needs (Basham et al., 2020). UDL guidelines focus on providing multiple means of representation, action and expression, and engagement (Cook and Rao, 2018). These guidelines are backed by neuroscience regarding the learning centers of the brain (Cook and Rao, 2018). Also, these guidelines are often associated

with the specially designed instruction provided by special educators; however, the practices used by special educators can be incorporated into the general education classroom as well.

The UDL framework can be applied as a part of the response to intervention (RTI) process (Singh & Jadhav, 2021). RTI is based upon a three-tiered pyramidal model of instruction intensity. UDL can be applied at each level of the RTI Pyramid: Tier 1 (universal interventions), Tier 2 (small group intervention), and Tier 3 (individualized intervention). Standard practice of SLPs has historically been to pull students out of their general education classroom into a therapy room, either individually or in a small group of other speech therapy students, in order to provide direct instruction of their services (Kennedy et al., 2018). However, SLPs can utilize concepts of UDL within their practices in the general education classroom as well. By utilizing these concepts, SLPs can benefit more children within the general education environment than in the standard model of pull-out, direct instruction. Research has demonstrated that even students who qualify for pull-out, direct instruction can be effectively served through whole group classroom SLP instruction. By providing whole group lessons, the SLP can benefit both general education and special education students.

Science of Reading

Reading is a man-made process that requires explicit instruction in children (Buckingham et al., 2019). Throughout the last hundred years, there has been debate over a phonics-based versus whole-language approach to teaching students how to read, coined the *reading wars* (Petscher et al., 2020). A shift occurred in the 1990's into early 2000's from phonics-based reading instruction to the whole-language approach to reading, resulting in an extensive amount of research that has been termed the *science of reading* (Petscher et al., 2020). The term *science of reading* was originally used by linguists in the 1800's to refer to teaching students how to

properly sound out words (Shanahan, 2020). Although this was the basis of the origination of the term *science of reading*, the term is not limited to phonics and decoding skills. Currently, the science of reading refers to a much broader range of neuroscience around reading and the brain mechanisms that support phonological processing.

Phonics-based instruction is based on the relationship between the sounds (phonemes) and the symbols (letters) that represent these sounds (Buckingham et al., 2019). Phonics instruction explicitly teaches children how to use phonics skills when reading. The emphasis on using the sound/symbol correspondence is in opposition to the cueing systems of the whole-language approach to reading, where a student is taught to use pictures to determine the word, thus teaching the student to guess rather than teaching the student to decode (Torgerson et al., 2018). To establish phonics, the student must first have phonemic awareness, which is the ability to hear the individual sounds in words (Buckingham et al., 2019). The move from phonemic awareness to phonics engages the alphabetic principle (Ehri, 2020). The alphabetic principle aids the student in learning to read by connecting visual features of the shapes of words with their meanings. There are four stages to the alphabetic principle: pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic. The alphabetic principle further helps to develop language comprehension, which is an integral part of the process of learning to read (Buckingham et al., 2019).

Research has shown phonics deficits that go un-remediated are a predictor for later reading comprehension challenges (Double et al., 2019). Phonics instruction has become embedded in the tier 1 instructional practices in many elementary school classrooms (Buckingham et al., 2019). Within the RTI model, phonics instruction is occurring within tier 1, tier 2, and tier 3 at varying levels of intensity. Working on phonemic awareness activities as a

part of universal classroom instruction is a building block of phonics instruction (Double et al., 2019). For students who are unable to attain these skills within the regular classroom, more intensive and targeted interventions of these skills are provided (Buckingham et al., 2019). By ameliorating these deficits, students are able to move from decoding the text to comprehending the text and are less likely to suffer from reading comprehension deficits (Double et al., 2019).

Dyslexia

Dyslexia is a neurological, developmental, language-based disorder that is defined educationally as a specific learning disability in fluent reading and phonological processing, affecting up to 10% of the population within the United States (Adlof et al., 2017; Rice & Gilson, 2022; Roitsch & Watson, 2019). Although dyslexia is not necessarily controversial in existence, the definition of dyslexia varies widely across researchers and literacy organizations (Knight, 2018; Miciak & Fletcher, 2020; Rice & Gilson, 2022; Roitsch & Watson, 2019). The definition of dyslexia has changed over time to reflect that intelligence is not a predictive factor for the difficulty with reading; in fact, some definitions of dyslexia specify that the difficulty with reading is unexpected given the individual's overall intelligence (Miciak & Fletcher, 2020; Rice & Gilson, 2022; Shaywitz et al., 2021). Most definitions, however, do include that dyslexia includes specific deficits in phonological processing that impact reading fluency (Adlof et al., 2017; Roitsch & Watson, 2019). The phonological language system impacts the individual's ability to connect spoken language to printed words (Roitsch & Watson, 2019). Reading fluency is the ability to decode accurately with reasonable rate and expression (International Literacy Association, 2018). Not only can dyslexia lead to difficulties with decoding words on the page, but dyslexia can also adversely impact other academic areas such as the individual's reading comprehension, vocabulary development, and written expression (Roitsch & Watson, 2019).

Dyslexia has further social impact on individuals by causing low self-esteem and poor motivation (Glazzard et al., 2010; Roitsch & Watson, 2019).

Although specific requirements to place a student under the categorical disability of Specific Learning Disability (SLD) in reading may vary from state-to-state, most assessments require evaluation of intelligence along with specific areas of achievement and processing in order to determine the pattern of strengths and weaknesses that make up the student's learning profile (Roitsch & Watson, 2019). In the United States, though all 50 states have dyslexia legislation, only 39 states have specific legislation regarding the screening, assessment, identification, and treatment of students with dyslexia (National Center on Improving Literacy, 2022). National legislation was enacted in 2018 that defined dyslexia as an unexpected difficulty in reading given the intelligence of the reader caused by deficits in the phonological processing system effecting the individual's speaking, reading, and writing abilities (115th Congress, 2019; Rice & Gilson, 2022; Shaywitz et al., 2021). Assessment for individuals with dyslexia can be challenging for school-based professionals, as dyslexia falls under the Individual's with Disabilities Education Act (IDEA) categorical disability of Specific Learning Disability (Rice & Gilson, 2022; Roitsch & Watson, 2019). Prior to assessment, schools are encouraged to implement RTI procedures to determine if changes in the curriculum and instruction could prevent the need for special education services (Rice & Gilson, 2022).

Phonological Processing

The American Speech-Language Hearing Association (ASHA) provides a definition of phonological processing and its three underlying components: phonological awareness, phonological working memory, and phonological retrieval (2019). Phonological processing is defined as the ability to use the sounds in one's native language (phonemes) to understand and

express language both orally and in written forms (ASHA, 2019). Phonology is one of the five aspects of language that governs the way an individual interprets and uses individual phonemes in words (ASHA, 2022). Phonemes are defined as one of the smallest units of sound that are detectable in human language (Kilpatrick, 2020). Phonemes are the individual sounds that make up words and distinguish them from each other. For example, the words "sad" and "sat" each have three phonemes (/s/, /a/, /d/ and /s/, /a/, /t//) with only one phoneme that is different (/d/ versus /t/). All three of these underlying components of phonological processing are vitally important for the learning of reading and writing (ASHA, 2019).

Phonological Awareness

Phonological awareness is the recognition of the specific sounds (phonemes) within a word that blend together to create the word (ASHA, 2019). Phonological awareness is a skill with strong ties to literacy development (Benway et al., 2021). Phonological awareness involves the analysis and manipulation of sounds and is an umbrella term comprising specific skills, such as rhyme awareness, alliteration and initial sound awareness, word awareness, syllable awareness, and phonemic awareness (Kilpatrick, 2016). Rhyme awareness involves both the ability to detect rhymes as well as produce rhymes. A rhyme is where the ending of two words (rime) is the same, while the beginning of the word (onset) is different. An example of rhyming are the words "sat" and "pat"; both words end with the same /at/ sound, while the initial sounds /s/ and /p/ are different (Bowen, 2022). Alliteration and initial sound awareness are somewhat the opposite of rhyming, in that the onsets of the words are the same while the rimes are different (Kilpatrick, 2016). An example of alliteration could include the phrase "ten tall trees"; these words all begin with the same /t/ phoneme, but end differently (Bowen, 2022). Word awareness

is the ability to hear words as separate units (Kilpatrick, 2016). Syllable awareness involves hearing the word, or part of a word, with only one vowel sound within a larger word.

Several phonological awareness skills involve the recognition and manipulation of words, syllables, and phonemes. Blending involves the ability to put together individual words, syllables, or sounds to create a new word, either real or nonsense. For example, blending the words “cup” and “cake” makes “cupcake”, blending the syllables “mon” and “key” makes “monkey” and blending the sounds /uh/ and /p/ makes “up” (Bowen, 2022). Segmentation is the ability to break apart a word into smaller words, syllables, or phonemes (Kilpatrick, 2016). Segmenting the word “cupcake”, for example, into “cup” and “cake”, “monkey” into the syllables “mon” and “key”, and the word “up” into /uh/ and /p/ (Bowen, 2022). Deletion is the ability to take away parts of a word to create a new real or nonsense word (Kilpatrick, 2016). For example, saying “cupcake” without “cup” leaves “cake”; saying “monkey” without “mon” leaves “key”, and saying “tall” without /t/ leaves “all” (Bowen, 2022). While phonological awareness involves awareness of sounds in the words, phonemic awareness involves the manipulation of the spoken phonemes in words (Kilpatrick, 2016). Phonemic awareness is a precursor to phonics, which is an academic skill involving printed letters and language (Kilpatrick, 2016). Providing explicit instruction in phonological awareness skills as a tier 1 intervention is a method that educators can provide to reduce a student’s cognitive load while developing their skills in these areas.

Phonological Working Memory

Phonological working memory involves the temporary storage of phonemes for later manipulation and use, such as for phonological awareness tasks (ASHA, 2019). Phonological memory has been found to support several linguistic behaviors, including vocabulary

development and learning to read new words (Perrachione et al., 2017). Additionally, difficulties in phonological working memory have been shown to be an area of weakness for many individuals with speech-language impairments. These may be due to a variety of etiologies, such as developmental dyslexia, stuttering, and even autism spectrum disorder (Clark et al., 2012; Perrachione et al, 2017). The link between overall language abilities and phonological working memory can be demonstrated through nonword repetition tasks, where the individual is asked to repeat a nonsense word. The use of nonword repetition tasks allows a look into the individual's speech perception along with their production. While direct instruction of phonological awareness has been shown to improve reading skills, direct instruction of phonological working memory has more conflicting evidence (Maehler et al., 2019; Cunningham et al., 2021). While phonological working memory has been determined to be a factor in a student's ability to learn to read, the provision of phonological working memory practice within the classroom has not been shown to improve the student's phonological working memory. Providing phonological working memory tasks as a classroom intervention, therefore, is an unnecessary use of classroom time, as it does not impact the student's cognitive load. However, phonological working memory tasks as an assessment or screening tool can be a predictor regarding the student's potential reading abilities (Maehler et al., 2019).

Phonological Retrieval

Phonological retrieval involves the ability to store and rapidly retrieve the graphemes (written letters) within a language (ASHA, 2019). Another term for phonological retrieval is *lexical processing* (Cummings et al., 2016). Rapid automatic naming is the ability to look at a set of printed stimuli and quickly name the stimuli, which is a task that is frequently used to assess phonological retrieval and has been found to be a predominant predictor of reading ability

(Araujo et al., 2019). Examples of rapid automatic naming include both symbols and non-symbols, such as objects, colors, letters, and numbers (Sitepu et al., 2017). Beyond just a measure of phonological retrieval, the ability to rapidly name letters, numbers, and objects is a predictor of an individual's reading fluency ability (Araujo et al., 2019).

Reading Fluency

The International Literacy Association (ILA) defines reading fluency as the combination of reading reasonably accurately, at an appropriate rate, with suitable expression (2018). This does not necessarily indicate that reading faster is better, however, as reading too fast has been shown to negatively impact accuracy, comprehension, and expression. Meta-analyses have found that reading practice is the agreed upon way for reading fluency to improve (National Reading Panel, 2000; Maki & Hammerschmidt-Snidarich, 2022; Zimmerman et al., 2021). Repeated reading with guidance and feedback from the instructor has been found to increase reading fluency and has historically been used to improve a student's reading fluency abilities (National Reading Panel, 2000). Repeated reading, however, has been called into question as an evidence-based practice, as researchers find that, although it can increase oral reading fluency, it lacks generalizability (Kim et al., 2017). A literature synthesis by Stevens et al. (2017) found that, in students with learning disabilities the practice of repeated reading strategies did increase reading fluency as well as reading comprehension. Non-repetitive reading strategies utilize similar strategies to repeated reading but incorporate different texts; these strategies have been shown to have a positive impact on reading fluency (Maki & Hammerschmidt-Snidarich, 2022; Zimmerman et al., 2021). A repetitive reading strategy that can be incorporated with non-repetitive reading strategies is to use a reading partner to provide feedback. Another non-repetitive reading strategy to increase reading fluency is the use of a technology application, such

as a computerized reading program, that the students read out loud to for designated lengths of time (Maki & Hammerschmidt-Snidarich, 2022). Additionally, non-repetitive reading strategies were found to have a positive impact on reading comprehension (Stevens et al., 2017; Zimmerman et al., 2021). The ability to read fluently and effortlessly is necessary as a student moves through school, as the focus of reading shifts from learning to decode words on a page towards using the material on the page to understand the material itself (International Literacy Association, 2018). Students must be able to reduce the cognitive load of decoding to develop subject-specific content schemas.

Dyslexia Interventions

Al Otaiba et al. (2018) found that there is not a one-size-fits-all approach for dyslexia intervention, as everyone's particular needs will differ. In general, interventions for dyslexia target phonological processing, as well as reading fluency, to facilitate the student's ability to decode text. Additional areas to target for students with dyslexia include meaning-focused skills, such as vocabulary development, listening comprehension, and reading comprehension. Interventions in morphology, another aspect of language, are also showing increasing importance in ameliorating reading difficulties in students with dyslexia (Fallon & Katz, 2020). Morphology is an aspect of language that moves from the individual sounds that comprise words (phonemes) into the groups of phonemes that make a grammatical marker (morphemes) (Fallon & Katz, 2020). An example of morphology would be the difference in the words "hat" and "hats"; the word "hat" has three phonemes (/h/, /a/, /t/) that makes up the singular morpheme "hat" while the word "hats" has four phonemes (/h/, /a/, /t/, /s/) that makes up two morphemes ("hat" plus the plural "-s"). The development of morphological skills is necessary as students move from

phonological awareness into orthographic awareness using the alphabetic principle. Teaching morphological skills expands into structured literacy interventions.

One term for dyslexia-specific interventions is called structured literacy (SL), which has been compared to typical literacy practices (TLP), in order to determine which strategy of teaching is most helpful to the majority of students (Spear-Swerling, 2018). SL was coined by the International Dyslexia Association in 2016 to describe a methodology of intervention for students with dyslexia (Fallon & Katz, 2020). SL programs have explicit, systematic, and structured sequences of teaching, cumulative practice and review, high levels of teacher-student interaction, carefully chosen examples and nonexamples, decodable texts, and prompt feedback (Spear-Swerling, 2018). While most studies have focused on providing SL in a one-on-one tutoring style session, studies conducted in the whole group classroom have found that incorporating SL strategies as tier 1 universal practice is beneficial to all students, not just children with dyslexia. In particular, the explicit instruction of phonemic awareness activities was found to benefit all learners. Specifically, focusing on SL approaches as a prevention measure in younger children was found to be more successful than as a remediation intervention in older students (Al Otaiba et al., 2018). There are numerous approaches to SL with a growing evidence base, including Orton-Gillingham (OG), Lindamood Phoneme Sequencing (LiPS), and the Wilson Reading System (WRS). However, current evidence from meta-analysis indicates that, while positive effects on reading do appear to exist with these programs, the effect sizes are minimal and typically intended for the small intervention group rather than the whole class (Stevens et al., 2021).

Speech-Language Abilities and Reading

Approximately 30% of all children present with reading difficulties, and a large proportion of those children have a comorbidity with an underlying speech-language disorder (McLean et al., 2021). While SLPs are not trained as teachers, they do have a background in literacy. Although literacy falls under the scope of practice of the SLP, they are not trained in curriculum and instruction like classroom teachers. The SLP can, however, support general education teachers in developing the student's literacy skills by advancing their communication skills through providing targeted interventions to individuals, small groups, and the whole classroom. Additionally, the simple view of reading indicates the relationship between listening comprehension and reading comprehension (Hoover & Gough, 1990). The simple view of reading demonstrates that the ability to decode in isolation does not equal the ability to read well; reading is the product of both decoding and linguistic comprehension (Gough & Tunmer, 1986). However, the ability to decode is correlated with listening comprehension. Therefore, as educators focus on teaching decoding, the students' comprehension will also improve (Hoover & Gough, 1990). As SLPs provide skills and strategies that increase a student's listening comprehension, they also impact the student's reading comprehension (McLean et al., 2021).

Oral Language and Reading

Oral language abilities are a predictor for later academic success and lay the foundation for literacy development (Adlof & Hogan, 2019). Oral language skills impact both decoding (via difficulties with phonological awareness or letter knowledge) and comprehension (Van Viersen, 2018). On assessments of intelligence, pre-literacy skills, such as phonological awareness, were a predictor for word decoding, while vocabulary assessment predicted reading comprehension skills. Comorbidity of neurodevelopmental disorders, such as dyslexia, attention deficit hyperactivity disorder (ADHD), developmental language disorder, speech sound disorder, as

well as mental health disorders, such as anxiety, are widely accepted to be at rates higher than expected based upon the general population (Snowling & Hulme, 2020). Currently, the comorbidity rate between dyslexia and developmental language disorder is at 48% (Snowling et al., 2019). While children diagnosed with only dyslexia have difficulties with the word reading (decoding) skills of reading, children with only developmental language disorder exhibit difficulties with the semantic, or comprehension, aspects of reading. Students with a comorbid diagnosis of dyslexia and developmental language disorder exhibit difficulties with both decoding and comprehension.

Many children with underlying oral language skill deficits go unidentified because schools do not measure their oral language skills in the same way they systematically measure their reading skills (Adlof & Hogan, 2019). This is for a variety of reasons, however the inability of SLPs to provide systematic assessment outside of individualized testing is a barrier to determining the language skills of the whole class. Simply put, tier 1 assessments are currently limited or unavailable to schools and SLPs. The simple view of reading states that a person learning to read must have both the ability to decode the words, as well as comprehend the words they decoded (Gough & Tunmer, 1986). Oral language comprehension and expression is key in this developmental relationship between decoding, language comprehension, and reading comprehension (Adlof & Hogan, 2019). The ability to read for meaning is encapsulated by the ability to map written language onto the spoken language (Snowling & Hulme, 2020). This orthographic mapping framework by Ehri (2014) is developed by the formation of letter-sound connections. For students with difficulties in decoding, such as is seen in dyslexia, this orthographic mapping process is challenging and can present in the preschool years as oral language difficulties (Snowling & Hulme, 2020).

Place, Manner, and Voicing of Speech Sounds

Each individual phoneme is comprised of a place, manner, and voicing that distinguishes one sound from the next (Bowen, 2022). Bowen provides information regarding the place, manner, and voicing of each sound in the English language and how these aspects differentiate the sounds from each other. The place of articulation is defined as the place where the sound's airflow is obstructed in the mouth. Places of articulation include bilabial (using two lips, e.g., "p" and "b"), labiodental (teeth on lips, e.g., "f", "v"), interdental (tongue between teeth, e.g., "th"), alveolar (tongue up behind teeth, e.g. "d", "t"), palatal (tongue up and slightly further back, e.g. "sh", "ch"), and velar (tongue up the soft palate, e.g. "k", g"). The manner of articulation is defined as the way in which the air moves at the location of articulation. Manners of articulation include stop-plosives (short bursts of air, e.g. "p", "t"), fricative (steady stream of noisy air, e.g. "sh", "z"), affricate (burst of air followed by a stream of air, e.g. "ch", "j"), nasal (air flowing from the nose, e.g. "m", "n"), liquid (partial closure of obstruction with resonant air, e.g. "l", "r"), and glide (air moves from one location to the next, e.g. "y"). Voicing in articulation refers to whether or not the vocal folds are being used to produce the sound. There are two voicings: voiced (e.g., /b/, /m/, /d/) or unvoiced (e.g., /s/, /t/, /k/). Each consonant in the English language has a unique pattern of place, manner, and voicing that distinguishes that sound from another sound. For example, the phonemes /b/ and /p/ have the same place (bilabial) and the same manner (stop) but have different voicing. Similarly, the sounds /n/ and /d/ have the same placement (alveolar) and voicing (voiced) but have different manners (nasal vs. stop).

Speech Sound Disorders and Reading

Students with SSDs may exhibit difficulties in the physical production of speech sounds (phonemes) across words, phrases, sentences, and conversations (Swaminathan & Farquharson,

2018). Students with SSDs, even when the disorder is mostly resolved, are associated with having later reading challenges (Cabbage et al., 2018). While it is well established that children with oral language deficits have a high comorbidity rate with reading difficulties, research has also demonstrated the comorbidity between children with SSDs and reading difficulties (Tambyraja et al., 2020). Indeed, the comorbidity rate between children with SSDs and reading difficulties has been found to be between 25% to 30% (Burgoyne et al., 2019). How an SSD is defined varies greatly across the country amongst SLPs (Farquharson & Boldini, 2018). Within the school setting, SLPs are required to consider whether the SSD is having an adverse educational impact. While oral participation in class is the predominant factor demonstrating this adverse effect, other dimensions, such as social-emotional and behavioral skills, oral reading, the social reaction of self and others, spelling, access to the curriculum, and grades, were also judged to be important in determining adverse educational impact by SLPs.

Research supports that phonological skills are prerequisites for word decoding; therefore, it follows that when an SSD is phonologically- rather than motorically- based it can cause an increased risk for word decoding deficits (Tambyraja et al., 2020). Phonologically based SSDs are language-based in nature, while motorically based SSDs are more physically-based. Students with SSDs are also more likely to exhibit difficulties with spelling, as a result of their weaker phonological skills. Along with spelling difficulties, students with SSDs were associated with having poorer language skills coupled with their lower reading skills (Burgoyne et al., 2019). On measures of nonverbal intelligence, kindergarten students who began school with SSDs had lower scores than kindergarten students without SSDs.

Resolving SSDs in children prior to beginning their reading instruction was found to yield age-appropriate reading skills compared to children without a history of SSDs (Tambyraja

et al., 2020). When accounting for variables, such as socioeconomic status, language level, and others, the student's phonological awareness and percent of consonants produced correctly were associated with the student's ability to decode words and were predictive of a student being at risk for reading difficulties. A study conducted by Lewis et al. (2019) found that students with resolved SSDs outperformed students with persistent SSDs in functional motor speech, receptive vocabulary, expressive vocabulary, and sentence imitation tasks. Students with no history of SSDs outperformed students with resolved SSDs on all the same measures (Lewis et al., 2019). Students with a resolved SSD, indicating that the student previously exhibited an SSD they no longer exhibit due to natural maturation or therapeutic intervention, also performed better on literacy assessments, such as word decoding, nonsense word decoding, reading comprehension, phonological awareness, and spelling. Severity of SSDs at the onset of diagnosis, however, was not found to be predictive of whether the SSD would be resolved.

Resolving SSDs can be challenging for SLPs, particularly when the student has comorbidities with oral language abilities and reading difficulties (Benway et al., 2021). Students with SSDs are found to have lower phonological awareness skills, specifically with the long-term storage and retrieval, which are essential to reading development. SSDs reflect a deficit in the speech perception system: speech input, lexical and phonological processing, and speech output (Tambyraja et al., 2020). Typically, speech therapy focuses on the speech output without considering the speech input or lexical and phonological processing. The student's ability to perceive speech sounds is a developmental step towards resolving the SSD but is not necessarily an area of deficit in all children with SSDs (Benway et al., 2021). For students who do exhibit speech perception difficulties, this can lead to difficulties in phonological awareness. Students with a minimal SSD, even with a mere one sound in error, are still at risk for later reading

difficulties (Farquharson, 2019). RTI models for students with few speech sounds in error are an option for SLPs; however, although RTI for SSDs is considered a common practice for SLPs in order to determine if a brief intervention could ameliorate the SSD without the need for special education services, the majority of SLPs do not participate in RTI models due to caseload sizes and lack of time (Swaminathan & Farquharson, 2018). Being able to provide intervention to a whole classroom rather than multiple small groups, therefore, could be an option that provides direct instruction to a student with an SSD while simultaneously saving time for the SLP.

Service Delivery Models

Within the public schools, SLPs provide speech therapy services to students with SSDs, who represent a high percentage of their caseloads (Brousseau-Lapre & Greenwell, 2019). While most SLPs provide services to small groups of students pulled from the regular classroom for 30-minute sessions twice weekly, research is progressively finding evidence that innovative service delivery models may be more appropriate for students with speech and language impairments (Green et al., 2018; Byers et al., 2020; Rehfeld & Sulak, 2020). While service delivery within the classroom has been investigated for students with language impairments, research has focused on service delivery in small groups or individual sessions for varying amounts of time outside of the classroom setting for students with SSDs (Roepke et al., 2019).

When considering appropriate service delivery methods, the SLP must consider a variety of factors, including dose form, dose, dose frequency, total intervention duration, and cumulative intervention intensity (Brousseau-Lapre & Greenwell, 2019). Dose form refers to the activity or task that the student is engaged with in therapy. Dose is the number of therapeutic opportunities a student has to practice their target goals, while dose frequency is the number of intervention sessions the student participates in over a given period of time. An example of *dose* would be for

a student to say a target sound 50 times within a treatment session. An example of dose frequency would be for the student to participate in a therapy session two times per week. The total intervention duration would be the amount of time over which the intervention was provided. The cumulative intervention intensity refers to the total number of therapeutic opportunities a student had to practice their targets given the dose frequency and total intervention duration. For example, if a student received a dose of 50 trials, with a dose frequency of twice weekly, over a total intervention duration of 12 weeks, then the cumulative intervention intensity would be 1200 trials. While small group therapy is the norm in speech therapy, researchers have found that the cumulative intervention intensity of students who participate in small groups is significantly less than that of students who receive individual therapy (Brousseau-Lapre & Greenwell, 2019; Roepke et al., 2019; Byers et al., 2020). Byers et al. (2020) found that students who received group therapy service 30 minutes, 2 times weekly for 6 weeks had the same level of cumulative intervention intensity as students who received individual therapy services 5 minutes, 3 times weekly for 6 weeks. SLPs can mitigate this effect by providing a longer therapy session duration to ensure that the student receives a large enough therapeutic dose of the intervention (Brousseau-Lapre & Greenwell, 2019; Rehfeld & Sulak, 2020). This can become problematic, as pulling students from the general education classroom inherently means they are missing grade-level instruction (Green et al., 2018; Broussea-Lapre & Greenwell, 2019; Lathouras et al., 2019).

A possible service delivery option that allows students to stay within their regular classroom is to provide speech therapy in the classroom itself (Green et al., 2018; Lathouras et al., 2019; Phoenix et al., 2021). Speech therapy within the classroom is becoming increasingly prevalent with a national push for more inclusive practices in special education (Green et al.,

2018). SLPs can provide inclusive practices in a variety of ways, such as collaborating with teachers, co-teaching the whole class, or providing small group and individual therapy services within the classroom setting (Green et al., 2018; Phoenix et al., 2021). Collaborating with teachers is an inclusive practice that the majority of SLPs incorporate as a tiered approach of service delivery via RTI (Phoenix et al., 2021). Collaboration includes frequent communication with the classroom teacher regarding the student's progress and current areas of need. Co-teaching is an inclusive practice where an SLP collaborates alongside the general education teacher to provide instruction to both typical and special needs students (Heisler & Thousand, 2021). With co-teaching, the SLP can provide support to the general education teacher and students or can be the main teacher providing instruction. Co-teaching can occur across the whole class or can occur in small groups or with individual students within the regular classroom setting.

Currently, a gap exists in the research specifically related to the area of effective service delivery for articulation or phonological treatment of SSDs in the whole classroom. Research on inclusive practices has previously focused on language-based services, while research on SSDs has focused on individual therapy sessions conducted more frequently with a higher dose (Brousseau-Lapre & Greenwell, 2019). More research is needed to determine the effectiveness of direct instruction of place, manner, and voicing to address SSDs within the general education classroom.

Virtual Instruction

The full impact of learning loss associated with the pivot from in-person instruction to virtual instruction in the wake of the Covid-19 pandemic is not yet fully known (Rahayu et al., 2020). When the pandemic began, educators across the country began to quickly shift from

traditional methods to digital instruction in a variety of formats (Barbierato et al., 2021). Synchronous learning is a method of virtual instruction where teachers and students are connected into the virtual environment at the same time, similarly to the traditional in-person method of instruction (Beach et al., 2021). Asynchronous learning is a method of virtual instruction where the teacher provides an assignment or activity that the student is to complete within a set amount of time but is not necessarily done at the same time as other students or with the teacher (Maheshwari et al., 2021). Hybrid learning is a method of virtual instruction that blends both synchronous and asynchronous learning experiences (Raes et al., 2019). Reading instruction was a challenge for instructors to teach during the pandemic, as traditional methods of reading instruction, such as pen and paper activities, no longer seemed feasible (Barbierato et al., 2021).

Synchronous Learning

Synchronous learning in the virtual environment is typically accomplished through video conferencing platforms (Alves & Romig, 2021). Students use synchronous learning in a similar way to in-person instruction, as they are given access to the teacher in real time (Beach et al., 2021). Another benefit to the synchronous learning environment is that it provides more peer interactions than asynchronous learning, which, in turn, increases student engagement (Francescucci & Rohani, 2018). Synchronous learning via video conferencing platforms allows the educator to simulate an in-person learning environment, however the pedagogical shift from in-person learning to synchronous virtual learning can be a struggle (Henriksen et al., 2020). These conferencing platforms provide a different dynamic regarding communication between teachers and students and move the educator into a role of manager. However, research supports that once educators are able to master this shift of role, students who participate in fully

synchronous learning have similar performance outcomes to students who participate in fully face-to-face instruction (Francescucci & Rohani, 2018). These findings, however, come from post-secondary scientific inquiries rather than elementary. Currently there is limited research regarding the effects of synchronous virtual learning in elementary school students (Basilaia & Kvavadze, 2020).

Asynchronous Learning

Asynchronous learning is one of the more traditional methods of online instruction that is used in higher education regularly (Barbierato et al., 2021). Asynchronous learning allows an educator to provide a set of activities for the student to accomplish in their own time. When classroom teachers were forced to pivot to virtual learning due to the Covid-19 pandemic, educators were suddenly charged with becoming experts in asynchronous learning and provide meaningful activities for students (O Ceallaigh, 2021). Although asynchronous learning is a standard model of virtual instruction for post-secondary students, it was a novel concept for elementary educators. While asynchronous learning in the context of Covid-19 often indicated a use of technology, it can be engaged via analog materials, such as worksheet, hands-on manipulatives, and other modes, as well (Chau et al., 2021). Though teachers may feel confident in their ability to organize asynchronous learning, they are reported to have concerns regarding the amount of planning time and increased workload associated with preparing for asynchronous learning (O Ceallaigh, 2021). Maheshwari et al. (2021) stated that effective asynchronous learning provides a social presence through a collaborative learning environment, a cognitive presence through construction of knowledge, and a teaching presence through educators designing and facilitating the social and cognitive processes. Indeed, creating authentic learning experiences through the asynchronous learning environment is a concern of educators, as well as

a necessity for students (O Ceallaigh, 2021). Creating a safe psychological space for students increase their willingness to engage with the asynchronous learning, as well as developing group cohesion (Maheshwari et al., 2021).

Hybrid Learning

For the end of the 2019-2020 school year and into the 2020-2021 school year, most schools across the country that provided virtual instruction used a combination of both synchronous and asynchronous learning activities (Careaga-Butter et al., 2021). This combination of self-directed learning, along with group learning, required a great amount of technological readiness (Chau et al., 2021). At the onset of the pandemic, Moorhouse and Wong (2021) found that teachers began learning how to utilize Learning Management Systems (LMS), such as Google Classroom, to provide asynchronous learning while also utilizing video conferencing platforms, such as Zoom. Although the process of learning all the new instructional methods may have seemed overwhelming, evidence from their study suggested that a hybrid model of blending synchronous and asynchronous learning was the most effective for students. This type of model allows the benefits of synchronous learning with collaborative, real-time interactions, while allowing for the asynchronous learning modality's slower, self-guided pacing.

Video Learning

Learning via video is a method of instruction that can be accomplished across in-person, virtual, and blended environments (Hong et al., 2018). The use of videos for instruction is asynchronous in that the educator can choose to play the video at will; however, it can also be synchronous in that an entire class can watch the video simultaneously. The use of videos is becoming an increasingly common practice within the general education classroom, as the use of videos for learning reduces the cognitive load necessary for the learners by providing stimuli

across a variety of mediums. The use of videos and video clips has historically been studied in older students where the student was able to watch the clips as needed on their own time (Skrylnikova et al., 2020). Research conducted in older students, including post-secondary students, indicated that incorporating video lessons into instruction yield a positive impact on academic gain, yet research has not yet been conducted regarding the application of this method in younger children (Wibawa & Payadnya, 2021). As such, there is currently a gap in the literature regarding the use of videos for instruction in elementary students when the video is played for the whole classroom simultaneously (Skrylnikova et al., 2020). Additionally, research supports having educators alongside the videos to guide the students rather than allowing the video to play freely without support from the educator (Hong et al., 2018). Dynamic use of video instruction by drawing or adding visuals to the instruction, guiding the listeners' eye gaze, and summarizing and explaining materials are strategies that have been found to increase the effectiveness of video instruction (Mayer et al., 2020).

Access to Virtual Instruction

When the pandemic began, students across the nation were displaced from their school environments and required to learn from home virtually (Oster et al., 2021). An unfortunate side effect of this change was a lack of access many students had to the virtual, online instruction. While the amount of learning loss due to the pandemic is still unknown, in communities with limited online access, the loss has been found to be greater. While educators were challenged with learning synchronous and asynchronous learning platforms, they were further challenged by students with inequitable access to virtual instruction (Ambrose, 2020). Rural communities, minorities, and English language learners were some of the groups that were the most affected (Oster et al., 2021). Poor communities were often unable to provide the technology that was

required to fully engage students in virtual instruction (Hamilton & Ercikan, 2021). These same groups were also limited in their access to school social programs, such as free meals (Ambrose, 2020). These physical and mental health needs were seen as priority over the educational work being provided by the schools, which further limited students' access to their virtual education. Data regarding students' opportunity to learn throughout the pandemic must be considered, monitored, and analyzed (Hamilton and Ercikan, 2021).

Summary

Visual attention, working memory, and long-term storage and retrieval are necessary cognitive processes in learning to read (Clark & Harrelson, 2002). Executive functions, such as inhibition, cognitive flexibility, planning, reasoning, and problem solving are also skills vital to the reading process (Cristofori et al., 2019). When a student has difficulty with cognitive processes and executive functions, the development of skills critical for reading, such as phonological awareness, are negatively impacted, as these processes are necessary for the student to both decode and comprehend text (Cristofori et al., 2019; Peng et al., 2018; Zaboski et al., 2018). When a student lacks these processes and functions, their cognitive load is increased, and categorizing and storing information in a way that is meaningful and easily accessible for later use is challenging (Sweller, 2010). The intrinsic cognitive load of learning to read can be reduced by altering the extrinsic load required by changing instructional practices (Sweller, 2010).

UDL is a framework for learning that provides flexibility by reducing barriers to learning for all students, particularly those with disabilities, in the general education classroom (Rogers-Shaw et al., 2018). Within UDL, three networks for learning are addressed in the learning process: recognition, strategic, and affective (Hall et al., 2012). The UDL framework can also be

applied in the RTI process at each pyramidal tier (Singh & Jadhav, 2021). Phonemic awareness activities are often a tier 1 practice within elementary school classrooms, as well as a structured tier 2 and tier 3 practice for students who require additional support, as these activities are building blocks of phonics instruction (Buckingham et al., 2019; Double et al., 2019). Phonics-based instruction is the key instructional method behind the science of reading that explores the relationship between sounds and letters (Buckingham et al., 2019).

Phonological processing is an area impacted by dyslexia. Dyslexia is a neurological, developmental, language-based disorder that affects up to 10% of the United States population that is educationally defined as a disability in fluent reading and phonological processing (Adlof et al., 2017; Rice & Gilson, 2022; Roitsch & Watson, 2019). Interventions for dyslexia generally target phonological processing and reading fluency to facilitate decoding skills (Al Otaiba et al., 2018). SL programs provide explicit and systematic sequences of teaching and have been found to positively impact the learning in students with dyslexia (Spear-Swerling, 2018).

SLPs are professionals with a background in literacy who are able to provide instructional support in many literacy areas, as a large percentage of students with a speech-language impairment have a comorbid diagnosis of dyslexia (Snowling et al., 2019; McLean et al., 2021). SLPs provide explicit instruction in skills and strategies to remediate SSDs and the components that make up speech sounds (Bowen, 2022). If a student can have their SSD corrected and resolved prior to learning to read, they perform better on literacy assessments (Lewis et al., 2019). While small group therapy has been the norm for speech therapy services for years, current research supports implementing more intensive individual therapy sessions for shorter time durations when addressing SSDs (Brousseau-Lapre & Greenwell, 2019; Roepke et al., 2019; Byers et al., 2020). Research also supports the use of service delivery in the general

education classroom itself for language therapy services (Green et al., 2018; Lathouras et al., 2019; Phoenix et al., 2021). However, there is currently a gap in the research regarding treatment of SSDs in the general education classroom.

Furthermore, a variety of virtual learning methods exist, including synchronous, asynchronous, and hybrid learning models (Alves & Romig, 2021; Barbiereto et al., 2021; Careaga-Butter et al., 2021). In fact, virtual learning became the norm in the spring of 2020 at the start of the coronavirus pandemic (Rahayu et al., 2020; Barbierato et al., 2021). Synchronous, asynchronous, and hybrid learning all have evidence of success for secondary and post-secondary students; however, there is a lack of research on how these learning methods impact elementary students (Francescucci & Rohani, 2018; Basilaia & Kvavadze, 2020). While video learning is a method of instruction that can be incorporated across all environments (Hong et al., 2018), there is a lack of information regarding the impact of video learning on elementary school students (Wibawa & Payadnya, 2021).

Although UDL provides high quality instruction for the whole class, the role of the SLP in UDL is lacking. This is likely due to a variety of factors, such as reliance on the traditional pull-out model of therapy and SLP caseload numbers. Additionally, how SLPs can provide tier 1 classroom instruction, through either synchronous or asynchronous virtual instruction, lacks research. Given that SLPs have specialized training in phonological and phonemic skills and are specially trained to work with oral language abilities and speech sound disorders, research regarding how specific instruction from the SLP to the whole class can change students' reading achievement is needed.

CHAPTER THREE: METHODS

Overview

The purpose of this quantitative, quasi-experimental study was to determine the impact of virtual lessons in place, manner, and voicing of speech sounds on reading achievement. The chapter begins by introducing the design of the study, including full definitions of the variables. The research questions and null hypotheses follow. The participants and setting, instrumentation, and procedures are presented. The chapter concludes with the data analysis plan.

Design

A quasi-experimental study with a pretest, posttest design was used to research the impact of video-based lessons on phonological processing. A quasi-experimental design, like experimental designs, tests causal hypotheses regarding an intervention or treatment (White & Sabarwal, 2014). With quasi-experimental designs, a treatment group is compared to a control group without true randomization of participants. Nonequivalent control-group designs have participants who are not randomly assigned to the experimental and control groups, and they involve a pretest and a posttest (Gall et al., 2007). Kindergarten students attending school within a building without video-based lessons served as the control group, while kindergarten students attending school in a building with video-based lessons served as the experimental group. This design was determined to be the most appropriate for this research study because the exposure to the interventions in the experimental group determined the potential differences between the pretest and posttest scores (Gall et al., 2007).

The purpose of this design was to determine whether the post-test scores on reading achievement differed when measured against the pre-test scores due to the intervention of video-based lessons on place, manner, and voicing. The independent variable was the video lessons;

the experimental group received the video-based whole group lessons in place, manner, and voicing of speech sounds while the control group did not. The dependent variable was the kindergarten scores on the spring reading MAP assessment. The covariate was the pretest scores on the fall reading MAP assessment.

Research Questions

RQ1: Is there a difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading Measures of Academic Progress (MAP)?

RQ2: Is there a difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP?

Hypotheses

$H_0$1: There is no difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading MAP.

$H_0$2: There is no difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP.

Participants and Setting

Population

The participants in this study were drawn from a convenience sample of kindergarten students attending two elementary schools within the same large school district located in Northwest Arkansas during the 2022-2023 school year. A convenience sample is a type of nonprobability sampling method, utilizing participants that are easy to reach (Statistics How To, 2020). Although a convenience sample may not be representative of the population and results should be interpreted with caution, it was the only method with which to gain participants for the current study. Per publicly available information, the school district is made up of 19 elementary schools, 4 middle schools, 4 junior high schools, and 4 high schools. The district's total enrollment is over 23,000 students, along with approximately 1,100 certified staff. The district has a minority enrollment of 70%, and 59.4% of the students are from lower socioeconomic statuses. The school district has a range of socioeconomic statuses, both within and between buildings. The student body is approximately 48.3% Hispanic/Latino, 32.7% White, 2.3% African American, and 1.6% Asian/Pacific Islander. The schools have a variety of languages spoken, with the primary languages being English, Spanish, and Marshallese.

Participants

For this study, the number of participants sampled was 136. According to Gall et al. (2007) a minimum sample size of 66 divided between two or three groups was necessary in conducting the ANCOVA analysis when assuming a medium effect size with statistical power of .7 at the .05 alpha level. The sample came from four kindergarten classrooms at School A (school with video-based lessons) and four kindergarten classrooms at School B (school without video-based lessons), with approximately 20 students per classroom. All kindergarten students

who began at their respective school, stayed at their respective school throughout the school year, and ended at their respective school, were used in this study. The study included 44 males and 34 females at School A and 26 males and 32 females at School B. School A had 57 native English speakers and 21 non-native English speakers, while School B had 24 native English speakers and 34 non-native English speakers. School A had 8 students identified as having special education services, with 8 of these students receiving speech therapy services. School B had 4 students identified as having special education services, with 4 of these students receiving speech therapy services.

Setting

Two elementary schools within the same school district were the setting of this study. School A and School B offered blended virtual and face-to-face instruction for the 2020-2021 school year, however offered only face-to-face instruction for the 2022-2023 school year. Virtual learning only occurred in the event of remote learning due to weather or pandemic concerns. School A and School B's kindergarten teachers were trained on the same phonics program, *Phonics First*, which was implemented at the beginning of the 2021-2022 school year. New kindergarten teachers received the same *Phonics First* training prior to the 2022-2023 school year. School A was additionally provided video lessons that aligned with the *Phonics First* curriculum to be presented to the entire class regarding place, manner, and voicing of speech sounds. School B was not provided those video lessons.

Instrumentation

The pretest and posttest used in this study was the reading MAP. Written permission to use this instrument was obtained prior to the initiation of the study. See Appendix B for permission to use the instrument. The reading portion of the MAP is an adaptive achievement

and growth test developed by the Northwest Educational Association (NWEA) (NWEA, 2017). The MAP is a criterion-referenced, computer adaptive test that screens the student's reading (Thomas, 2018). Rather than a standardized assessment, such as the ACT Aspire or the Benchmark, the MAP is a formative assessment that assesses the student at their current achievement level and allows the student to continue as needed to show their furthered growth (Sireci et al., 2010). The MAP reading assessment tests foundational skills, literature and informational, language and writing, and vocabulary use and functions (NWEA, 2017). These areas are combined to provide a Rasch unit (RIT) that is used to allow for a simpler interpretation of the test scores (NWEA, 2017.)

The instructional area of foundational skills has subcategories for phonics and word recognition, phonological awareness, and print concepts. The other instructional areas have a focus on writing mechanics, language use, and vocabulary. The foundational skills' instructional area is the most closely aligned with the type of intervention that is taking place in the present study, therefore it was determined that both the overall reading MAP score should be examined, as well as this specific instructional area, in order to determine the intervention's effect on the students.

The MAP assessment can be conducted multiple times throughout a school year. Within the school district used in this study, the MAP assessment was conducted at three points throughout the school year, during various three-week windows. Students were assessed in September (fall), January (winter), and May (spring).

The NWEA MAP assessment has been found to have good reliability and validity by a variety of publications (NWEA, 2017). According to the 2019 MAP Technical Report, the MAP has considered reliability measures, including test-retest reliability and internal consistency

(Meyer, 2019). The test-retest reliability in the area of reading for kindergarten students does exhibit the lowest level of test-retest reliability from fall to winter, with a coefficient of 0.687. However, winter to spring has a coefficient of 0.759 for kindergarten students. All other grade levels achieve a test-retest reliability coefficient of 0.80 or above. Internal consistency was calculated using Wright's marginal reliability alpha coefficient. Kindergarten students were found to have a reliability of 0.955 on the reading test. Furthermore, the reliability coefficient was found to be 0.818 or higher across each of the four different instructional areas taken by kindergarten students. To address validity, EdMetric completed an external alignment study for MAP Growth and found that over 97% of the items assessed across grades K-12 aligned with Common Core State Standards (Hahn, 2018). Concurrent validity on the MAP reading assessment has a Pearson's coefficient ranging from 0.68-0.80 between the MAP Growth Reading and state tests for grades 3-12, while information is not provided for K-2 (Meyer, 2019). The Mantel-Haenszel (MH) Procedure was used to compare Differential Item Functioning (DIF), which means that the probability of a correct response is due to the item's difficulty and the student's ability rather than other characteristics of the test taker, such as gender and ethnicity. According to the MH Procedure, 98.2% of items showed negligible DIF between genders; 99.2% of American Indian, 88.8% of Asian, 97.8% of Black, and 98.2% of Hispanic students showed negligible DIF.

As the MAP is a formative assessment, it does not have a set number of questions that are administered per testing session (NWEA, 2017). The majority of students complete a section within 30 to 60 minutes. The MAP assessment is not timed, however, which allows students to take as much time as necessary to complete their test. The MAP is administered via a student's laptop or tablet. Teachers are able to provide technical support in the case of the student's

technology malfunctioning, but may not provide any support, assistance, or accommodation with reading the prompts or answering the questions. Students are provided a RIT score immediately following test administration, and teachers can review a customized report regarding these student's progress within 24 hours of administration (Cordray et al., 2013). These reports are able to be reviewed by teachers to aid in academic goal setting. These RIT scores provide percentile ranks for both achievement and growth to show how the student performs in comparison to national norms (NWEA, 2017). Permission to use the reading MAP assessment is provided in Appendix B.

Procedures

IRB approval for this study was submitted and received. See Appendix D for IRB approval. Participants were drawn from the experimental school as the researcher already worked in School A to provide the intervention that took place. Participants from the control school were chosen based upon publicly available demographic data that was similar to the experimental school. The MAP assessment that was used as the pretest data was taken by all participants, both within the experimental and control group, in the fall of 2022. The MAP assessment posttest data was conducted in the spring of 2023. As student data was used for this study, the researcher submitted research review committee (RRC) approval through the district. See Appendix C for the school district's RRC approval.

The video-based lessons were initially created by the researcher in order to support kindergarten students during the 2020-2021 school year. Prior to this year, in-class lessons were conducted with kindergarten classrooms in order to teach place, manner, and voicing of speech sounds. As concerns with spread of Covid-19 were prevalent during the 2020-2021 school year, the school district put social distancing measures in place that made going into the classrooms to

conduct these lessons impractical. The researcher determined that the instruction could continue via recorded lessons in an abundance of caution to not spread the virus between classrooms. These lessons were created using the district's Blended Lessons Google Slides Template and using the Screencastify video-recording software. The lessons contained uncopyrighted images that the researcher personally took, developed in the Paint software application on the researcher's computer, or found via the Unsplash Images Google Slides Add-On. The lessons were developed in Google Slides and were recorded with Screencastify, being saved to the researcher's Google Drive. The videos were embedded into the Google Slides presentation and shared with the kindergarten teachers. The lessons were modified and re-recorded for the 2021-2022 school year in order to align with the verbiage and theory used with the *Phonics First* curriculum.

The *Phonics First* curriculum was chosen to be implemented across the district for the 2021-2022 school year to align with Arkansas' Science of Reading initiative and continued to be implemented for the 2022-2023 school year. The lessons were modified to ensure that the students were only taught that a letter represents one sound at a time. In previous lessons, for example, the letter "C" was taught to be pronounced as both the hard "C" as in "cat" as well as the soft "C" as in "cent". *Phonics First* curriculum breaks these lessons apart: one week is spent only learning the hard "c", and the soft "c" is taught on a different week. This same concept is applied to vowels. These lessons were provided to School A as a supplement to the *Phonics First* instruction, as the program does not provide explicit instruction for students in the different features of consonant and vowel speech sound articulation. The company behind *Phonics First*, Brainspring, does provide pronunciation guides for teachers that includes the concept of voiced versus unvoiced sounds, however there is not explicit instruction on placement and manner or

how to discuss the concept of voiced and unvoiced sounds (Brainspring, n.d.). Sound wall posters available for purchase do provide a visual representation of placement for how spread or rounded the lips are during production, but again do not provide clear instruction on the precise placement of speech sounds (Brainspring, n.d.).

The MAP reading assessment was completed for all kindergarten students during a three-week window in September of 2022 and May of 2023. Once each testing window had closed, the data collection process began. Data was collected in the spring of 2023 following the spring MAP. Participants included only the students who were at their respective schools for the fall 2022 MAP reading assessment, stayed at their school throughout the 2022-2023 school year, and completed the spring 2023 MAP reading assessment at their respective school. Once all participants had been identified, they were assigned a number in order to ensure privacy. The student was additionally identified as an English language learner (ELL) for data collection and analysis purposes. Information was collected via a records review utilizing the NWEA MAP data. Information regarding the participant's school (A or B) was obtained, along with gender, ethnicity, and languages spoken. The participants' fall 2022 reading MAP scores were obtained as a pretest measure, as well as their spring 2023 scores as their posttest measure.

At all stages of data collection, all information that could personally identify the participants was protected. Data was stored securely with only the researcher having access to the records. Data was stored on a password-protected computer. When not being utilized, the computer was stored in a locked room in a locked filing cabinet. The data will be retained for a period of five years after the completion of this research study and will then be destroyed.

Data Analysis

An analysis of covariance (ANCOVA) was used to determine if there was a difference in reading achievement scores among kindergarten students who received whole-group video lessons on place, manner, and voicing of speech sounds and those who did not when controlling for prior reading achievement as measured by the reading overall reading MAP, as well as the instructional area of Foundational Skills on the reading MAP. One threat to internal validity of nonequivalent control-group experiments is that it is possible for differences on the posttest to be due to pre-existing group differences rather than the treatment (Gall et al., 2007). In order to combat this, the ANCOVA statistic was conducted in order to reduce the effect of initial group differences. In order to determine the impact of the intervention, pretest and posttest scores on the reading MAP were collected. Gall et al. (2007), state that this technique is used to determine whether the pretest-posttest differences for control group is reliably different from the experimental group. Given that the same test is given for each student at pretest and posttest, interpretable results from this analysis should be meaningful.

A statistical software program was used to screen for violation of assumptions. Per Gall et al., a variety of assumptions must be met for the ANCOVA statistic. One assumption is that of normality. As the sample size was greater than 50, a Kolmogorov-Smirnov test was used to determine the normality of the distribution of data. A Box and Whiskers plot was used to check for extreme outliers. The assumption of linearity and the assumption of bivariate normal distribution was assessed by examining scatterplots between pretest and posttest achievement results. The assumption of homogeneity of slopes was examined. Finally, the assumption of equal variance was examined with the Levene's test. A power analysis was run with p=0.5 and power of 0.7 to determine the minimal sample size required to get a significant outcome. Effect size

was reported using the Eta squared statistic. The null hypotheses were considered rejected at the 95% confidence level with an alpha of 0.5.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this quasi-experimental study was to determine if there are differences in reading achievement on the reading MAP assessment when controlling for prior reading achievement. Chapter 4 reviews the two research questions, as well as their corresponding null hypotheses. Next, the collected data is reviewed in terms of descriptive statistics and assumption tests. The chapter concludes with statistical analyses of the results for both research questions in relation to their null hypotheses.

Research Questions

RQ1: Is there a difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading Measures of Academic Progress (MAP)?

RQ2: Is there a difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP?

Null Hypotheses

$H_0$1: There is no difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading MAP.

$H_0$2: There is no difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP.

Descriptive Statistics

Descriptive statistics were obtained on the covariate (pre-intervention Reading and Foundational Skills MAP scores), dependent variable (post-intervention Reading and Foundational Skills MAP scores), and the adjusted dependent variable (adjusted means for post-intervention Reading and Foundational Skills MAP scores) for each group. Tables 1-6 provide the descriptive statistics.

Table 1

Descriptive Statistics

Covariate: pre-intervention reading MAP

Group	*n*	*M*	*SD*
1 – Control	58	138.05	9.081
2 - Experimental	78	138.22	8.043

Table 2

Descriptive Statistics

Dependent Variable: post-intervention reading MAP

Group	*n*	*M*	*SD*
1 – Control	58	154.81	11.037
2 – Experimental	78	158.33	10.689

Table 3

Descriptive Statistics

Dependent Variable (Adjusted Means): post-intervention reading MAP			
Group	*n*	*M*	*SE*
1 - Control	58	154.90	1.012
2 - Experimental	78	158.27	.872

Table 4

Descriptive Statistics

Covariate: pre-intervention foundational skills MAP			
Group	*n*	*M*	*SD*
1 - Control	58	136.21	12.885
2 - Experimental	78	136.12	11.447

Table 5

Descriptive Statistics

Dependent Variable: post-intervention foundational skills MAP			
Group	*n*	*M*	*SD*
1 – Control	58	157.07	13.553
2 - Experimental	78	160.82	13.509

Table 6

Descriptive Statistics

Dependent Variable (Adjusted Means): post-intervention foundational skills MAP			
Group	*n*	*M*	*SE*
1 – Control	58	156.04	1.489
2 – Experimental	78	160.85	1.284

Results

Data screening

Data screening was conducted on each group's covariate and dependent variable. The researcher sorted the data on each variable and scanned for inconsistencies. No data errors or inconsistencies were identified. Box and whiskers plots were used to detect extreme outliers on each dependent variable. Although some outliers were noted on the box and whiskers plots, SPSS did not identify any extreme outliers for pre-intervention foundational skills MAP, pre-intervention reading MAP, post-intervention foundational skills MAP, and post-intervention reading MAP. In order to ensure that the SPSS program did not miss any extreme outliers, the researcher converted all data points to z-scores, and they fell within +3 and -3 standard deviations of the sample mean (Warner, 2013). See Figure 1 and Figure 2 for box and whisker plots.

Figure 1.

Box and whisker plots (covariate).

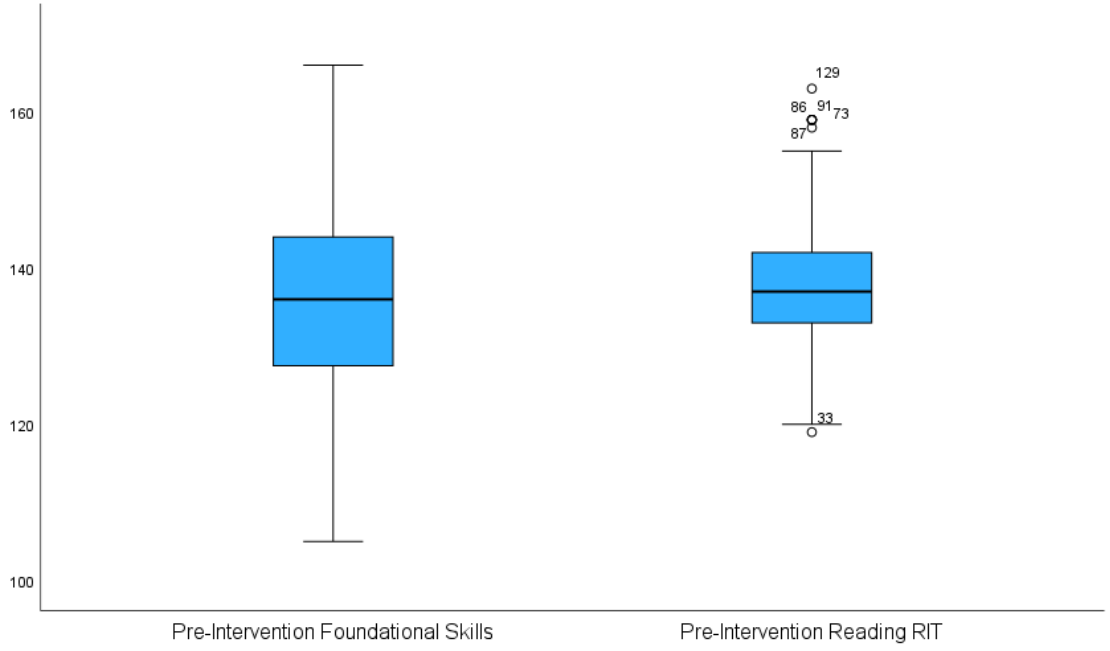
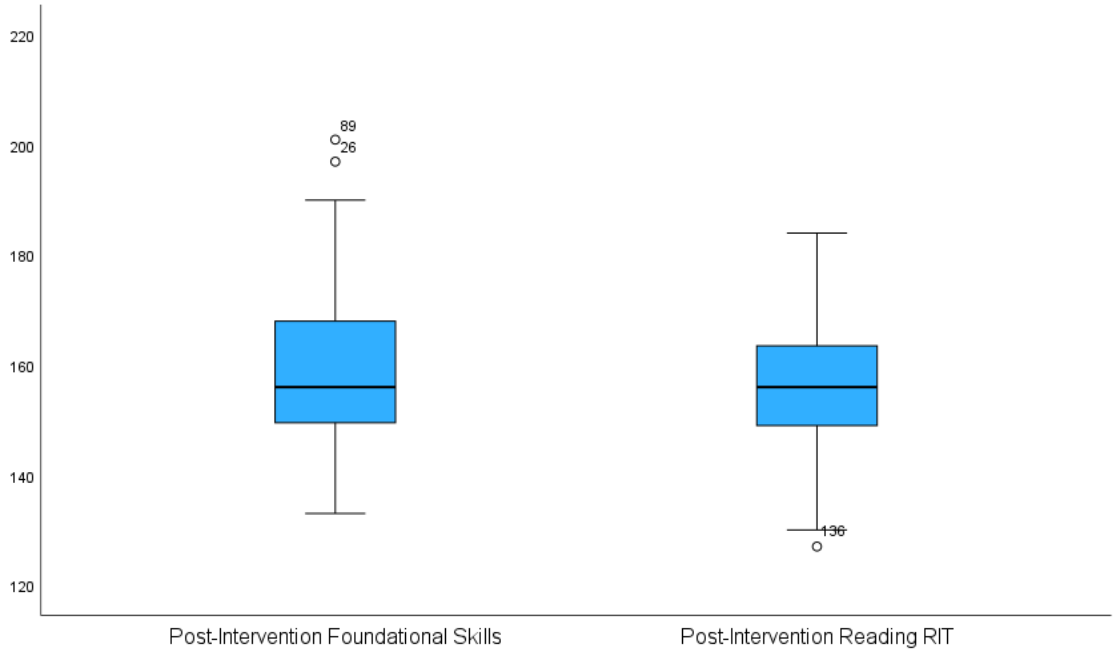


Figure 2.

Box and whisker plots (dependent).



Assumptions

An Analysis of Covariance (ANCOVA) was used to test the null hypothesis. The ANCOVA required that the assumptions of normality, assumption of linearity and bivariate normal distribution, assumptions of homogeneity of slopes, and the homogeneity of variance, are met.

Normality was examined using a Kolmogorov-Smirnov test. Kolmogorov-Smirnov was used because the sample size was more than 50. No violations of normality were found. See Tables 7 and 8 for Tests of Normality.

Table 7

Tests of Normality

		Kolmogorov-Smirnov		
	Groups	Statistic	*df*	Sig.
Pre-intervention reading MAP	1 – Control	.156	58	.001
	2 - Experimental	.130	78	.002
Post-intervention reading MAP	1 – Control	.090	58	.200
	2 - Experimental	.051	78	.200

Table 8

Tests of Normality

		Kolmogorov-Smirnov		
	Groups	Statistic	*df*	Sig.
Pre-intervention foundational skills MAP	1 – Control	.116	58	.052
	2 - Experimental	.073	78	.200
Post-intervention foundational skills MAP	1 – Control	.090	58	.200
	2 - Experimental	.051	78	.200

The assumption of linearity and bivariate normal distribution were tested using scatter plots for each group. Linearity was met and bivariate normal distributions were tenable as the shapes of the distributions were not extreme. Figure 3 and Figure 4 include the scatter plots for each group.

Figure 3

Scatter Plot for Control Group and Intervention Group MAP

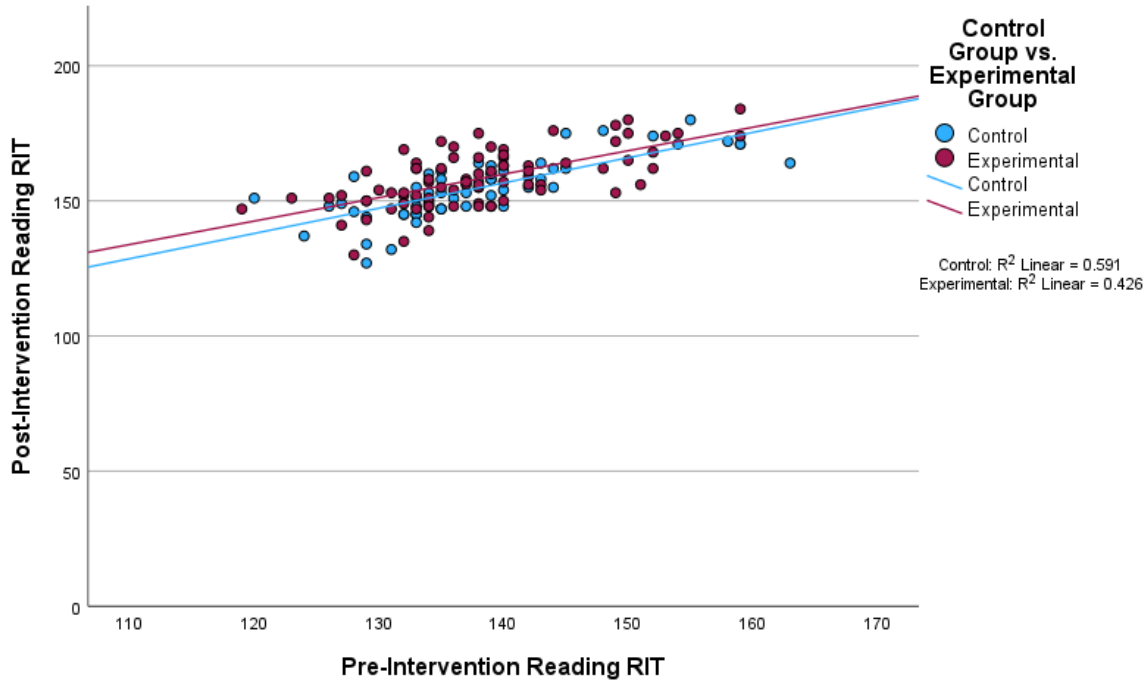
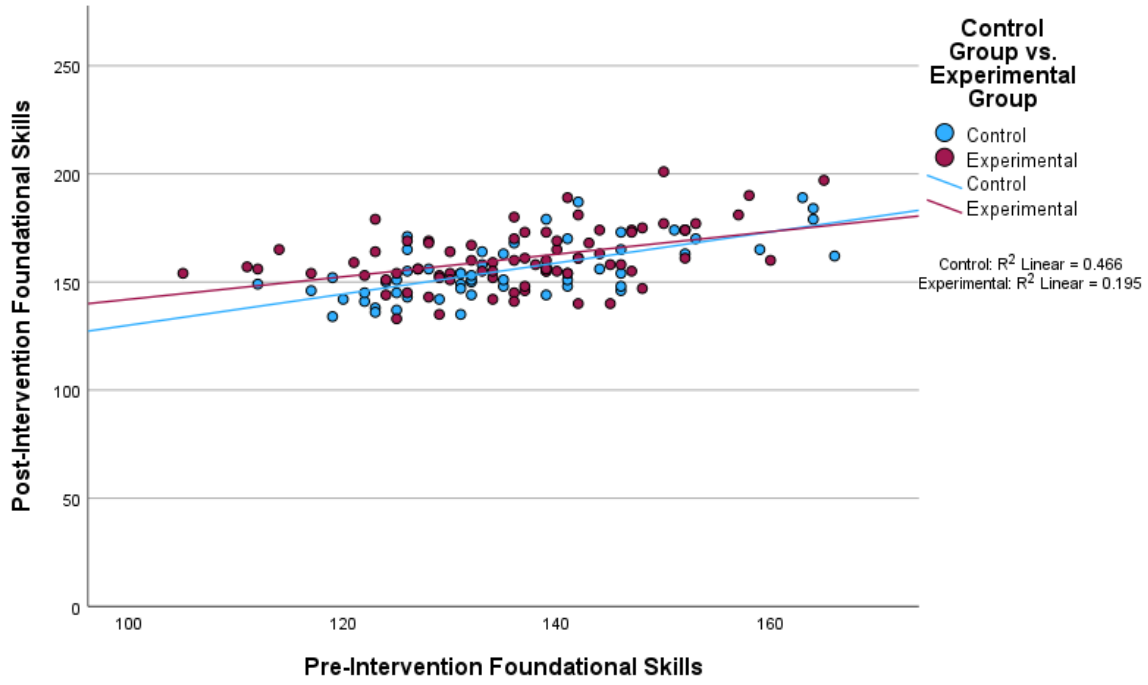


Figure 4

Scatter plot for Control Group and Intervention Group Foundational Skills MAP



The assumption of homogeneity of slopes was tested and no interaction was found in reading MAP where $p = .672$. Additionally, no interaction was found in foundational skills MAP where $p = .225$. Therefore, the assumption of homogeneity of slope was met. The assumption of homogeneity of variance was examined using the Levene's test. No violation was found where $p = .229$ for reading MAP and $p = .162$ for foundational skills MAP. The assumption of homogeneity of variance was met.

Results for Null Hypotheses

An ANCOVA was used to test the null hypothesis regarding the post-intervention reading MAP and foundational skills MAP while controlling for prior reading achievement. The first null hypothesis was rejected at a 95% confidence level where $F(1, 133) = 6.376$, $p = .013$, $\eta_p^2 = .046$. The effect size was small. Because the null was rejected, post hoc analysis was

conducted using Bonferroni procedure. There was a significant difference between the Control group (M_{adj} = 154.90, *SE.* = 1.01) and Experimental group (M_{adj} = 158.27, *SE.* = .87). See Table 9 for Multiple Comparisons of Groups. The second null hypothesis was rejected at a 95% confidence level where $F(1, 133) = 5.984$, $p = .016$, $\eta_p^2 = .043$. The effect size was small. Because the null was rejected, post hoc analysis was conducted using Bonferroni procedure. There was a significant difference between the Control group (M_{adj} = 156.04, *SE.* = 1.49) and Experimental group (M_{adj} = 160.85, *SE.* = 1.28). See Table 10 for Multiple Comparisons of Groups.

Table 9

Multiple Comparisons of Groups

Pairwise Comparisons

Dependent Variable: post-intervention reading MAP

(I) group	(J) group	Mean Difference (I-J)	*SE*	Sig.[b]	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Control	Experimental	-3.373*	1.336	.013	-6.016	-.731
Experimental	Control	3.373*	1.336	.013	.731	6.016

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Table 10

Multiple Comparisons of Groups

Pairwise Comparisons

Dependent Variable: post-intervention foundational skills MAP

(I) group	(J) group	Mean Difference (I-J)	*SE*	Sig.[b]	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Control	Experimental	-4.808*	1.966	.016	-8.696	-.920
Experimental	Control	4.808*	1.966	.016	.920	8.696

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

CHAPTER FIVE: CONCLUSIONS

Overview

The purpose of this study, the hypotheses, and how the literature supports the hypotheses are discussed in this chapter. The final chapter discusses the findings for both research questions. The chapter compares and contrasts the study's results with previous literature. The implications and limitations of the study are reviewed. Chapter 5 concludes with recommendations for future research.

Discussion

The purpose of this study was to determine if kindergarten students who receive video-based, whole group instruction of place, manner, and voicing of speech sounds demonstrate gains on reading assessments compared to kindergarten students who did not receive the intervention. The purpose was studied by completing a quasi-experimental pre-test/post-test control group research design study. The control group was comprised of 58 kindergarten students attending a school that provided the standard Phonics First curriculum but did not receive the video lessons on place, manner, and voicing (PMV) of speech sounds. The experimental group was comprised of 78 kindergarten students attending a school within the same district and close geographic area to the control school who were provided the standard Phonics First curriculum with the supplementation of video-based, whole group instruction of PMV of speech sounds.

As explored in the research, the shift towards the phonics-based approach to reading has resulted in a need for explicit instruction of the individual sounds in words (Petscher et al., 2020). Speech-language pathologists (SLPs) can be an important part of the educational team, working alongside teachers to help students who struggle with both speech sound disorders

(SSDs) and reading as research shows that direct instruction of speech sound production improves reading outcomes (Wise et al., 1999; Joly-Pottuz et al., 2008; Falth et al., 2017; Burgoyne et al., 2019; McLean et al., 2021).

Innovative service delivery models of speech therapy services are an area with limited exploration; the research has typically focused on language-based services in the whole classroom and articulation-based services in small groups (Roepke et al., 2019). A national push towards inclusive practices in special education indicates that SLPs need to be flexible in providing services in their least restrictive environment (LRE) to the maximum extent appropriate (Green et al., 2018). Currently a gap exists in the research specifically related to the area of effect service delivery for articulation or phonological treatment of SSDs in the whole classroom. More research has been needed to determine the efficacy of whole class instruction of speech sound production.

Virtual instructional practices could be an answer on how SLPs can treat SSDs in the whole classroom. Synchronous, asynchronous, and hybrid virtual learning environments were adapted following the onset of the coronavirus pandemic in the spring of 2020 (Barbierato et al., 2021). Synchronous learning is the most similar to traditional, in-person learning where an educator interacts via conferencing platforms with their students; however, there is limited research regarding the impact of synchronous learning in young elementary students (Alves & Romig, 2021; Basilaia & Kvavadze, 2020; Francescucci & Rohani, 2018). Asynchronous learning allows students to learn at their own pace, in their own time, with a teacher placed in a facilitative and assistive role; this role is a pedagogical shift, however, causing many educators to experience difficulties with creating authentic learning environments (O Ceallaigh, 2021). The use of videos is a method of instruction that can be used within traditional learning

environments, as well as in both synchronous and asynchronous learning environments (Hong et al., 2018). Again, there is a current dearth of research regarding the efficacy of video use in the learning of young elementary students (Skrylnikova et al., 2020). The SLP could potentially provide an innovative service delivery of SSD instruction by providing educators with video lessons which the educators can use to dynamically instruct and guide their students (Mayer et al., 2020).

Two research questions were addressed in this study. The first research question was: Is there a difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading Measures of Academic Progress (MAP)?

The first null hypothesis ($H_0 1$) states there is no difference in reading achievement scores among kindergarten students who receive whole group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the Reading MAP. Results of this research study found the experimental group had a statistically significant improvement of reading achievement compared to the control group on the Reading MAP, and therefore the researcher rejected the null first null hypothesis. The findings from this study support research from Double et al. (2019) stating that targeting phonics deficits in the classroom moves students from decoding the text to comprehending the text. This further supports research by Hoover & Gough (1990) that a focus on decoding will improve overall reading comprehension. Furthermore, this supports the efficacy of inclusive practices by the SLP by pushing into the general education classroom rather than pulling the student into a small group or individual therapy session (Green et al., 2018).

The second research question was: Is there a difference in reading achievement scores among kindergarten students who receive whole group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP?

The second null hypothesis ($H_0 2$) states there is not difference in reading achievement scores among kindergarten students who receive whole-group video lessons on place, manner, and voicing of speech sounds and those who do not when controlling for prior reading achievement as measured by the instructional area of Foundational Skills on the Reading MAP. Results of this research study found the experimental group had a statistically significant improvement of reading achievement compared to the control group on the instructional area of Foundational Skills on the Reading MAP, and therefore the researcher rejected the null second null hypothesis. These findings support research by Spear-Swerling (2018) indicating that the explicit instruction of phonemic awareness activities benefit all learners, not just those with reading deficits, and that using this instruction was a powerful tool for prevention rather than just remediation. As Foundational Skills is the area of the MAP most explicitly tied to phonics, and subsequently speech sound production, this study supports prior research conducted by Tambryaja et al. (2020) indicating the importance of speech sound production on reading achievement. This study further helps to fill a gap in the prior research regarding the effectiveness of targeting SSDs in the general education classroom, particularly via video-based instruction.

Implications

The ability to fluently read and comprehend text is a prerequisite to our current society and impacts the trajectory of a person's life (Adlof & Hogan, 2019; Livingston et al., 2018).

Elementary students who struggle with dyslexia find the ability to decode text slow and cumbersome, putting them at risk for academic failure (Adlof & Hogan, 2019; Barnes et al., 2019). Given the cognitive load of students with dyslexia is already high, educators must integrate explicit instruction of phonics into daily practice (Adlof et al., 2017). The use of video-based instruction is an increasingly prevalent tool that educators incorporate to instruct their students and reduce their cognitive loads (Lai et al., 2018; Wang et al., 2020). SLPs are professionals who can support students with phonological processing deficits, such as dyslexia, by providing explicit instruction of place, manner, and voicing of speech sounds in order to improve reading outcomes (Wise et al., 1999; Joly-Pottuz et al., 2008; Falth et al., 2017).

This study provides important evidence that video-based instruction of SSDs can be beneficial to the reading achievement of young, elementary school students. This supports the importance of the SLP as a part of the educational team. SLPs provide a different perspective of literacy that can be utilized by general educators, not just special educators. This study additionally supports the use of the whole group model of service delivery for SLPs in the instruction of SSDs. As students with SSDs make up a large portion of an SLPs caseload, the concept of whole group instruction for SSDs could potentially help SLPs maximize their limited time with their students by providing a service model that is both impactful and expeditious. Finally, this study supports the concept of using video-based learning for subjects other than SSDs; video-based learning could be a potentially viable resource for a variety of subjects and content areas in young elementary students. Given the increasingly technological world, it is vital that students can access and learn from multiple sources. Dynamic video learning, where the student is engaged with the video rather than merely observing the video, could be the next step in an educational revolution.

Limitations

A significant limitation of this study is that it was limited to two schools within one school district, and therefore the results of the study may not be generalized to other students in different populations. An additional limitation to this study is that testing data from 22 students were unable to be included from the control school, while only four students were unable to be included from the experimental school. This was due to the inclusion/exclusion criteria of taking the fall 2022 MAP at the control/experimental school and taking the spring 2023 MAP at the same school. One of the kindergarten classrooms at the control school was designated as a district *overflow* classroom. This meant that students were a within-district transfer from their boundary school to the control school until a spot became available at their boundary school. As a part of the data collection process, the researcher was unable to include the testing data from these students, as it could potentially impact the validity of the results. It is possible that with a sample size from the control school that was more comparable to the experimental school could have impacted the results of this study.

Recommendations for Future Research

The ability to fluently read impacts a student's achievement. Recommendations for further research include:

1. Expand this study to investigate the impact of whole group, video-based lessons on place, manner, and voicing on kindergarten students across additional schools within the same district of this study. This could provide further insight on the impact of the lessons on students from varying backgrounds within the same school system using the same phonics curriculum.

2. Investigate the impact of whole group, video-based lessons on place, manner, and voicing on kindergarten students across additional districts with differing phonics curriculums.
3. Reduplicate this study to include more districts across the state.
4. Widen this study to include more states with dyslexia specific legislation.
5. Conduct this study to include states without dyslexia legislation.
6. Conduct a qualitative study on teachers' perceptions on the usefulness and efficacy of the lessons to provide additional insight to findings reported during this study.

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APPENDIX A

Video Lesson Script

Hey everyone it's Mrs. Victoria and today we're going to be talking about the letter "D" which makes the sound /d/. And yes, "D" says /d/ not "duh". We have to clip off that yucky "uh" sound. So, let's get started!

So, the first thing we talk about with our sounds is the "place". Now remember the place is WHERE the sounds are being made. So what parts of your mouth are MOVING when you make that sound. So, let's say our /d/ sound five times, and I want you to really focus on which parts of your mouth are moving, okay? Let's try it: /d, d, d, d, d/. So what part of your mouth did you feel moving when you made that /d/ sound? You felt your tongue going up behind your teeth. So, your teeth are together or spread, and your tongue is kicking up behind your teeth. (Visual demonstration of gesture of sound kicking out from behind teeth). There's this bumpy part behind your teeth where your tongue is kicking and the science word for it is "alveolar ridge". But when I ask you what's the place of your /d/ sound you can just say tongue up behind teeth. So, what's the place? Tongue up behind teeth. Great job.

So now that we talked about the PLACE, we need to talk about the MANNER. So, remember, the placement is WHERE a sound is being made and the manner is HOW the sound is being made. It's the way the air is moving to make the sound. So we're going to say our /d/ sound five more times, but this time we're going to put our hand in front of our mouth and feel for that air. Okay, ready? Let's do it: /d, d, d, d, d/. So what kind of air did you feel hitting your hand? Did you feel little puffs of air? Or a long steady stream of air? You felt a puff! That's right, so when you feel the puff we call it a "stop" because the air is going "stop! Stop! Stop!"

(Gesture for stop). All right, so let's review. What's the place of our /d/ sound? Tongue up behind teeth. And what's the manner! It's a stop. Great job.

So now the last thing we're going to talk about is the voicing. Is your voice on or off? Is it voiced or unvoiced? So what we're going to do is we're going to put our fingers on our throat and we're going to feel for a tickle, or vibration, on our fingers. So, let's say our /d/ sound five more times and see: /d, d, d, d, d/. What did you feel? Did you feel a tickle? Or no tickle? Yes, you did feel the tickle which means your voice is on! That's right. Voiced. We felt the tickle, that means your voice is on. So, let's review: what's the place of your /d/? Tongue up behind your teeth. The manner is a: stop. And your voice is: on. Good job.

So now let's do some practice words and I want you to tell me if the /d/ sound is at the beginning, middle, or end of the word. Are you ready? Let's do it. Dog. Dog. /D/, /O/, /G/. The /d/ is at the…beginning. Good job. What about this next word: Mad. The baby is "mad". /M/, /A/, /D/. The /d/ sound is at the…end. Let's do the next one: hotdog. Hotdog. /H/, /o/, /t/, /d/, /o/, /g/. The /d/ sound is in the…middle great job!

So now we're going to talk about the path of movement. Now my camera does things in reverse, so I have to think in reverse and that messes up my hands sometimes, so check with your teacher about the actual directions, because I don't want to tell you the wrong way, BUT the VERBAL path for your Capital D is "Down, Around". "Down, Around". Okay, and the verbal path for your lowercase d is "Around, Up, Down". "Around, Up, Down". All right? Good job.

Now we're going to talk about our gesture. For every sound we have a gesture. So for this gesture we're going to take our fingers right by our teeth and kick our fingers up and out to go /d, d, d/. Okay? Great.

This is the link to your letter D song. You can watch this video with your teacher and make sure you're using your gesture and your path of movement for your d sound.

So, guys thank you so much for watching me! I hope you learned a lot, and I'll see you soon! Bye!

APPENDIX B

NWEA UAP MAP Approval

[redacted] MYRANDA VICTORIA [redacted]

NWEA Permissions

[redacted] Wed, Sep 14, 2022 at 8:25 AM

To: MYRANDA VICTORIA [redacted]

Hi Myranda,

I am so sorry I didn't get back to you. Our Legal team has no objections on you using the data as long as you have the district's permission. So in other words it is up to the district since the data belongs to them.

Thank you,

[redacted]

[redacted]

nwea believe in what's possible™

Here's how to use MAP Growth results to achieve great things

APPENDIX C
School District Research Review Committee Approval

February 21, 2023

Liberty University
[redacted]

Ms. Victoria,

I am pleased to inform you, the Springdale School District will support the data needed for your inquisition into "The Impact on Reading Achievement of Video-Based Whole Group Learning on Place, Manner and Voicing of Speech Sounds."

Ms. Victoria contacted my office by email during the fall semester of 2022 to recruit the Springdale Public Schools for the study. A timeline was established for the study, and Springdale Public Schools has agreed to allow Ms. Victoria to collect data to use in the study. No personal identifying information on the district or individual students will be collected or reported. If there is a need for additional information, Myranda Victoria has agreed to contact me.

Ms. Victoria will provide my office with a copy of the Liberty University IRB-approval letter before determining the sample of students to be involved in the study. Ms. Victoria has also agreed to provide a copy of the study's results.

If there are any questions, please feel free to contact my office.

Respectfully,

[redacted]

APPENDIX D
IRB Approval

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

March 15, 2023

Myranda Victoria
Laura Mansfield

Re: IRB Exemption - IRB-FY22-23-365 THE IMPACT OF VIDEO-BASED WHOLE GROUP LESSONS ON PLACE, MANNER, AND VOICING OF SPEECH SOUNDS ON READING ACHIEVEMENT

Dear Myranda Victoria, Laura Mansfield,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 1. Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Please note that this exemption only applies to your current research application, and any

modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at [redacted]

Sincerely,

[redacted]