

A MIXED METHODS STUDY OF KINDERGARTEN  
STUDENTS' EXPLANATION WRITING  
AND VOCABULARY ACQUISITION

by

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## ABSTRACT

Information text can be utilized to enhance both reading and science instruction in the kindergarten classroom. These books bring abstract concepts to life for young learners, and can serve as the focal point for numerous topics of study. Although many teachers incorporate information books into their teaching, it is important that teachers understand how to best harness the full instructional power of these texts. One pedagogical strategy teachers can employ to teach content knowledge, as well as reading comprehension is the interactive read aloud. As such, the goal of this study is to determine the impact of interactive read alouds with information text on kindergarten students' ability to convey their own understanding of science content through multiple modes (e.g., orally, written and drawn).

The research questions guiding this study focus on the role information text plays in student vocabulary knowledge and the ability to produce oral and written explanation statements, as these skills are vital to developing understanding of scientific concepts. Data will be collected through the examination of student samples of emergent writing, which includes drawings. The results of this study indicate two major findings: more written than verbal explanations were produced by students in both the intervention and nonintervention classrooms and a greater use of cause and effect statements produced by students in the intervention class. This study adds to the growing body of literature concerning the use of information text in elementary settings, while also providing teachers with a deeper understanding of the role that interactive read alouds with informational text support young children's writing in science.

## DEDICATION

To my mother and father, who help me in all things great and small,

and

To my many teachers, who inspired me to never stop learning

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## CHAPTER 1

### INTRODUCTION

Education has played a critical role in my life. My great aunt worked tirelessly to educate students in a two-room schoolhouse in a rural area of north Alabama. Her work in education inspired her niece, my grandmother, to spend thirty-two years educating students who were low-income and often marginalized. As a child in elementary school, my Aunt Lisa welcomed me into her first-grade classroom where I received my first experience teaching young children by reading aloud books such as *Harold and the Purple Crayon* and *Home for a Bunny*. I loved reading to her students, just as I loved when my teachers read aloud to me. As I reflect upon these formative experiences, I have come to understand how inspiring these experiences were and how they helped to ignite my love of reading which I have carried throughout my adult life. Perhaps, even more importantly, it is this passion for reading that has inspired children in my own classrooms over the years.

Upon graduating from my teacher education program, I was hired to teach at a primary school serving kindergarten and first grade students in northern Alabama. As a newly minted kindergarten teacher, I was trained to use nonfiction readers in small group guided reading instruction, and to occasionally include nonfiction read alouds during whole group instruction. However, as a novice teacher, it was evident that I lacked the depth of knowledge regarding how to use non-fiction text with my young students. My own use of non-fiction was superficial at best, and I certainly was not prepared to utilize these books to their full potential. However, as I gained more teaching experience over the years, I began to understand just how engaging non-

fiction texts, and particularly informational texts, could be when working with young children. These texts are opportunities for teachers to provide students with a way to understand content, rather than simply just focused on reading comprehension (Strachan, 2015). The increased emphasis on content found in informational texts seemed to capture my young students' interests and curiosity. Consequently, the students' own engagement then sparked my curiosity about how to best utilize this genre.

Since the implementation of the CCRS, primary grade teachers must be well informed about instructional practices that support literacy learning and content area learning even with young children. Information texts play an important role in scaffolding student understanding and are becoming more prominent in national and state standards. In recent years, many US states have adopted new standards in both science and literacy instruction. The adoption of these standards, known as the Common Core State Standards (CCSS, 2010), required educators nationwide to rethink their teaching as they developed new instructional practices to meet the requirements of the CCSS. In Alabama, the CCSS were adopted in combination with an existing set of curriculum standards. This resulting adaptation is referred to as the College and Career Ready Standards (CCRS, 2011) and is, at present, the most recent iteration of the Common Core State Standards in Alabama. Because this study will be taking place in Alabama, the educational standards referred to in this document will be drawn from the CCRS.

### **Purpose of the Study**

The new demands created by the College and Career Ready Standards (National Governors Association Center for Best Practices, 2010) coupled with my experiences as a graduate student, led me to explore research on the role of information text in the primary grade classroom and how teachers can best support kindergarten students' literacy development *and*

increase their understanding of science concepts. In order to meet the needs of the CCRS (2010), I have incorporated information text into my own classroom; coupled with the implementation of motivational techniques (Guthrie & Klauda, 2014) that include: (1) interactive read alouds, (2) hands-on activities, (3) group discussions, and (4) associated writing. However, I have not collected data on the impact this instructional shift has made on my students' ability to utilize scientific vocabulary to produce their own explanations about scientific topics. As such, the goal for this proposed study is to shed light on the use of interactive read alouds to present information text as an instructional tool to develop students' scientific thinking. Further, the findings from this study can be helpful to educators and researchers to understand how to improve integrated literacy and science instruction in other kindergarten classrooms thus laying the groundwork for increased science achievement in upper elementary and secondary grades.

While a substantial amount of research has been done on the benefits of informational text in science instruction, many teachers are still failing to use these texts to their full potential (Donovan & Smolkin, 2002; Ness, 2011). Through challenging students to create their own informational texts, using teacher modeling of nonfiction books as an example, students can harness these instructional practices to create authentic learning and develop greater understanding of the material (Kuhn, et. al., 2015; Guthrie & Klauda, 2014). While this method of instruction has been studied in first, second, and third grades, there is a noticeable gap in this research with kindergarten students (Coleman, Bradley, Donovan, 2012; Duke, Purcell-Gates, Hall, & Tower, 2006; Wollman-Bonilla, 2000). Due to the emerging nature of kindergarten student writing, it is understandable that researchers and educators alike are wary to undertake a study of this nature with our youngest writers. However, the increased need for science understanding coupled with the rigor of writing instruction in the upper elementary grades

(Calkins, 1994; Clay, 1987) calls for teachers of all students, including kindergarteners, to begin using instructional practices that prepare students to think and to communicate critically about science concepts.

I believe that young students can be challenged to think critically in an engaging and developmentally appropriate way. The success of utilizing student created nonfiction text with older students is proof that this is an engaging and educationally beneficial practice. By juxtaposing student created non-fiction texts with an understanding of the characteristics of emergent writing, practitioners and researchers can provide kindergarten students with an engaging instructional practice while preparing them for the academic challenges they will face in later grades.

Providing kindergarten students with the opportunity to develop scientific writing while in the emergent writing phase increases their understanding of science concepts as well as their ability to produce explanatory writing, a genre heavily used in upper elementary grades (Calkins, 1994; Seah, 2015). Exposing the very youngest writers to this genre will provide an opportunity to develop understanding that will lay the framework for success in upper elementary science and writing. By creating their own drawings and books, kindergarten students are given the opportunity to express their learning in concrete, meaningful ways while also implementing emergent writing practices, providing a rehearsal for the technical science writing required in upper elementary grades (Calkins, 1994). This study also sought to utilize science information text as a medium for authentic learning (Duke, Purcell-Gates, Hall, & Tower, 2006) and vocabulary instruction (Rimbey, McKeown, Beck & Sandora, 2016) in two kindergarten science units on polar animals and winter weather. Following instruction, students created their own scientific explanations and definitions technical vocabulary terms. Through the use of writing,

images, and retellings, kindergarten students were provided an opportunity to showcase their learning through the application and explanation of the concepts presented in the instructional units (Moline, 2012; Coleman, Bradley & Donovan, 2012).

This study also provided an understanding about the benefits of using informational science text as a tool to support young children's literacy and science learning when used appropriately in the kindergarten classroom. Further, the study serves as a model for practitioners on how to utilize nonfiction text as a valuable instructional tool, rather than just a fleeting read aloud. The results of this study also add to the growing body of literature on students' informational writing and the role student writing plays in developing understanding of science-based concepts. Because this study took place with a population of forty students in a single primary school, it can and should be replicated to determine the impact of these instructional strategies with broader student populations. Ultimately, this study serves to begin the conversation about challenging kindergarten students to create their own nonfiction texts using science trade books as models.

### **New Standards and the Increase in Informational Text in the Primary Grades**

In the following section, I present the background information that is essential to contextualize the study. First, I begin with a discussion of the shifts in the educational climate that have resulted in greater demands on both primary grade teachers as well as the rise in expectations for literacy and science achievement in young learners. Next, I discuss the opportunities non-fiction text affords primary grade teachers when teaching children literacy skills and science concepts. Finally, I highlight the role that interactive read alouds and student generated non-fiction books play in supporting learning in both literacy and science for young children.

## **A Shift in Educational Climate: New State Standards and Rise in Student Expectations**

As Common Core State Standards (CCSS, 2010) were adopted nationwide, Alabama implemented the CCSS, along with selected state standards, to create the Alabama College and Career Ready Standards (CCRS, 2011). The CCRS are currently in place in the state of Alabama and include both the Common Core State Standards for literacy (CCSS), as well as the Next Generation Science Standards (NGSS Lead States, 2013). The partnering of the NGSS and CCRS make Alabama's standards unique, lending to the importance of educational research in the state.

The need to develop students' ability to create scientific explanations is also critical. In the 2015 National Assessment of Educational Progress (NAEP), fourth graders across the state of Alabama scored eight points below the national average in science skills. Further, this negative trend increased as students entered the secondary grades. In the same study, eighth grade students' science scores were found to be twelve points below the national average (NAEP, 2015). Given that scientific understanding is largely built upon children's abilities to talk about and to craft explanations, it is evident that Alabama's students lack the skills needed to succeed in the discipline of science.

Due to the implementation of the CCRS, there was a significant shift in the kindergarten curriculum in Alabama. The focus of these standards for kindergarten students is to "actively engage in reading and science lessons with purpose and understanding (Alabama College and Career Ready Standards, 2013). These new standards challenge students to think critically about scientific topics and apply their thinking in realistic ways (Matnzcopoulos & Samarapungavan, 2009). In addition, these standards also require kindergarten students to interact with text in a group setting and to think critically about the features of texts.

Given the increased expectations for student learning as described in the CCRS, a shift from the traditional notions of kindergarten literacy instruction demanded a much more integrated approach to supporting young children’s literacy learning as well as their knowledge of the world around them. For example, before the implementation of the CCRS in Alabama, the literacy instruction in my classroom focused mainly on supporting children’s phonemic awareness and phonics knowledge. In addition, the majority of the books in my classroom were decodable texts and leveled readers that I used for small group reading instruction. Further, although, I occasionally incorporated information book read alouds into my classroom, I only knew how to use these texts to teach reading comprehension skills. However, it became evident that I needed to be able to integrate my instruction by way of teaching both content (in this study science content specifically) utilizing information texts—one important tool to meet this goal. It was clear, the time had come to change the way I approached both literacy and science instruction.

### **Benefits of Nonfiction Science Texts in the Primary Grades**

Significant research has been conducted to determine the most effective ways to implement information text in the elementary classroom (Coleman, Bradley, Donovan, 2012; Duke, Purcell-Gates, Hall, & Tower, 2006; Kuhn, et. al., 2015; Korth, et. al., 2016; Wollman-Bonilla, 2000). In the past decade, the use of informational text to supplement science instruction has become widely accepted by many elementary educators (Maloch & Horsey, 2014; Maloch & Bomer, 2013; Jeong, Gaffney, & Choi, 2010; Young & Moss, 2006). However this instructional tool must be used in explicit ways to provide students with the maximum instructional benefit (Korth, et. al., 2016). These methods include inviting students to discuss the features of

information text through discussion of the content and key vocabulary terms, as well as through inviting students to create their own information books based on the texts read in the classroom.

Informational text holds a great deal of promise for providing students with a model to develop their own understanding of scientific concepts; information text also provides content through the use of explanation statements, while engaging readers with both words and visual representations to convey meaning (Reed & Weber, 1990). Nonfiction text can provide students with concrete understanding of scientific concepts that prevent the notorious “fourth grade slump” (Torrance, 1967), a time when students traditionally experience difficulty understanding increasingly difficult text as the focus of instruction shifts on reading to learn rather than learning to read (McNamara, Ozuru, & Floyd, 2011).

One effective way to implement nonfiction texts is through instruction on technical vocabulary (McTigue & Flowers, 2011). The use of technical vocabulary provides a springboard for conversation about discipline specific words (Foorman, Koon, Petscher, Mitchell, & Truckenmiller, 2015). The use of technical vocabulary makes nonfiction text a useful instructional tool if used appropriately by teachers. However, simply reading these terms aloud does not support young children’s ability to unlock the power of these resources (Coleman, 2010; Coleman, Bradley & Donovan, 2012).

In addition to engaging readers with words, information text can also increase motivation when used as a method for science instruction. Using Concept Oriented Reading Instruction (CORI) (2014), researchers have found that incorporating motivational practices with information text create a drastic increase in student comprehension. These motivational practices include collaborating with classmates, participating in hands-on activities, and creating writing related to the topic. Using this approach with middle school students, comprehension of

informational text increased significantly more than using a traditional reading approach (Guthrie & Klauda, 2014).

Practitioners and educational researchers have noted the power of information text to support students' vocabulary development (Strachan, 2015), which in turn supports content learning. In short, when used as a teaching tool over the course of an integrated science and literacy instructional unit, informational text has been shown to develop students' understanding of science concepts, increase their motivation to learn, and enhance vocabulary acquisition (Coleman, Bradley, & Donovan, 2012; Duke, Purcell-Gates, Hall, & Tower, 2006; Kuhn, et. al., 2015; Korth, et. al., 2016; Moline, 2011; Wollman-Bonilla, 2000). Accordingly, this study adds to this body of literature as there is a gap in the research regarding young children and the development of explanation writing, a form of scientific writing. Further, given that the nature of young children's unconventional writing, it is difficult to capture their thinking through writing.

### **Explicit Instruction in Reading and Writing Informational Science Texts**

Explicit instruction is vital to provide students with a framework for understanding and utilizing the information brought to life by nonfiction (Coleman, McTigue & Smolkin, 2011; Coleman, Bradley, & Donovan, 2012,). Because a great number of young students misinterpret features of information text (McTigue & Flowers, 2011), it is imperative that teachers become aware of the need for explicit discussion and explanation of text features. Unfortunately, many elementary teachers do not know how to capitalize upon the unique features of non-fiction text as they often gloss over important information presented in these texts (Coleman, 2010). In a 2010 study, Coleman found that the number one practice reported by elementary school teachers using graphical representations was pointing to visual information. Simply pointing out visuals to students is not sufficient (Coleman, 2010; McTigue & Flowers, 2011; Unsworth, 2001), and

instead teachers must constructively talk through the meaning of visual representations in text, as well as provide students with an opportunity to create their own visuals in order to utilize information text to their full potential (Wollman-Bonilla, 2000; Purcell-Gates, Hall, & Tower, 2006).

One method of explicit instruction encourages students to draw their own graphical representations from reading material. In a 2012 study, Coleman, Bradley and Donovan allowed second grade students to create their own informational science texts, based on those read in the classroom. Through drawing attention to visuals in model science texts, students were able to convey their own understanding of science concepts, in both words and pictures (Coleman, Bradley, & Donovan, 2012).

A second method of explicit instruction with nonfiction texts focuses on engaging students in writing about their understanding of text. Duke, Purcell-Gates, Hall and Tower (2006) followed second and third graders using authentic literacy activities as they composed their own informative and procedural texts. Authentic literacy activities were defined as reading and creating nonfiction texts. In this study, students created texts for a purpose, to convey meaning to their classmates or audience members. Teachers reported increased student motivation and ability to construct scientific concepts within the information genre through the use of nonfiction texts as both models and prompts for student writing (Duke, Purcell-Gates, Hall & Tower, 2006). Through creating their own writing, students are able to showcase their understanding of a topic, while simultaneously supporting their learning.

Finally, explicit instruction using nonfiction texts may include writing scientific journals. Wollman-Bonilla (2000) conducted a study examining the use of nonfiction science writing with emerging first grade writers. In this study, students were encouraged to describe the science

concepts discussed in their classroom with family members through the use of science journals (Wollman-Bonilla, 2000). Similar to the use of information books, these journals provided students with a medium to share their learning in meaningful ways using their own words and drawings.

### **Science Instruction with Information Texts in the Primary Grades**

In the following sections, I explore specific strategies and considerations for using science texts in primary grades.

#### **Interactive Read Alouds with Science Information Text**

To harness the full power of information text, teachers must read books aloud in a way that invites students to make connections and develop deep understanding of the concepts presented in the text. As such, to capitalize upon the full utility of information text in the kindergarten classroom, teachers can utilize the interactive read aloud. Interactive read alouds provide the opportunity to scaffold student understanding through modeling comprehension strategies and pausing during reading to discuss vocabulary and important concepts (McLure & Fullerton, 2017).

Interactive read alouds require teachers and students to authentically interact with a text during repeated readings. While reading, teachers pause to discuss the text and ask questions. This practice allows students to scaffold their understanding of the material, building reading comprehension (McGee & Schickedanz, 2007). This instructional practice can also increase students' content knowledge when reading information books about science, social studies, and other topics. Interactive read alouds require a text to be read aloud at least three times, each time focusing on different comprehension skills. Vocabulary is also highlighted during interactive

read alouds, providing students with the opportunity to notice the word in the text, and use the word in context during discussions with peers and teachers (McGee & Schickedanz, 2007).

When teachers read nonfiction text to students they expose students to new ideas represented by visual information and technical vocabulary (Donovan & Smoklin, 2002; Varelas & Pappas, 2006) By discussing the text and the visuals explicitly during an interactive read aloud, teachers use these books as a vehicle to develop talk and explanations around specific science concepts. The scientific explanations provided and modeled by teachers during the interactive read aloud help to strengthen and to support young children's own use and understanding of scientific vocabulary, which in turn also contributes to their overall understanding of these concepts. By talking productively and authentically about science, children are able to develop skills that are vital to critical thinking and understanding in the upper elementary and secondary grades (Strickland & Townsend, 2011).

Information text also provides students with the opportunity to explore explanations. This is an important concept, particularly in science instruction. The Next Generation Science Standards (NGSS) require students to be able to understand and produce explanations about scientific topics (NGSS Lead States, 2013). In addition, the expectation to create scientific explanations increases as students reach upper elementary and secondary grades (NAEP, 2015). Exposing kindergarten students to explanation statements in text, and subsequently encouraging young students to create their own explanations through writing, drawing, and talking, provides students with a foundation for the development of more sophisticated explanation statements as they enter the upper elementary grades. By engaging young students in the act of creating science explanations, teachers can lay the framework for scientific thinking well into their future schooling (Donovan & Smolkin, 2011). Reading information text aloud to students provides

examples of scientific explanations. These read alouds provide an excellent foundation for students to begin to develop their own verbal scientific explanations.

### **Teacher Professional Development with Interactive Read Alouds**

Teachers must receive instruction about how to effectively use interactive read alouds specifically with information text (Duke & Bennett-Armisted, 2003; Strachan, 2015). Initially, teachers must understand how to best choose information text to read aloud for classroom use (Donovan & Smolkin, 2002). Further, teachers should spend extensive amounts of time modeling and describing visuals in nonfiction text, (Bradley, Coleman & Donovan, 2012) as well as describing technical vocabulary and allowing students to utilize vocabulary in every day speech (Rimbey, McKeown, & Beck, & Sandora, 2016). Another way that teachers can support children’s literacy and scientific understanding through the use of interactive read alouds is to encourage and support students’ own abilities to create their own writing and visual information to inspire critical thinking and explanations regarding the unit of study.

### **From Interactive Read Alouds to Writing in Science**

Student generated nonfiction text can serve as a medium by which students express their understanding of scientific concepts. Kindergarten students can use their own writing to convey explanations in a variety of literacy mediums. As stated by the CCSS, students should be able to convey their understanding using a “combination of writing, drawing, and verbal retelling” (National Governors Association Center for Best Practices, 2010). Student generated information books provide a medium for students to craft their own explanation statements using these mediums.

Kindergarten students require explicit instruction, as well as modeling and scaffolding, in order to write independently (Matnizicopoulos & Samarapungavan, 2009)). This is especially

important with dealing with information text that features language that can be difficult for young students to understand (Halliday, 1993; Donovan & Smolkin, 2002). Many of the concepts and phenomena students encounter in science instruction are those that students have not experienced first-hand. Consequently, young learners are more likely to misunderstand or misinterpret the explanations of even the most experienced teacher. Visuals and graphical representations (e.g., diagrams and visual displays) in nonfiction text can bridge this gap in understanding and provide teachers with an effective instructional tool to model and discuss scientific concepts (Coleman, Bradley, & Donovan, 2012).

### **Theoretical Framework: Social Learning Theory**

Students' creation of informational text provides an opportunity to display learning and mastery of the concepts presented in the instructional units. Bandura's social learning theory (1977) is founded on the importance of observational learning, imitation, and modeling. Bandura asserts that modeled behavior serves as a cue to stimulate similar behavior in others. Social learning theory utilizes both environmental and cognitive factors to explain the learning process. Bandura states that learning begins with environmental observation, much like students observing a teacher during instruction. Following this stage, the emphasis shifts from the environmental to the cognitive, as learners retain what they have observed. Finally, learners reproduce what they have observed and retained, reinforcing the behavior and resulting in motivation to continue the behavior, specifically based on the feedback and experience received during the reproduction stage.

In the classroom, a teacher can model the appropriate use of nonfiction text by spending multiple days revisiting the text (Coleman, Bradley & Donovan, 2012) and discussing technical vocabulary in authentic, relatable ways (Beck, Perfetti, & McKeown, 1982). These behaviors

provide students with a framework to react with text in authentic ways, and can spark authentic talk and discussion on a subject, creating greater understanding of the concept. Students then imitate the behavior that has been modeled by the teacher as they create their own nonfiction texts, using visuals and words to display their own understanding of the concept.

Reproduction plays a crucial role in social learning theory. Through the reproduction of modeled behavior, students are able to convey their understanding of the topic. Bandura's theory also states that reproduction can lead to increased motivation in learners, increasing the likelihood that the behavior will be repeated in the future. Studies have shown that creating informational text is highly motivating to students (Coleman, Bradley, Donovan, 2012; Duke, Purcell-Gates, Hall, & Tower, 2006; Wollman-Bonilla, 2000; Guthrie & Klauda, 2014) increasing the opportunity for learning and the likelihood that students will remember the concepts long after the teaching is finished. This study's emphasis on the generation of technical vocabulary definitions and student crafted explanation writing to convey application of learning is directly in keeping with social learning theory, creating a meaningful theoretical foundation for this study.

### **The Study**

In the following sections, I provide an outline of the gap in the literature, research questions, assumptions, limitations, definition of terms, and organization of the study.

#### **Gap in the Literature**

Despite the significant amount of research conducted concerning effective implementation of information science text in the elementary classroom, there is still a gap in the literature. While these studies (Coleman, Bradley, & Donovan, 2012; Duke, Purcell-Gates, Hall, & Tower, 2006; Wollman-Bonilla, 2000) provide a model for effective instruction using

information science text, these instructional practices have not been extensively studied in the kindergarten classroom. For example, many kindergarten students do not engage in conventional writing (Mayer, 2007), creating a challenge for researchers. In order to successfully study kindergartners' writing, researchers must have a significant understanding of emergent writing. Emergent writing is categorized by a child's realization that writing is a form of communication and that marks on paper convey a message (Mayer, 2007; Clay, 1987). This realization can take many forms including the drawing of lines mimicking text, unintelligible letters or letter strings, and words written phonetically, or "sounded out" by the student (Gerde, et. al., 2015)

Due to the unconventional nature of kindergarten students writing, further study is needed to apply these instructional concepts in the kindergarten classroom with emergent writers. Kindergarten students present a unique challenge due to their emerging writing capabilities (Mayer, 2007; Clay, 1987) and many practitioners find it difficult to challenge these young students to write about higher order thinking, science based concepts (Korth, et. al., 2016). However, I argue that through the use of research-based instructional strategies, even kindergarteners can and should be challenged to write in meaningful ways about their learning. Researchers must simply consider the use of multiple modalities when creating and assessing young children's writing. As emergent writers, kindergarten students may convey meaning through writing words or letter strings, drawing pictures, or orally retelling their story (Clay, 1987). Studies that consider such modalities as this are needed to provide a basis for science based writing instruction with young children.

### **Statement of the Problem**

It is evident information text can lead to increased understanding of science concepts and the ability to think critically. Information text is a tool that teachers can use to provide students

with opportunities to engage in authentic science based discourse. In addition, supporting young children in discipline specific literacies can be appropriate when young learners are involved in the actual practices of science and literacy. In content area literacy instruction, children read and write to acquire new content knowledge about the world around them (Flushman, 2012; Shanhan & Shanahan, 2012). Research (e.g, Chall, Jacobs, & Baldwin, 1990) has attributed the “fourth grade slump” to a lack of content area literacy instruction, particularly with information text, in the primary grades (Chall, Jacobs, & Baldwin, 1990; Duke, 2000). Further, the shift in the educational climate (see earlier) has placed new demands on primary grade teachers and their abilities to support the literacy and science learning of young children.

Despite the benefits of incorporating information text into instruction, this genre is not used to the fullest potential in many primary classrooms (Baird, et. al., 2016). Consequently, these missed opportunities by teachers to utilize non-fiction text decreases the opportunities for children to discuss science concepts with adults and peers. Often, when teachers use information text, they incorporate less discussion of the author and the language than when reading narrative or fiction text (O’Hallaron, Palinscor, & Schleppengrell, 2015). Despite the fact that young students are as capable of understanding informational text as narrative text (Pappas, 1991) primary grade teachers are often reluctant to incorporate this genre into instruction. This can be attributed to a lack of understanding about the benefits information text provide for young students (Flushman, 2012) and a lack of understanding about how to successfully implement information text (Baird, et. al., 2016).

In order to increase the use of information science texts in the primary classroom, teachers must be educated on how to successfully use these texts in instruction. Kindergarten students must learn how to comprehend nonfiction text through direct instructional practices

(Smolkin & Donovan, 2001). Students must understand the text as a message that has been constructed by an author to convey meaning to the reader (O' Hallaron, Palinscor, & Schleppengrell, 2015). It is vital that teachers incorporate conversation and special cues when reading nonfiction text to support students understanding (Hannus & Hyona, 1999). In order to provide students with a framework to build understanding teachers must engage in the process of thinking aloud. This can be achieved through the use of interactive read alouds.

### **Research Questions**

The primary concern of this research is to explore the role of interactive read alouds with informational science text on kindergarten students' understanding of technical vocabulary and explanation of science concepts. In order to refine this broad concept, I developed two research questions to determine the specific impact of interactive read alouds with information text on student understanding. The research questions are as follows:

1. How does an integrated science unit, featuring interactive read alouds, support kindergarten students' ability to understand and explain science concepts, as determined by their own explanation writing?
2. What is the relationship between science information text and kindergarten students' ability to explain scientific concepts using age appropriate technical vocabulary?

### **Assumptions**

1. Participants were selected using purposive sampling measures, providing a range of students from different ability levels. It is assumed that teachers will be truthful in selecting students to participate in this study

2. The teacher in the intervention group will follow the instructional outline described in Appendix C. The non-intervention group teacher will follow traditional instructional practices.

### **Limitations**

1. Pre- and post vocabulary knowledge rubrics and student interviews will be collected during a limited time period, between January and February 2018.
2. Data will be collected from forty kindergarten students. This limited number of students presents an opportunity for this study to be replicated in different environments with a larger number of students.
3. Data will be limited to two kindergarten classrooms in the same school in north Alabama. Therefore, results provide descriptions within the particular context of the school. For a description of the school see Chapter 3.

### **Definition of Terms**

It is important to define the following terms in order to develop shared meanings between readers and the researcher:

*Emergent Literacy:* A child's knowledge of reading and writing skills before they learn how to formally read and write.

*Emergent Writing:* The unconventional ways children write to convey meaning. Writing develops on a continuum and students' markings become more sophisticated over time, beginning to resemble conventional writing.

*Explanation Writing:* A form of information writing that is characterized by the use of explanatory clauses, featuring a description of conditions, effects, causal explanations and purpose statements.

*Information Text:* A form of nonfiction text that provides information on a topic.

Information text often features a large number of visual diagrams and technical vocabulary that are necessary to understand to garner meaning from the text.

*Next Generation Science Standards:* Science standards designed for K-12 students. These standards were designed to prepare students for careers in technical and engineering fields.

*Interactive Read Alouds:* Books that are read aloud by a teacher to an entire class or a whole group of students. Interactive read alouds provide time to stop and analyze specific features of the text and to converse about topics such as a vocabulary word or an image in the text.

*Trade Books:* Book typically written by one author that is intended to be read aloud to children.

### **Organization of the Study**

The report of this study is organized in the following manner. Chapter 2 presents a review of relevant literature concerning social learning theory, emergent literacy and writing, multimodal approaches to literacy, the impact of vocabulary on scientific explanation, the benefits of using information text to guide science instruction, and the nature of explanation writing in science instruction. Chapter 3 discusses a detailed explanation of proposed research methodology along with a description of data analysis procedures. Chapters 4 and 5 present results of the analysis, findings, conclusions, and discussions addressing recommendations for further research.

### **Summary**

Chapter 2 provides a literature review of the literature relevant to this study. The literature review discusses how kindergarten students learn and applies this understanding to

both writing and science instruction. An in depth discussion on the benefits of utilizing information text to teach young students is also provided. This discussion leads into an analysis of research regarding scientific learning, with a focus on scientific explanations. Chapter 3 discusses the methodology for the proposed study and outlines data collection and analysis, as well as the proposed instructional science unit that were implemented in a kindergarten classroom. Chapter 4 provides an analysis of data while Chapter 5 provides a discussion of this data.

## CHAPTER 2

### REVIEW OF THE LITERATURE

The primary purpose of this study was to determine the impact information text has on kindergarten students' ability to produce explanation statements about scientific concepts and the impact information texts have on students' ability to properly utilize the technical vocabulary necessary to create these explanations. In order to fully understand the impact information text can have on kindergarten instruction, teachers must first become familiar with how kindergarten students learn, how informational text is most effectively used in kindergarten instruction, and the standards kindergarten teachers are expected to teach their students. In the following sections, I outline theoretical frameworks and research pertaining to information texts in science and kindergarten students writing of scientific texts.

#### **Theoretical Frameworks**

Many theories can be used to describe how kindergarten students process information texts and complete scientific writing. Specifically, I describe social learning theory and emergent literacy theory and how these theories describe scientific writing and information texts.

#### **Emergent Literacy Theory**

**Emergent Literacy.** Clay (1987) produced seminal work regarding the development of emergent literacy in children. Clay's original work was motivated by students' literacy performance during the first year of schooling and these students' resulting literacy development. Clay (1987) found that students who struggled to acquire literacy skills during

their first year of schooling continued to struggle with literacy development in subsequent years. Given her extensive work with children, her initial work was the basis for the idea of emergent literacy. Further, this work was also instrumental in providing a developmental continuum based upon stages of reading and writing development in children. Still today, this developmental framework informs teacher educators, practicing teachers, and literacy researchers as they seek to develop and use practices that support the literacy development of children.

In order to provide young children with a framework to develop literacy skills, Clay sought to define optimal literacy development in young children. Through application of developmental psychology practices, Clay documented children's behavioral performances in reading and writing tasks, beginning with children in the first year of schooling. Teale and Sulzby (1986) and Goodman (1986) assert the process of becoming literate begins at birth and development continues as students interact with print in the world and continues as reading becomes necessary to understand and to communicate with others. In a 2016 study, Piasta found emergent literacy encompasses children's oral language, their ability to recognize and identify sounds within words, knowledge of conventions of print, and an understanding of the alphabet and letter-sound correspondence.

From an emergent literacy perspective, there is no official starting point to beginning literacy. Students become prepared to begin learning to read and write by their environment rather than by the acquisition of a certain set of skills (Piasta, 2016). Because children are constantly learning new skills based on language and print in their environment, Clay (1967) and Goodman (1986) believe it is reasonable to believe that kindergarten students can develop drawings and writing to convey their understanding early on in their literacy development.

Through exposure to information text, students can begin to craft drawings and writings that utilize the features of these texts to convey their own understanding. Reading and writing are inextricably linked, and these skills develop in conjunction with one another. In order to understand literacy development, the link between reading and writing must be carefully examined.

Clay's (1975) work not only sheds light upon the construct of emergent literacy, but her work also led to the development of a writing continuum that children progress through as part of their literacy development. Similar to learning to read letters and words in print, students also progress through a series of stages in their writing abilities if they are to grow into successful writers. In her seminal work *Words this Way*, Clay (1975) describes these stages as principles. Each of these principles has certain characteristics that are foundational to the development of traditional writing skills. These principles include the recurring principle (writing repeated words or phrases to establish habitual patterns and produce feelings of competence), the directional principle (understanding that print is written from left to right and top to bottom), the generating principle (combining elements of writing in an inventive fashion), and the inventory principle (taking ownership of learning by writing or listing known concepts), the abbreviation principle (understanding that words are composed of letters that stand for fuller forms of words), and the flexibility principle (repositioning or decorating standard letters to explore the limits within each letter may be changed and still retain its identity and meaning). Given that Clay's work is largely the foundational to understanding the literacy development of young children, many developmental stages of writing have been created using her work as a model. A listing of stages created by Calkins, Eherenworth, & Lehmen, (2012) is detailed in the following sections.

**Preconventional stage.** The first stage is the known as the preconventional stage and typically appears in students aged three to five. During this stage, students use pictures or scribbles to convey meaning in their stories. Further, students in this stage can legibly write their first name and are aware that print expresses meaning. However, students are only using scribbles or nonsensical letter strings to represent formal writing. In other words, they understand that print carries meaning but do not yet have letter, sound, and symbol correspondence. It is important to note that students in this stage can tell a peer partner or an adult about their writing, despite the lack of traditional words or sentences.

**Emerging stage.** The second stage is the emerging stage and is exhibited in students aged four to six. In this stage students can dictate or draw pictures to represent their ideas. Students understand the relationship between letters and sounds and begin to roughly sound out and write words using capital letters. These words are often made up the beginning and ending consonant sounds. In this stage, students may pretend to read their own writing verbatim to a peer partner or adult. While the student is not actually reading what has been written, they are able to convey the meaning of their work.

**Conventional stage.** The conventional stage is the third stage of the writing continuum and is typical of students aged five to seven years old. In this stage, students can independently write names and sight words as well as one to two sentences about a given topic. Students begin to write in the traditional left to right, top to bottom format and use both uppercase and lowercase letters in their writing. Students also begin using conventions in their writing such as spaces between words and capital letters at the beginnings of sentences. In this stage, students are able to successfully read what they have written to a peer partner or an adult.

**Transitional stage.** The fourth stage on the writing continuum is the beginning stage and is traditionally seen in students aged six to eight. During this stage, students write follow up sentences about a given topic and are able to write about a variety of different topics; including topics of their own choosing. Students in this stage are able to follow sophisticated rules of grammar, as well as notice and revise mistakes in their writing and improve upon their writing with the help of a peer partner or an adult. Legible handwriting, spacing, and phonetic spelling are all characteristic of this stage.

**Fluent stage.** The fifth stage is the fluent stage and is typical of students aged seven to nine. While a majority of kindergarteners will not exhibit these characteristics in their writing, high achieving students are able to meet these goals and teachers should be knowledgeable of this stage in order to differentiate instruction for all learners. In this stage, students independently write pieces representative of different genres and are able to elaborate on a central idea. Further, students are able to craft complete sentences as their writing follows a logical progression. In addition, students in this stage are able to use interesting language to add depth to their writing and begin to use writing feedback. In this stage, students are able to give and receive feedback on their writing from peers and adults. Finally, in this phase students also publish and share their writing formally (Calkins, Eherenworth, & Lehmen, 2012; North Carolina State Department of Public Instruction, 2001)

### **Social Learning Theory**

Given that this study seeks to determine the impact of interactive read alouds with information text on students' scientific vocabulary development and explanations, it is important to understand the theoretical framework and research constructs that inform the study. Teaching and learning occur within a sociocultural context. As such, Bandura's (1977) social learning

theory asserts that children develop through both cognitive and environmental factors.

Accordingly, these factors inform my study due to the highly social nature of reading aloud and discussing text with young students, and the impact these discussions can have on students' learning (Dickinson & Smith, 1994; Heath, 1983).

Christie (1989) explains the nature of the early childhood classroom capitalizes on the use of teacher and student talk to develop students' social and academic skills. In addition, young children learn through observation, modeling, and imitation. Children observe adults as they model behavior and, in turn, retain and reproduce this behavior later in time. Through modeling, a child comes to accept behaviors cognitively and replicate these behaviors in similar situations. Calkins (1994) explains teachers and other adults read aloud and discuss text with young children, they model comprehension skills that children can then replicate in their own verbal discussions and writing.

**Observation.** Modeling and observation are relevant to student literacy development in several ways: (1) environment and (2) discussions. Adults, particularly teachers, play a pivotal role in shaping the environment in which a child develops his or her literacy skills. Barton & Hamilton (2000) and Street (1985) describe the affect a child's environment has on his or her developing literacy. Further, students from a variety of literacy backgrounds can benefit from discussing text with adults and peers. In a 1983 study, Heath found through discussion of texts and text features, children develop the ability to actively garner information from texts, rather than observing texts as a passive listener. Dickinson & Smith (1994) conducted a study observing teachers inviting students to discuss books during and after reading. Students benefited in meaningful ways from this interaction. For example, incorporating extended discussions after

read alouds with a group of four-year-old preschool students resulted in increased vocabulary knowledge and story understanding.

**Modeling and imitation.** Literacy based demonstrations and invitations provided by adults play a formative role in shaping how young students develop reading and writing skills. With each interaction, adults serve as a model for which students will later construct their own frameworks for reading and writing. It is, therefore, imperative that teachers provide students with a sound model for emergent reading and writing practices.

Bandura's theory is rooted in the importance of replication, and the importance of this act should not be lost on educators. Calkins (1994) explains through replication of emergent reading and writing activities, students are able to apply their learning and take ownership in the literacy process. This type of replication can include independently reading or retelling previously read text, as well as students' own drawings or writings. When replicated literacy activities, such as reading and writing, are connected to a specific area of study, such as science or social studies, the benefits of this type of learning can be transferred to discipline-specific concepts and/or topics.

Often, teachers use mentor texts as models to support children's writing abilities. Dorfman and Capelli (2007) found mentor texts are effective teaching tools when used appropriately by teachers to support children's technical vocabulary, book language, and genre specific elements that can later be applied to writing.

### **Developmental Writing Continuum**

Through an understanding of a developmental writing continuum, teachers can develop lessons to meet the needs of the diverse learners in their classrooms. Teachers can also adjust the goals of writing conferences to explicitly meet the needs of their students who may fall within

different stages of their development in writing. For example, some children may enter school with a strong background in literacy and progress more quickly along a developmental continuum. However, in a 1999 study Burns, Griffin & Snow found other children may enter school with much less exposure to language, books and have limited understanding of letter knowledge and literacy tasks. To support children in their various developmental needs regarding their literacy development, teachers often use developmental continuum as a way to assess students' literacy knowledge and develop appropriate instruction that meets the diverse students academic needs found in the classrooms of today. Because of the unique nature of kindergarten students' writing, and the varied range of student writing ability based on prior knowledge and home backgrounds, it is important to approach each students' writing uniquely. For the purposes of this study, given the developmental nature of kindergarteners' writing abilities, it is important to consider the children's writing samples not only for the inclusion of written words, but to also consider the children's drawings, scribbles and oral retellings of their written work to determine overall growth and development in their written work.

**Unique qualities of emergent writers.** Mayer (2007) states while young students' writing is not conventional, it still plays an important role in the development of understanding. Children's initial marks, including unintelligible scribbles or letter strings, are referred to as emergent writing. Harste (1984) explains these marks are significant and provide a window to a child's understanding regarding academic learning. Further, Clay (1967) and Goodman (1986) describe how young children exhibit knowledge of print and often reproduce their own writings in a style similar to those they have seen modeled in books. As such, it is essential that teachers choose high quality mentor texts to use for read alouds with children. Further, teachers must be

explicit and purposeful in the examples and connections to an author's craft as the ultimate goal is for children to model these same writing attributes in their own writing over time.

### **Applying Emergent Literacy in the Kindergarten Classroom**

In addition to scribbles and letter strings, emergent writers often rely heavily on pictures to convey meaning (Binder & Kotsopoulos, 2011). The use of drawing to convey meaning can also be modeled using nonfiction text, providing students with a framework to create meaning with their pictures, as well as their words. The New London Group (1996) provides a framework for redefining traditional literacies, referring to literacy as a "multiplicity of discourses". Literacy can be viewed in many forms, including situational, instructive, critical, and transformative. Eisner (1998) describes these multiple forms of literacy as ways to establish meaning and communication through nontextual modes, such as student pictures or diagrams.

Kindergarten students present a unique challenge for both educators and educational researchers. During the kindergarten year, when most children range in age from five to seven, students are at a pivotal stage of their cognitive development. Johnson, Markowitz, Hill, & Phillips (2016) found that for many children, kindergarten is also their first experience with formal schooling, presenting young children with the challenge of learning to navigate classroom expectations for both academic work and behavior.

In addition, kindergarten lessons must align with nation wide educational standards that outline curriculum that must be covered during the academic year. Often, these demands require that teachers deliver meaningful and relevant content that aligns with curriculum standards to students who may or may not be developmentally ready to learn the information. Consequently, it is important to have a deep understanding of reading and writing development of children if literacy success is to be achieved.

**Developmental milestones in literacy acquisition.** In order to understand the impact information text has on young students' reading and writing development, teachers must first understand how students' begin to develop these foundational literacy skills. Because of the developmental nature of kindergarten students' reading and writing abilities, students' written work and interpretation of books that are read aloud differ from students who are further along in their development of conventional reading and writing skills. It is crucial that kindergarten students' work be examined from a perspective that accounts for the following developmental stages.

**Oral language.** Oral language is a foundational component of writing. The ability to formulate ideas and express these ideas verbally is a critical component in developing literacy. Hooper and colleagues (2011) explain the importance of oral language skills in children's formal reading and writing development. Long before students are able to formally read, they are able to express ideas through oral language. Further, students develop language as both speakers and listeners from a very young age. For example, babies and young children begin developing language through listening to the speech around them from birth.

Consequently, reading aloud to children has long been a practice heralded both by teachers and literacy scholars as an essential component to building children's oral language skills thus leading to increased literacy achievement (Allison & Watson, 1994; Scarborough, Dobrich, & Hager, 1991). While most adults are aware of the benefits of speaking and reading to children, many are unfamiliar with the specific ways in which children develop language. It is important for adults, specifically educators, to understand these components of language development, as it directly impacts students' reading comprehension and their ability to produce

written work (Abbott and Berninger, 1993; Berninger, et. al., 2006; Hooper, et. al., 2011; Kim, et. al., 2011).

A working knowledge of domain specific vocabulary and rules of grammar are necessary for a child to master oral and written language. In a 2011 study Hooper and colleagues explain that children develop both language through listening to adult speech and reading. The relationship between neuropsychological components of writing, including fine motor skills, working memory, and language development, were examined a longitudinal study of 205 students throughout the first and second grades. The study found that both language development and working memory function were more highly associated with successful written expression than fine motor skills; further emphasizing the importance of verbal literacy on students' writing development.

Anyone who has listened to young children speak can recognize that children's speech develops over time. For example, a young child may begin speaking a few words at a time but then gradually over time, the words or phrases grow into sentences with increasing coherence, developing receptive language and then building to expressive language. Abbott and Berninger's 1993 study shows us the ability to create verbal explanations, also known as verbal reasoning fluency has been found to correlate with students' writing capabilities in the first and third grades. More importantly, research (e.g., Berninger, et al, 2006) substantiates that students' language development over time is a strong correlate between students' expressive language and writing development in grades first through third.

Even more specific to kindergarten students, expressive and receptive language has been found to predict writing skill in the upper elementary grades (Hooper et al., 2011). Further, Kim

and colleagues (2011) also found that kindergarten students' language skills have a strong influence on compositional fluency in later grades.

**The reading-writing connection.** Hiebert (1991) defines literacy is a complex process that involves the ability to listen, understand, and communicate orally, as well as understand written words and express ideas through writing. Each of these abilities are closely linked and interrelated. Reading and writing develop reciprocally. Consequently, children's reading and writing skills typically develop in conjunction with one another. For example, Abbott & Berninger (1993) and Berninger, et al. (2002) investigated the effects of word and sentence-level reading on the compositional quality of children's writing in grades 1-6. The results of a structural equation model found that both reading ability and oral language, or speaking ability, impacted students' ability to create written compositions in the primary grades. While this difference was not as pronounced in the upper elementary grades, this study still has significance when designing kindergarten writing instruction.

### **Multimodal Approaches to Literacy**

The visual mode provides yet another approach to analyzing student work, particularly in emergent writers who are not yet able to convey meaning through the written word. In a 2011 study, Binder and Kotsopoulous describe how students' artwork and visual representations can serve as a different approach to view young children's understanding of a subject. Binder and Kotsopoulous warn teachers who restrict young students to communicating using only the written word can not only stifle creativity, but can also inhibit writing development and thus their ability to communicate. However, Cummins (2004) multimodal engagement provides another opportunity for emergent writers to understand, communicate, and think about their learning.

Multimodal literacy practices empower young students to reveal their thinking through a variety of literacy practices, particularly in content specific, science writing.

Diagrams and visuals are a cornerstone of informational text, and often provide greater detail and information to support the text especially in science trade books (Coleman & Dantzler, 2016). It is particularly important to understand visual representations when engaging in reading about science (Roth & McGinn, 1998, Coleman, McTigue & Smolkin, 2011). Stern, et. al., (2003) explain when teachers unpack the complex visual layouts often found in nonfiction text in an instructional setting, students are provided with a model for how to incorporate visual representations into their writing, similar to those in nonfiction texts, to create greater meaning. In a 2009 study, Pappas, et. al. found when young children read and write scientific texts, they are engaged in using multiple sources of representation to establish meaning.

Young students' science writing involves written text, visual representations, such as students' drawings or diagrams, and any talk associated with these representations. Consequently, meaningful messages are achieved through many different modes and combinations of modes (Kress & van Leeuwen, 2006). As students develop in their conventional writing abilities, students can also grow and develop if their abilities to produce more sophisticated, meaningful visual representations (Calkins, 1994). If teachers are to maximize students' ability to produce such meaningful visuals, teachers should provide students with mentor texts that include the types of visual representations that are used by authors in text. However, unless explicitly prompted by teachers, students are less likely to make effective use of complex illustrations (Coleman, 2010). Students must be explicitly taught how to interpret visual information presented in text and how to use visual information to communicate messages. In other words, if students are taught early on to integrate both words and visual

information in their compositions particularly in science explanation writing, then students will come to view both sources of information—the words and the visuals as integral to writing in science (Nickolajeva & Scott, 2010).

In addition to making meaning through visuals, students also provide information about their drawings and pictures through oral retell. In a 2016 study Snow & Matthews found this skill is foundational to the development of later success in both reading and writing. In addition to building literacy and writing skills, oral retelling provides students with opportunities to revisit the concepts and ideas presented during instruction.

In addition, when teachers create a space and allot time for children to use and to practice the language, vocabulary, and language structures unique to the topic of study, children's reading and writing connected to that topic only improves. In a discussion of students' literacy development in grades K-8, Snow and Matthews describe instruction in constrained literacy skills (e.g. sight words, letters, and letter sounds) and unconstrained literacy skills (e.g. vocabulary, understanding story structure, and crafting explanations).

Constrained literacy skills encompass the bulk of instruction in grades K-2, while unconstrained literacy skills are taught much less frequently, despite the correlation between these skills and later reading success. Unconstrained literacy skills are also more strongly linked to students' socioeconomic status than constrained literacy skills. Multimodal approaches to literacy, such as oral retelling and class discussion of visuals and written words in text, can increase students' understanding of unconstrained literacy skills. It is, therefore, imperative that primary grade teachers begin to understand how to incorporate this form of instruction into their literacy lessons.

## **Science Instruction in Kindergarten**

While literacy is an important part of kindergarten instruction, other disciplines are also necessary to create well-rounded students. In recent years, the development of the Common Core State Standards (CCSS) has placed an increased emphasis on science instruction in elementary classrooms. While this is certainly a positive shift, it has presented a unique challenge to kindergarten teachers who struggle to cover the required literacy content during hectic, curriculum-filled days. In order to meet all instructional requirements outlined in the CCSS, teachers need creative solutions to combine literacy and science instruction across the curriculum.

**Incorporating science and literacy.** In the past twenty years, developing literacy skills such as letter recognition and production, phonemic awareness, early print convention knowledge has been the central focus of kindergarten instruction (Berg and Stegeman, 2003; Snow and Matthews, 2016). In a 2000 study Duke argues, as a result, a lack of instructional time was devoted to other disciplines, particularly science and social studies. However, given the adoption and implementation of the Common Core State Standards (CCSS) across many US states, changes have occurred in the way instruction in primary grade classroom should look. For example, an increased emphasis upon science instruction is one area of notable concern given the lack of time traditionally devoted to this area across the elementary grades, and particularly in kindergarten. Even for the youngest of children, opportunities and affordances must be designed by teachers to build foundational and concrete understanding of science concepts early on in primary grade classrooms. According to the NGSS (2013) standards, kindergarten students are not only expected to understand science concepts, but to “construct explanations and design solutions” p. 7 (NGSS, 2013).

If children are to learn the skills necessary to comprehend science text and to explain what they read and learn, then one way to support these scientific explanations is through the integrated of science information texts during science instruction. By explicitly teaching students the concept of scientific explanations using children friendly definitions, information texts provide a platform for students to begin to create their own explanations, both verbally and in written form. Well-written information texts for children present explanations using certain text structures. These text structures include: description/list structure, cause and effect structure, and comparison/contrast structure. In their 2008 study Read, Reutzel, & Fawson, identify and describe common expository text structures in children's literature. Description/list structure is the most rudimentary form of explanation found in children's text. Despite the name, this structure provides explanations by extrapolating upon main ideas using sentences, pictures, and labels.

Cause and effect structure is similar to more traditional explanations and follows a cause and effect chain structure of events throughout the text. Like cause and effect structure, comparison contrast structure provides a more traditional form for explanations by comparing two items or events and explaining how each are alike or different. It is important to note that this structure does not simply list features of each item but creates an explanation dialogue by discussing how the features area like and different. The final text feature described is order or sequence structure. This structure teaches young students about steps in a procedure or a cycle of events. These texts provide students with an explanation of how and why events occur.

In order to capitalize on this unique feature of information text, Read, Reutzel, and Fawson (2008) recommend teachers select information text with strong explanations and emphasize one of these text structures during instruction. During reading, it is recommended that

teachers and students engage in identifying the explanations in the text and recreating similar explanations both verbally and in written form. By introducing students to explanation texts in this way, teachers help students identify these text structures and understand how these types of text support understanding of varying concepts.

**Kindergarten science standards.** The nature of science in the elementary classroom has changed drastically in recent years. The CCSS have placed an increasing emphasis on science instruction, resulting in the Next Generation Science Standards (NGSS). The NGSS were developed by a team of researchers and educators in order to meet the need for a growing number of jobs in the science and technical fields (NGSS, 2013). Students in upper elementary and secondary grades are now challenged to think critically to solve problems in the fields of science and technology. This increased emphasis has trickled down to the primary grades, requiring students as young as kindergarten to develop a familiarity with science concepts. Now more than ever, it is vital that teachers consider instructional tools and strategies that will help young learners understand science concepts.

The NGSS are arranged according to disciplinary core ideas that build understanding from one grade level to the next and recommend that all lessons follow an essential question. The essential question serves to guide instruction and student inquiry throughout the duration of the instructional unit. These instructional units kindergarten address the following topics: forces and interactions, interdependent relationships in ecosystems, weather, and climate (NGSS, 2013). Further, the expectation is for each kindergarten student to master each of the aforementioned concepts if performance expectations are met. These expectations include but are not limited to “asking and answering questions relevant questions, developing and using models,

planning and carrying out investigations, engaging in an argument from evidence, and obtaining, communicating, and evaluating information” p. 4 (NGSS K-ESS2-2; K-ESS3-1, 2013).

It is widely accepted and encouraged in the field of science education that teachers in the elementary grades follow an inquiry-based method of instruction. In a 2015 study, Driver found inquiry based methods of teaching allow students to explore concepts and to interact with scientific ideas in authentic ways by making predictions, asking and answering questions, recording observations, and predicting and summarizing to others what was learned.

Consequently, I argue that information text plays a vital role in the inquiry process as research has substantiated the benefits of using information texts to support science instruction in the kindergarten classroom (Patrick, Mantzicopoulos, & Samarapungavan, 2009). Further, information text provide teachers with opportunities to use these mentor texts to model reading processing strategies including summarizing information, identifying key concepts, and interpreting visual information (Yopp & Yopp, 2000; Pappas, 2006; Coleman, 2010). In addition to literacy skills, information texts are rich resources that teachers can use to support students’ technical vocabulary in a learning context that can enhance their understanding of science concepts (Patrick, Mantzicopoulos, & Samarapungavan, 2009; Shanahan & Shanahan, 2012). While these texts provide opportunities to explore and discuss discipline specific vocabulary, information texts are also uniquely qualified to support young children’s written and oral explanations if used appropriately and skillfully. (Smolkin, McTigue, Donovan, & Coleman, 2009).

### **Explanations and Science Education**

In a 2008 study, Smolkin, McTigue, Donovan and Coleman discuss the crucial role explanations play in science education. The ability to inquire about a scientific event or

phenomenon, and then explain one's findings is the cornerstone of science education (Patrick, Matzicopoulos, & Samarapungavan, 2009). To effectively teach students how to craft their own explanations, teachers must do two things: provide students with a working understanding of scientific content knowledge and introduce students to a number of scientific explanations using examples and models (Smolkin, McTigue, Donovan, & Coleman, 2008). It is, therefore, of key importance that educators provide students with ample opportunities to listen to science explanations and create their own explanations.

Gilbert, Boulter, & Rutherford (1998) provide an overview of five types of explanations that can be used as models during inquiry based science instruction. These explanations include: intentional explanation, which describes why an inquiry was conducted; descriptive explanation, which describes a scientific phenomenon; interpretive explanation, describing how entities within a scientific phenomenon react together; causal explanation, explaining why a phenomenon behaves in a certain way; and, finally, predictive explanation, which provides a prediction about how a certain phenomenon might behave in the future or under different conditions.

Causal and predictive explanations are of particular interest in science instruction. Not only have these types of explanations been found to be missing from science classrooms (Newton & Newton, 2000), they are also integral in the development of children's scientific reasoning capabilities (Zimmerman, 2000). Through the development of explanation statements, students are able to develop an understanding of both the cause and effect involved in scientific phenomena. Carl Hempel, scientist and early advocate for the role of explanation in scientific understanding describes an explanation as "an argument to the effect that the phenomena to be explained...was to be expected in virtue of certain explanatory facts" (Hempel, 1965 p.336).

This sophisticated way of thinking can be introduced in early schooling through the use of explanation statements to support scientific reasoning skills.

### **Explanations and Information Text**

Information text clearly plays a valuable role in classroom instruction; and can provide a model for explanations in the science classroom. While an effective tool for literacy instruction, the very nature of information text lends itself to use in a broader range of subjects. In many elementary classrooms, science is taught using two types of texts: textbooks and trade books (Smolkin, McTigue, Donovan, & Coleman, 2008). While textbooks certainly serve a place in the classroom, research has explored the use of trade books as an effective measure of science instruction (Sandoval & Millwood, 2005; Asberry & Morgan, 2007). Trade books based on science concepts are typically informative in nature and provide students with access to science concepts in an easily accessible manner (Ford, 2006). In the case of young students, who are not developmentally ready to learn information from a traditional textbook, trade books provide teachers with an effective and engaging way to present scientific concepts (Sandoval & Millwood, 2005).

**The nature of young students' explanations.** Explanatory statements found in trade books can help children make connections between complex relationships and ideas (Smolkin, McTigue, & Donovan, 2008; Varelas, et. al., 2008). These explanations provide support for thinking and ideas, providing learners with a concrete framework to establish understanding of a topic. The nature of science instruction involves the discussion of abstract concepts and ideas. The abstract nature of many science topics is made even more inaccessible because many students do not have a clear understanding of the language associated with these topics. This gap in understanding can be bridged through the use of trade books, which are commonly read aloud

to a student by an adult in order to assist in comprehension of the terms and ideas presented in the text (Smolkin, McTigue, Donovan, & Coleman, 2008).

Because science trade books are intended to be read aloud to children, it is vital that teachers understand how to properly use these texts as an instructional tool. As noted earlier, special attention should be given to causal and predictive explanations in order to provide students with a sound basis for scientific reasoning (Zimmerman, 2000). In their 2009 study Smolkin, et. al., examined a number of science trade books to determine the nature of scientific explanations in life science and physical science trade books. This study also examined the nature of explanations in books intended for different student populations, specifically primary students in grades K-2 and intermediate students in grades 3 and up.

Using a coding system adapted from Newton et. al., 2002, explanatory statements were identified in trade books and coded according to the nature of the explanation. Using this coding system, Smolkin, et. al. found a greater number of explanatory statements in trade books than were found in science texts books analyzed by Newton, Newton, Blake, & Brown (2002). This is a positive indication for the use of information based science trade books in elementary instruction. Smolkin, et. al., assert that trade books with a greater number of explanatory passages result in an increased amount of teacher discourse to ensure student understanding. This increased discussion between teachers and students provides a more solid foundation as students begin to think critically about science concepts.

**The role of vocabulary in developing explanations.** Driver, Newton, and Osborne (2000) found a core practice of science is the construction of arguments or explanations including weighing evidence, interpreting text, and evaluating claims. However, in most primary grade settings students are simply expected to observe and describe science concepts (NGSS,

2013). The literacy development and scientific understanding of young students is placed at a disadvantage when students are not required to think critically. Five-year-old children are able to explain science concepts in terms of cause and effect (Newton & Newton, 2000). However, teachers must provide students with opportunities to have these discussions in order to develop critical thinking skills and to allow students to develop the specific, technical vocabulary required for effective understanding of science concepts. Allowing students to engage with information science text can provide these opportunities.

The role students take on during science discussions has a lasting impact on their understanding, specifically when students are studying science. Students can have discussions supported by technical vocabulary usage when they are allowed to engage as legitimate participants in literacy events (Palinscar & Magnusson, 2000). In order to develop students' technical science vocabulary and understanding of science concepts, teachers must spend time talking through the meaning of images in nonfiction text (Stylianidou, Ormerod & Ogborn, 2002; National Research Council, 2007). Critical language awareness requires that students be able to explain their learning (O' Hallaon, Palinscor, & Schleppengrell, 2015). Teachers cannot assume students have a concrete understanding of science concepts until they are able to explain what they have learned. Through book-based discussions, teachers can provide students with a model of how to explain their thinking both verbally and visually.

When reading, children make connections between real, play, and book worlds (Baird, Laughorne, Maagero, & Tonneson, 2015). Young learners can be engaged in theorizing about observations and explaining their observations by connecting their learning to prior experiences (Mertz, 1995, 1007, 2004; Varelas, & Pappas, 2006). In order for students to make these connections, teachers must scaffold instruction to allow students to make connections between

real, play, and book worlds (Baird, Laughorne, Maagero, & Tonneson, 2015; Coleman, 2010).

Through practice connecting real and book worlds, students are able to develop vocabulary that helps them explain technical concepts in both their speech and writing:

Data suggests that children are cognizant of the fact that semantic constraints are very much part of the “text world” created during reading. Access and reaccess to this “text world” and within it, the constraints which operate, allow them not only to predict and generate a text which a reader might judge quite successful, but to reap the generative and self-educative benefits of literacy (Harste, et. al., 1984 p. 127).

Despite the instructional benefits of science discourse, it is less frequent among primary teachers than with older students (Newton & Newton, 2000). Explanation in science education must be viewed as important to help students develop reasoning and inquiry practices (Sandoval & Millwood, 2005). Information books serve numerous purposes in primary grade classrooms, they provide children with an exposure to a variety of text structures and features, helping to mitigate the fourth grade slump when reading materials and requirements shift from “learning to read” in the primary grades to “reading to learn” in the upper grades (Duke, 2000). Information books expose students to concepts and specialized vocabulary, building background knowledge and language students can draw upon when reading more complex books later (Kuhn, Rausch, McCarty, Montgomery & Rule, 2015). Information books also cause a shift in the focus of discussion and nature of activities accompanying the reading experience, thus contributing to children’s understanding and the purpose and processes of reading (Yopp & Yopp, 2000).

### **Information Texts as Tools**

It is evident information text can lead to an increased understanding of science concepts and the ability to think critically. Guthrie & Klauda (2014) provide evidence of this relationship through the use of the CORI method. This method incorporates instructional support for choice, importance, collaboration, confidence, and scaffolding and when studied during a four-week

instructional unit, increased seventh grade students' comprehension and motivation scores when reading information text. Information text is a tool that teachers can use to provide students with opportunities to engage in authentic science based discourse.

### **Research on the Instructional Benefits of Information Text**

Content literacy is an approach for involving students in actual practices of science and literacy. In a 2012 dissertation, Flushman explains through content literacy instruction children read and write to acquire new content knowledge. Research has attributed the fourth grade slump to a lack of content literacy instruction, particularly with information text, in the primary grades. For example, in a study of twenty first grade classrooms, ranging from low to high socioeconomic status, a scarcity of information text was noted in classrooms, school libraries, and instructional content. In a 2000 study Duke found a mean of only 3.5 minutes per day was spent with information text in high-income schools, while a mean of 1.9 minutes per day was spent with these texts in low-income schools. This lack of instruction with information text can lead to devastating consequences for many children, specifically those of low socioeconomic status. Chall, Jacobs, & Baldwin (1990) examined the strengths and weaknesses in reading, writing, and language development among students from low-income families. This research examines students' literacy achievement as content transitions to an increased emphasis on reading comprehension, specifically during the fourth grade. During this crucial academic year, many students begin to fall behind academically as they encounter texts with more difficult vocabulary and organizational structure. This is commonly known as the "fourth grade slump". Chall, Jacobs, & Baldwin (1990) assert that students' lack of achievement during this time is due to a lack of understanding in specific literacy content, specifically in vocabulary knowledge and critical thinking skills. Reminiscent of Snow & Matthews work with unconstrained literacy

skills, the number of struggling students in upper elementary grades is indicative of a problem that begins as early as kindergarten.

Information trade books provide kindergarten teachers with a developmentally appropriate way to introduce these higher order-thinking skills with their young students. Unlike textbooks, trade books have been found to produce higher instances of explanation statements. In a study of 43 information trade books, 20 intended for primary students (K-2) and 23 intended for upper elementary students (3-5), physical science books were found to have more explanatory writing than in life science trade books, particularly those written for students in the primary grades. Because these texts provide teachers with an instructional tool to combine literacy and science content, while increasing students' exposure to unconstrained literacy skills, including vocabulary and explanations (Smolkin, McTigue, Donovan & Coleman, 2008).

In their 2008 study, Smolkin, McTigue, Donovan, & Coleman found the use of information trade books provides students more exposure to explanatory texts in the science classroom, increasing their ability to reason critically and provide their own explanations when writing and speaking. These texts encourage students and teachers to talk about and engage with explanatory science. An example of this engagement is provided in a study of twenty-four elementary students interacting dialogically with science information text during whole class, interactive read alouds. Students had a combined total of 1,861 utterances, or spoken words related to the science concept, during the academic year. These utterances were categorized into the following groups: telling, naming, reasoning, connections, comparing, questioning, describing, and predicting. Telling and questioning occurred with the most frequency throughout the study. Based on these results, the authors assert that this dialogic approach to teaching

science allows young students to use language in meaningful ways, all while participating in the classroom community (Tucker- Raymond, Varelas, Pappas & Ortiz, 2013).

In addition to encouraging students to engage with explanatory science, information texts also provide a framework for students to view themselves as participants who can respond to science based dialogue. In a 2015 study, O' Hallaron, Palinscor, & Schleppengrell, 2015 analyzed teachers and students in two third grade classrooms as they analyzed information texts for the "author's attitude". Similar to studies of author's purpose with narrative text, the instruction in this study focused on developing students' awareness of the author's choices with language and visuals to convey specific meaning in information text. The authors report that many students were unaware that author's had their own purpose when writing, rather than simply reporting facts. Teachers reported an increase in critical thinking and awareness in their students. While this is a more sophisticated skill than is needed in kindergarten classrooms, this study provides another instance of how information text can be use to empower students to think critically about scientific concepts, while simultaneously strengthening literacy skills.

### **Research on Effective Use of Information Text**

Information text is not used to the fullest potential in many primary classrooms (Baird, et. al., 2016). This decreases opportunities for students to discuss science concepts with adults and peers. When teachers use information text, they often incorporate less discussion of author and language than when reading narrative or fiction text (O'Hallaron, Palinscor, & Schleppengrell, 2015). Despite the fact that young students are as capable of understanding informational text as narrative text (Pappas, 1991) primary grade teachers are often reluctant to incorporate this genre into instruction. This can be attributed to a lack of understanding about the benefits information

text provide for young students and a lack of understanding about how to successfully implement information text (Baird, et. al., 2016).

**Interactive Read Alouds.** Another important factor in increasing the use of information science texts in the primary classroom is the need to educate teachers on how to effectively use these texts. Kindergarten students must learn how to comprehend nonfiction text through direct instructional practices (Smolkin & Donovan, 2001). Students must understand the text as a message that has been constructed by an author to convey meaning to the reader (O' Hallaron, Palinscor, & Schleppengrell, 2015). Hannus and Hyona (1999) recommend teachers incorporate conversation and special cues when reading nonfiction text to support students understanding. In order to provide students with a framework to build understanding teachers must engage in the process of thinking aloud. In order to use information text to the greatest capacity, kindergarten teachers must help students make connections between the concepts presented in these texts and their own experiences. Read, Reutzel & Fawson (2008) and Donovan and Smolkin (2002) recommend this be done through the use of interactive read alouds.

It is paramount that kindergarten students are presented with the opportunity to engage in constructive talk about a variety of subjects to build grammar and vocabulary, the cornerstones of expressive language. Interactive read alouds emphasize these characteristics of information text (Clark, Jones, & Reutzel, 2012; Read, Reutzel, & Fawson, 2008). During interactive read alouds, students are encouraged to examine the text and engage with the teacher and peers about the ideas presented in the book. During these lessons, students are exposed to vocabulary terms in the text and have a chance to use these terms in sentences. Interactive read alouds also provide an opportunity to pause during reading and discuss the events that take place in the text. Allowing young students to share their ideas using expressive language provides a rehearsal for

writing that develops students' ability to express themselves through the written word (Abbott and Berninger, 1993; Hooper, et. al., 2011).

Interactive read alouds require the teacher to take time to talk through the meaning of words and images in a text and create a space for discussion amongst students and teachers regarding the concepts presented in this book. In a 2007 study, Dorfman and Capelli found the use of information read alouds as mentor texts allows teachers to create entire instructional units around an information text, using the text as an anchor for hands-on experiences that connect to scientific concepts at the heart of the instructional unit. By consistently revisiting these texts, and pointing out the features of text that allow students to make meaning of scientific concepts, teachers build understanding in authentic ways.

Information text also provides students with examples of scientific reasoning and thinking, strategies that are heavily emphasized in the CCSS (National Governors Association Center for Best Practices, 2010). Technical vocabulary terms and explanation statements are a hallmark of information text and provide examples of deep thinking and reasoning that students can replicate in their own drawing and writing. Further, information text can provide teachers with a basis to assess their students' understanding at the culmination of instructional units. Through the use of information texts as models, students can create their own writings and drawings to explain their learning, using accurate vocabulary and scientifically correct explanation terms. This study also provides insight regarding exactly how impactful these strategies can be when used as an instructional intervention in the kindergarten classroom. Through analyzing student writing and vocabulary after the use of interactive read alouds of information text, as well as analyzing students taught traditionally using fiction texts and

traditional read aloud methods, I provide additional understanding of the role these texts play in an instructional setting.

**Explicit instruction when engaging with information text.** Cazden (1983) explains students can only observe adults comprehending text when it is made audible through thinking aloud. This process involves modeling thoughts verbally to help students understand comprehension strategies that can be used when engaging with text. Students should be allowed to make real world connections from outside the text to increase their understanding. In their 2015 study, Baird, Laughorne, Maagero & Tonneson found students should be allowed to respond creatively to text, developing their own interpretation of literacy understanding and how books work. By modeling learning and inquiry skills associated with nonfiction text, kindergarten teachers can provide frameworks for students to follow when using nonfiction text to learn (Coleman & McTigue, 2013).

Nonfiction text is often very visually complex, and therefore teachers must be mindful when introducing this genre to students. Coleman and McTigue (2013) found teachers can help students develop an understanding of nonfiction text by modeling how to navigate visually complex text and explicitly teaching conventions of graphics and how to coordinate two sources of information. Young students can also use visuals to convey their understanding, using visual representations observed in books to convey their own understanding of science concepts. Teachers can utilize both drawing and writing to help students develop pieces of text that convey their understanding of subjects described in nonfiction text.

### **Utilizing Information Text in Science Instruction**

Composing explanation writing has a strong link to supporting students' understanding of science concepts. Klein (2000) examined scientific writing from seventy students in fourth,

sixth, and eighth grades. During the study, students conducted scientific experiments and wrote journal-style articles to explain their learning. Students with the strongest explanations utilized both the experiments and text associated with the lesson to produce their writings. Based on this data, Klein asserts that writing associated with science can help students understand science concepts when students connect their writing to specific strategies, including modeling explanations based on text and experiments discussed in the classroom.

Incorporating information text into classroom instruction can provide students with a model of explanation statements in the form of visuals and written words (Price, Bradley & Smith, 2012), as well as with concrete examples of technical vocabulary terms (Rimbey, et. al., 2016). Information text provides a medium for the construction of conscious, causal understanding. Newton and Newton (2000) discuss the importance of developing causal understanding in science instruction. After conducting discourse analysis on fifty science lessons with students ranging from 3 to 10 years of age, Newton and Newton found that a majority of teachers engaged in low levels of discourse related to causes and reasoning. This was especially prominent amongst teachers of young students. By simply focusing on facts and descriptions when engaging in science discourse, teachers do not provide students with a framework to understand and discuss the causal nature of scientific inquiry. Newton and Newton recommend teachers be trained in methods and strategies that engage students in discourse related to causes and reasons. By educating teachers to challenge students in this way, students will develop more sophisticated scientific thinking and reasoning. Information text can serve as a powerful catalyst to increase this type of science discourse with young students.

It is important to note that understanding cannot simply be transmitted from the teacher to the student. Students must make connections themselves, however, this process can be supported

(Newton & Newton, 2000). Cazden (1986) explains modeling and scaffolding give students the opportunity to add to understandings of desired behavior through observation and participation. Modeling and scaffolding can be defined as teachers spending time talking through the meaning of images (National Research Council, 2007). While this may seem a commonplace practice to skilled readers, young students are not familiar with how to interpret text, specifically visually rich, vocabulary-laden information text. It is imperative that teachers talk through their thoughts aloud, allowing students to actually hear the thought process behind developing meaning from a text. Students will then be able to contextualize these thoughts and apply them to their own learning (Cazden, 1986).

Meyer and Woodruff (2007) note helping students understand abstract science concepts has been a problem in education. Ferreiro & Teberosky (1982) and Harste (1984) have found young children are able to apply prior knowledge to build understanding when encountering new ideas. However; young students often do not have a prior framework or understanding for many science concepts. This makes the process of scaffolding and modeling, through the medium of information text, all the more important in science instruction.

Hannus and Hyona (1999) recommend teachers use specific verbal cues when using science texts with young children. Students must also be allowed to interact with the text over time, allowing understanding to develop authentically, rather than simply referring to the text in a single lesson (Coleman, Bradley, & Donovan, 2012). Finally, the teacher must invite students to take part in discussion and activities connected to the text. When students are treated as legitimate participants in literacy events, they develop the ability to engage in sophisticated literacy activities, such as reading and writing in content specific areas (Purcell-Gates, Duke, & Martineau, 2007; Coleman, Bradley, & Donovan, 2012).

## **Selecting Texts for Science Instruction**

When considering texts for science instruction, teachers must consider the potential for students to make connections from both the words and illustrations in a text (Coleman, 2010; Smolkin, McTigue, Donovan, & Coleman, 2008). Ultimately, the text should serve as a model for students as they attempt to convey their learning through their own explanation writing. Finding a text that meets all of these requirements is a rigorous task. Fortunately, the National Science Teachers of America (NSTA) creates an annual list of Outstanding Science Trade Books. The books on this list are considered exemplars of science trade books. The list features books for students of all ages and recommended ages are given for each book, according to the complexity of text. Using this list as a starting point, teachers can then determine if the book contains explanation statements, visual representations, and vocabulary that meet their instructional needs.

Teachers and researchers are consistently searching for new and meaningful ways to enhance literacy instruction. The implementation of new writing and science standards has increased the focus on science instruction and writing, creating a trickle down effect that can be seen in the earliest of primary grades. The increased emphasis on science concepts and writing techniques has placed kindergarten teachers at the forefront of a sweeping shift in early childhood curriculum.

In a 2016 study, Korth, et. al. found information text can be used as an effective tool for both science and writing instruction; however, educators must be aware of how to effectively embed information text within instructional units. This requires an understanding of how young students interpret information text and the impact information text plays on young students' writing development, vocabulary acquisition, and understanding of science concepts. Through

analyzing literature relating to each of these factors, educators can develop an understanding of how to effectively use information text in science instruction.

My study seeks to provide kindergarten teachers with an additional layer of evidence in favor of implementing information text in kindergarten science instruction. Each science unit will be based on an exemplary trade book, selected from the NSTA's Outstanding Science Trade Book list. The book will serve as a foundation for instruction during a two-week science unit. *Best in Snow* by April Sayre will serve as the mentor text for the unit on winter weather and *About Habitats: Polar Regions* by Catherine Sill will serve as the mentor text for the unit on polar animals. During the initial reading and subsequent re-readings and retellings, I will focus on explanation statements and technical vocabulary, while inviting students to utilize their own explanations and vocabulary in class discussions; ultimately showcasing their knowledge through the creation of their own information writing.

### **Summary**

This chapter provided a review of literature informing the present study. This review identified the complex nature of information text and the important impact these texts can play in science and literacy instruction. Through an examination of kindergarten students' emerging writing and reading abilities' the impact of multimodal approaches to literacy, specifically visual and verbal literacy on student understanding, the features of information text; the use of interactive read alouds to present information text to young students; and the impact of explanation statements in increasing student understanding of science concepts, I argue that the need for information text in the kindergarten classroom is vital to student success. This literature review also provides evidence that information texts are currently not used to the fullest capacity in the primary grades. This study presents research on the implementation of information text in

the kindergarten classroom, using interactive read alouds as an instructional strategy. This study can provide educators and researchers with evidence of the impact information text can play on students' understanding, proven by the ability to create explanation statements utilizing technical vocabulary. The following chapter includes the methodology for the present study with a description of the research design, participants, and procedures for collecting and analyzing data.

## CHAPTER 3

### RESEARCH METHODOLOGY

This chapter discusses the methodology for the study. It includes the following sections: research design, study participants, instructional scope and sequence of integrated science units, data collection, and data analyses. The first section describes the rationale of the research design. The following section describes the selection of student participants. The third section is composed of a discussion of data collection methods, analysis and the description of the relevant instruments associated with the proposed study. In the final section, the procedures for data analysis are presented. The chapter concludes with a discussion of the methods planned to ensure the credibility and trustworthiness of the data.

The primary purpose of this mixed methods study was to determine the impact of an integrated science unit utilizing interactive read alouds with science information text on kindergarten students' use of written explanatory statements and student use of key vocabulary terms in these explanations. Explanatory statements were defined as written statements or a verbal retelling of written statements that are intentional, descriptive, interpretive, causal, or predictive (Gilbert, Boulter, & Rutherford, 1998). Vocabulary terms were defined as terms used to provide additional understanding regarding scientific concepts (Kuhn, et. al., 2015). These vocabulary terms are vital in creating effective explanation statements. Explanation statements are often found in information text and play a vital role in helping students make connections between complex relationships and ideas (Smolkin, McTigue, & Donovan, 2008; Varelas, et. al.,

2008). Through their own writings, drawings, and verbal explanations, students are able to provide evidence of their learning (O' Hallaon, Palinscor, & Schleppengrell, 2015). In order to produce accurate explanations of science concepts, a definitive knowledge of technical vocabulary terms related to science concepts is vital. Below, I present the research questions, and then move to a discussion of the research design and research paradigm that informs the study.

### **Research Questions**

The following questions will guide my exploration of the impact of information text in the kindergarten classroom:

1. How does an integrated science unit, featuring interactive read alouds, support kindergarten students' ability to understand and explain science concepts, as determined by their own explanation writing?
2. What is the relationship between science information text and kindergarten students' ability to explain scientific concepts using age appropriate technical vocabulary?

### **Research Design**

A mixed methodology was used to guide the study. Mixed methodologies combine qualitative and quantitative methods to provide greater insight into the research questions. The study utilized an embedded, process oriented design, with quantitative data embedded into qualitative results (Cresswell & Plano-Clark 2007; Teddlie & Tashakkori, 2009). During the quantitative phase, student responses were scored using a rubric to determine knowledge of key vocabulary terms related to the scientific unit of study. As noted above, during phase one of this study, the quantitative phase, a rubric was used to determine students' understanding of vocabulary terms that are foundational to the units of study (in this case—the term freeze, slushy,

crystals, blubber, survive, and den). During phase two, the qualitative phase, I analyzed the students' information writing, and their verbal "readings" of their information writing in order to determine the frequencies and/or instances of the explanations used or present in the student-generated writing (Smolkin, McTigue, et. al., 2009). It is important to note that due to the emergent nature of kindergarten students' writing, data analysis included students' written words or letter strings, verbal readings, and drawings for evidence of scientific explanations.

### **Mixed Methods Research**

Mixed methods research is considered a third paradigm or a third methodology (Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2009) as it serves as an alternative to traditional quantitative or qualitative methodologies. Researchers are guided by paradigms, belief systems or a certain way of viewing the world (Guba & Lincoln, 1994). In the past several decades, adherents to the positivist paradigm, often associated with quantitative research, and the constructivist paradigm, often associated with qualitative research, experienced heavy criticism from those of opposing research views (Teddlie & Tashakkori, 2009). As a result of this conflict, many researchers broadened their worldview, and began to choose a research method based on its applicability to the research question (Teddlie & Tashakkori, 2009).

Mixed methods researchers often ascribe to the pragmatist paradigm, which asserts research should be conducted in an area that is of value to the researcher and in ways that the researcher deems appropriate (Teddlie & Tashakkori, 2009). In accordance with this belief, I selected a mixed-methods design for this study for several reasons. First, the research questions were applicable for the use of both qualitative and quantitative methods. Because an understanding of vocabulary is crucial in order to develop the understanding needed to compose explanatory statements (Kuhn, et. al., 2015), it is important to determine a baseline of vocabulary

knowledge regarding the topic of study. Further, it is vital to also gain a sense of the young learners' oral language abilities as well as their ability to develop explanations. Because the ability to effectively use vocabulary terms is vital to the creation of explanation statements, it is necessary to use a mixed methods design as this design provides the freedom to sequentially analyze multiple layers of student learning (Johnson & Onwuegbuzie, 2004) while also providing the opportunity to deeply examine students' written and spoken words, as well as drawings, for meaning. The use of multiple approaches allows for a more in depth understanding of the research questions than could be determined using either quantitative or qualitative methods in isolation (Guba & Lincoln, 1994).

### **Research Paradigm**

A single paradigm has been found to be most useful for a Mixed Methods approach (Johnson & Onwuegbuzie, 2004; Hall, 2012). My study is anchored in the pragmatist research paradigm. A pragmatic lens is important to this study because it facilitates a multi-layered, action-oriented view of student learning and meaning making. (Teddlie & Tashakkori, 2009; Creswell & Plano Clark, 2007). Pragmatism has been determined to be compatible with Mixed Methods research (Hall, 2012), and is oriented toward solving practical problems in the “real world” (Feilzer, 2010, p.8). This approach is useful for my stance as a practitioner-based researcher. My work will serve as a framework for other kindergarten teachers as they seek to implement informational science text in their own classrooms.

As a paradigm, pragmatism serves to inform practice by serving to explain the “problems of people rather than simply the problems of philosophy” (Feinberg, p. 2015). Traditional pragmatism takes root when a problematic situation is recognized and a resolution that meets the needs of those involved is made. This form of research is useful to both educational researchers

and teachers, as it provides solutions to problems faced by practitioners in classrooms on a day-to-day basis. The pragmatist paradigm is certainly needed in school-based settings as reflective teachers are consistently seeking new methods to improve upon teaching practices.

In my own professional experience, I have encountered many teachers who are aware of the instructional benefits of information text, but who are not using information text to its full potential through the use of interactive read alouds and class discussions. One reason for teachers' lack of knowledge on the benefits of information texts and interactive read alouds, is that a great number of teachers are not sufficiently trained on the effective use of informational text (Yopp & Yopp, 2006). In addition, given the highly technical nature of the vocabulary often found in nonfiction text coupled with the complex visual displays such as graphs and labeled drawings, that are not inherently decodable by young learners (Coleman & McTigue, 2013). Many teachers are uninformed about the necessity of explicit instruction required to support these skills in young children (Donovan & Smolkin, 2004). Without sufficient modeling and scaffolding, through the use of interactive read alouds to make meaning of the features of nonfiction science based text, students do not experience the true richness of the genre. Through analyzing this problem pragmatically, I provide researchers and teachers with a basis for instructional practice and future study.

### **Ontology and Axiology of Pragmatism**

Pragmatism adopts an ontology regarding diverse viewpoints on social realities (Teddlie & Tashakkori, 2009). Ultimately, pragmatist research is based on the personal value system of the researcher. Accordingly, pragmatist axiology places high importance on researcher values when interpreting results. The emphasis upon researcher values is evident when analyzing the epistemological relationship between the researcher and participant in pragmatist research. As

such, data collection can be both subjective or objective depending on the stage of the research cycle (Teddlie & Tashakkori, 2009). For the purposes of this study, the quantitative portion featured a more objective method of data collection, while the qualitative portion is more subjective. For example, the quantitative portion utilized a rubric to determine students' understanding of vocabulary terms from an informational text. Each student's score will be determined based on their ability to provide a definition of a vocabulary term and use the term in one or multiple sentences. The rubric used in this study was based on a similar rubric used by Kuhn, et. al. (2007) to measure vocabulary understanding with second grade students. In order to utilize the rubric with kindergarten students, it was modified to include less in depth, focusing on simply identifying the word and using it in a simple sentence, rather than providing additional context clues. The rubric was piloted in September 2017 with a group of twenty kindergarten students. Based on student responses, the rubric was modified to include more specific directives for answering questions (e.g. tell me what the word means with your voice, not just with your face or body). The rubric was also modified to provide students who could define the term but not use it in a sentence one point, rather than zero. The rubric continues to require students to provide a definition and sentence to receive two or three points (See table 2).

The qualitative portion analyzed students' explanation statements using multiple modes of emergent literacy (Clay, 1987), including written words, drawings, and verbal retellings. This analysis consisted of qualitative codes assigned to explanation statements.

### **Researcher Positionality**

As a pragmatic researcher conducting research with my own students, the need for awareness of my positionality was extremely important. I believe students' writing gives teachers important insights into both the strengths and weaknesses in students' literacy

development. Writing is a culmination of literacy, and can be used to display understanding of concepts that have been discussed in books (Goel et. al., 2010), and is therefore, an important subject for teachers to introduce to their students. Many young students struggle in writing because they lack the ability to formally write words on paper (Clay, 1987). Utilizing interactive read alouds as a method to highlight the multiple ways to produce writing (e.g, drawing, written explanations, and oral retellings) offers a way for students to create writing that meets their developmental capabilities. This empowers young students to begin to think of themselves as writers, and gives the opportunity for students to express their learning in a variety of ways (Korth, et. al., 2016).

It is also important to note my past professional experiences and the impact these experiences may have on the study. During the 2016-2017 academic year, I was selected as a finalist for a state wide teaching award. I was selected based on my educational pedagogy and teaching practice. Because of my experience as an educator, it is important to consider my role in teaching students during the study. Data from the study is likely impacted by the educational practices implemented in the classroom; but may also be effected by my teaching style and experience.

### **Subjectivity**

As a participant-observer, I was cautious not to purposely sway interactions with students while interviewing or observing. It is natural that participants want to provide answers and behavior that is pleasing to the researcher, a fact that is amplified when the researcher is also the teacher. This is known as social desirability (Olmos-Penuela, Benneworth, & Castro-Martinez, 2015). However, the relationship I had with my young students also created a feeling of familiarity and trust, creating the opportunity to yield findings that are credible and trustworthy.

In order to garner the positive impact of my close relationship with the participants, while providing for the potentially negative aspects of this relationship, I implemented measures that provided safeguards against social desirability and impacting the results of this study.

### **Trustworthiness, Credibility and Validity Measures**

It is evident that my personal experiences and my views of teaching led me to this current line of research. As a result, this passion can often lead to high levels of subjectivity. However, I do not view this as a weakness in the study as this realization led me to handle my subjectivity in an appropriate manner. In order to mediate my role as a participant observer, I have included the following design features of audio recording, debrief/member checking and triangulation to support the validity of my findings.

**Audio recording.** I recorded audio of all data-collection with students, as well as collected copies of all student work samples. These were reviewed during data analysis to check my findings and to identify data not initially observed. Listening to students' recorded responses allowed me to interpret non-spoken ways of communicating, such as pauses or laughter. This provided additional information in determining the students' level of understanding of the vocabulary terms. During data analysis, I created an audit trail as a safeguard to ensure accuracy.

**Debrief/member checking.** I also debriefed my data with two peers throughout the data collection and analysis process in order to confirm interpretations of my data. Peer debriefers included a kindergarten teacher who was not participating in the study and a fellow doctoral student specializing in literacy. Allowing others to review the data and discuss observations ensured my objectivity during the data analysis process. I believe that my role as a teacher-researcher made this study accessible for classroom teachers who often resist reading academic

articles or conducting their own research. Through speaking to readers as a fellow teacher, I hope to reach this audience in an impactful way.

**Triangulation.** In order to check and establish validity I also included a second researcher in my data analysis. This researcher was doctoral student specializing in the area of literacy. Her background in both education and research provided an additional perspective as we analyzed students' explanation statements and vocabulary rubrics, helping to achieve consistency in the interpretation of data. In the following section, I present an explanation of the quantitative methods of this mixed methods study.

### **Quantitative Methods and Procedures**

Quantitative methods are defined as the “techniques associated with gathering, analysis, interpretation, and presentation of numerical information” (Teddlie & Tashakkori, 2009). Both positivist and post-positivist paradigms are associated with quantitative research. The positivist tradition ascribes to rigorous scientific research, unencumbered by the researcher's own personal views. Post-positivist thinkers acknowledge that it is impossible to separate the researcher from his or her value systems and personal beliefs, and that this does not inhibit one's ability to perform rigorous research (Wilson & Gochyyev, 2013).

A pre/post vocabulary measure (see table 2) was used to provide a baseline regarding kindergarten students' initial understanding and background knowledge regarding vocabulary terms central to the unit of study. Given that young learners background and vocabulary knowledge are skills necessary to produce explanation statements (Kuhn, et. al., 2015), it is important to establish an initial baseline of these abilities for the participants. Two classrooms of kindergarten students were included in this portion of the study. Classroom A served as an intervention group, using information text as a basis for science instruction. During the

instructional unit nonfiction texts served as an instructional anchor as students create writings and interact with words related to the text. Classroom B taught teach science concepts using fiction text. The instructional unit included watching songs and short videos about the concepts, with no connected writing or discussion of vocabulary concepts. Results from this portion of the study provide information regarding research question one.

### **Phase One of Study**

The first phase of this study involved the use of a vocabulary rubric, developed based on Kuhn's work with vocabulary acquisition in elementary students. This rubric was modified to meet the needs of kindergarten students and piloted with kindergarten students to ensure reliability and validity. This rubric was used as a pre and post measure to determine the growth of students' understanding regarding vocabulary terms featured in information text used within a specific unit of study. Students' vocabulary rubric scores were analyzed to determine the impact of interactive read alouds with information texts versus the use of fiction books on students' ability to utilize vocabulary terms in context. Students met individually with the researcher to complete the vocabulary rubric. This meeting took place in the hallway outside the classroom to reduce distractions. The researcher asked students to describe the terms and audio recorded each students' response. Student responses were transcribed following data collection.

### **Quantitative Data Analysis**

Quantitative data analysis is concerned with the interpretation of numerical data using techniques that describe the phenomenon or look for significant differences between groups or among variables (Teddlie & Tasakkori, 2009). For the purposes of this study the groups or variables will be considered the intervention and non-intervention classrooms. For example, students' pre and post vocabulary rubric scores will be used to determine the initial impact of

information text of vocabulary knowledge. These scores were assigned to both the intervention and non-intervention classes to determine the impact of the use of information text. Instruction with information text was again considered when analyzing writing samples from groups of students in the intervention and non-intervention groups. An effective form of measurement was used in order to effectively determine the impact of information text on kindergarten students' vocabulary knowledge. Quantitative researchers typically measure data using a descriptive or an explanatory approach, as this type of research is used to connect ideas and understand cause and effect (Wilson & Gochyyev, 2013). An explanatory approach was used for this study in order to establish relationships between the use of interactive read alouds with information text and students' vocabulary development (Wilson & Gochyyev, 2013). This relationship was then compared with the relationship between the use of fiction text and students' vocabulary development.

### **Outcomes of Quantitative Analysis**

The goal of the first phase of this study was to gain an understanding of the role information text plays on students' vocabulary acquisition. Growth between the pre-and post scores were assessed to determine if students' experience greater growth in vocabulary knowledge using instructional approaches featuring interactive read alouds with information text, rather than instructional approaches using a traditional read aloud of fiction text. Students' vocabulary knowledge served as a basis for this portion of the study. Because the ability to correctly use vocabulary terms is crucial in the development of explanatory phrases, this phase of the study also guided selection of participants for the following, qualitative phase.

## **Qualitative Methods**

Qualitative methods were used during phase two of this study to provide information on kindergarten students' use of explanation statements, as well as the nature of the explanation statements used by these students. Data from the qualitative phase from this study was used to answer the second research question. Participants in this phase of the study consisted of students from both classrooms A and B who demonstrated proficiency in vocabulary acquisition. Students created one page of information writing. Their written work, as well as students' own interpretations of their work through reading aloud, was analyzed during this phase of the study.

Qualitative researchers interpret meanings through examining and interpreting phenomena in natural settings (Denzin & Lincoln, 1994). This research methodology is typically associated with narrative data. These researchers ascribe to the constructivist paradigm, believing that researchers individually and collectively construct the meaning of phenomena during investigation (Teddlie & Tashakkori, 2009). In order to collect data from narrative forms, qualitative researchers use thematic data analysis, a process that includes coding a transcript or written work from participants. Data is analyzed using an iterative process that methodically sorts a participant's own words into categories. These categories are then interpreted to produce themes. These themes are then used to explain qualitative research questions (Denzin & Lincoln, 1994).

### **Qualitative Data Collection**

In keeping with the tradition of qualitative research, data in this study was gathered using student generated writing collected from the classroom environment. In order to understand students' interpretation of their own emergent writing, as well as the actual writing itself, students were asked to read their writing aloud. Students' actual writings and recordings of

students' voices were collected and analyzed qualitatively. This study used various types of qualitative coding methods to categorize students' written and spoken words into themes (Saldana, 2013). These themes were be interpreted to determine the nature of explanatory statements used by students in both classrooms A and B.

### **Outcomes of Qualitative Data Collection**

Through the collection and analysis of qualitative data, I explored the mechanisms that may help explain exactly how information text impacts students' ability to produce explanation statements.

### **Overview of Present Study**

The present study uses both qualitative and quantitative methods to gain a better understanding on the use of information text in the kindergarten classroom. In the following sections I present detailed information regarding the selection of teacher participants, data collection instruments and procedures, methods of data analysis, and efforts to ensure the credibility and trustworthiness of the data. (See Table 1 for an overview of the research methodology.)

### **Participants**

All participants in this study were grouped into two research phases, employing either quantitative or qualitative methodologies. The following section describes the classrooms and teachers involved in this study. The second section provides information regarding the selection of students for phase one of the study, which includes quantitative data collected through the use of a vocabulary rubric. The third section informs the reader about the selection of students for phase two of the study, the qualitative phase examining students' own writing for explanation

statements. This section concludes with a discussion of the permissions used to protect participants.

Table 1

*Overview of Research Methodology*

Phase	Participant Selection	Data Collection	Data Analysis	Research Questions Answered
Phase One	38 homogeneously sampled kindergarten students 19 from Classroom A (Intervention) 19 from Classroom B (Conventional Instruction)	Vocabulary Rubric administered at the beginning and conclusion of each instructional unit	Quantitative Statistics	One
Phase Two	38 homogeneously sampled kindergarten students 19 from Classroom A (Intervention) 19 from Classroom B (Conventional Instruction)	Student created information writings (and students drawings and “readings” of their writing)  Audio recordings of students reading their writing aloud	Qualitative Thematic Analysis	Two

**Focal Classrooms and Teachers**

This study took place in a rural primary school in north Alabama during the 2017-2018 school year. The rural, Title 1 school serves 528 students in kindergarten and first grades. Demographically, 83% of students at the school are Caucasian, 10% Hispanic, and 7% African-American. Forty-one percent of the study body is eligible for free and reduced lunch. Two

classrooms were selected to participate in this study: classroom A, the intervention classroom, and classroom B the non-intervention classroom. It is important to note that the two teachers participating in the study, Mrs. Smith and myself, swapped classrooms for the duration of this study. Working with a different set of students ensured equity and prevented teacher bias towards students based on prior academic performance and other extenuating factors.

**Intervention classroom.** Due to the limited integration of information text in science instruction at this school, I elected to teach lessons with information text in the intervention classroom. I taught in Mrs. Smith's class during this portion of the study, while Mrs. Smith taught my own students. Considering the rich methodological tradition of teacher as researcher (Cobb & Steffe, 1983), using my own students did not hinder the validity of this study. A discussion of the controls in place to ensure validity is included in the researcher positionality section (see above). The intervention classroom consisted of 19 five- and six-year old students. During the study, science instruction in classroom A typically followed an inquiry-based format, allowing students to interact and explore with scientific concepts using a guiding question. Writing instruction followed a Writer's Workshop format (Calkins, 1994) and was integrated with science instruction, to allow students the opportunity to write about the concepts they were learning during science.

**Non-intervention classroom.** My own students served as classroom B, the non-intervention classroom during this study. Mrs. Smith taught my students during science and writing for the duration of this study. I selected Mrs. Smith to teach the nonintervention group because of her interest in new teaching methods and her willingness to work collaboratively with me during research. The nonintervention classroom consisted of 18 students between the ages of five and six years old at the onset of the study. Between the first and second instructional units, a

new student moved into this classroom; bringing the total number of students to 19. Mrs. Smith has four years of teaching experience and holds a bachelor's degree in elementary education, as well as several reading credentials. While highly effective in teaching reading to her students, Mrs. Smith expressed that she was not as knowledgeable in exemplary science instruction. Science instruction in Mrs. Smith's classroom typically consisted of a coloring page or short, educational video. Writing instruction in her classroom followed the Writer's Workshop format found in classroom A. Students occasionally wrote about science concepts in her classroom, but the two subjects were not integrated. While Mrs. Smith reported using nonfiction text occasionally during her reading comprehension lessons; she did not emphasize the characteristics of information text, such as explanatory statements, to her students. This is due to the nature of instruction at the school. The instructional emphasis is placed on phonics and sight word instruction in an attempt to develop traditional reading skills. While this is important, the intensity of this instruction reduces the time allocated to science instruction and reading comprehension. Read alouds were often squeezed into the day if there is time between phonics, small group guided reading, and sight word instruction. Science is also rarely incorporated due to these time constraints.

### **Phase One: Vocabulary**

In order to provide an in depth understanding of participants, students in this phase of the study were selected using homogenous sampling (Teddlie & Tashakkori, 2009). An entire classroom was assigned to either the intervention or non-intervention group. Classroom A served as the intervention group, with all students receiving the same intervention taught by the researcher, while classroom B served as the non-intervention group, with all students receiving traditional instruction by Mrs. Smith.

## **Phase Two: Explanation Statements**

Again, homogenous sampling will be used to select participants for this phase of the study. Students from both the intervention and nonintervention classrooms provide writing samples as well as verbal retellings of their writings and drawings. The data was coded for explanation statements. Audio recordings of interactive read alouds with the intervention class was also transcribed to identify explanation statements modeled by the instructor.

## **Permissions/Protections of Participants**

I sought permission to conduct this study from the Institutional Review Board of the University of Alabama prior to any data collection. All participating teachers and principals in this study were provided with detailed information regarding the study and an informed consent form. Because this study involved children under the age of 18, parents or guardians were be provided with information regarding the study and an informed consent form. Following consent from the parent, students were provided an assent form that was read aloud to the child, to gain assent for participation in the study. Participants' names were not used in this study to protect confidentiality. Participants were also given the option to terminate participation in the study at any time, as outlined within guidelines for conducting ethical research. (See Appendix B for consent and assent forms.)

## **Instructional Units**

The integrated science and writing lessons delivered in this study were part of two researcher created instructional units designed to meet the Next Generation Science Standards adopted by the state of Alabama. (See appendix C instructional units.) The science content and activities in each of these units used inquiry based instruction, as well as information text, in order to provide students with real-life experiences with science concepts. A single text served as

the anchor for each instructional unit, and using the text as a model each day, the instructor guided students as they participate in activities related to the text. Because high quality information text is necessary for effective instruction (Smolkin, McTigue, Donovan, & Coleman, 2008), the information texts that served as the anchor for each instructional unit were selected from the National Science Teacher's Association Outstanding Science Trade Book List (NSTA). These texts were selected due to the brief nature of the text. While they texts did not feature true explanation statements, they provided an opportunity for teacher and student explanations to take place during interactive read alouds.

For example, in Sayre's *Best in Snow* the text reads "A freeze, a breeze, a cloud. It snows." (p.3) This provides an opportunity to ask students about the type of weather changes that cause snow and how snow is formed as part of the water cycle. Similarly in Sill's *Polar Regions* the text reads "[Polar animals] have special ways to survive in cold temperatures." (p.5) Again, this sentence provides an opportunity for the instructor to spend time discussing science topics using explanations, rather than reading lengthy text. This is particularly important when selecting texts to be read with very young students, as their brief attention spans often limit the duration for interactive read alouds.

The use of these texts in instruction, as well as the invitations for student writing at the conclusion of each instructional unit, were based on promising research using information text in the elementary grades (Duke, Purcell-Gates, Hall & Tower, 2006; Wollman-Bonilla, 2000). The following sections describe a general description of instruction, as well as a description of each instructional unit.

## **Description of Instruction**

In this study, students participated in two science units, each lasting two weeks. (See appendix C: instructional units.) Students in classroom A received the intervention instruction detailed in this section. Students in classroom B received instruction using short, educational videos, teacher discussion of vocabulary terms, and worksheets. The only commonalities between the two classrooms were the topics of instructional units and the vocabulary terms used during instruction. Both the intervention and non-intervention units lasted two weeks.

The intervention consisted of an introductory question guiding the two-week unit. During these two weeks, students utilized an information book as an anchor text, revisiting this text multiple times over the course of the unit. Students used the text as a basis for vocabulary instruction, an exploration of visuals used in information text, and as a guide for the use of explanation statements. Because students also need to actively participate in science rather than simply read about science, instructional units in the intervention classroom also featured interactive science activities centered on topics from the text. At the conclusion of each unit, students from both classrooms A and B were assessed on their vocabulary knowledge using the vocabulary rubric. Following this assessment, all students from each classroom were invited to create their own writing detailing information discussed during the instructional unit.

**Unit one: Winter and its characteristics.** Unit one focused on winter and the characteristics of this season. Using the information trade book *Best in Snow* (Sayre, 2016) as an anchor text, students learned about the characteristics of winter weather, as well as how animals adapt to harsh winter conditions. This instructional unit met two of the Next Generation Science Standards:

Standard 4: Gather evidence to support how plants and animals provide for their needs by altering their environment.

Standard 7: Observe and describe the effects of sunlight on Earth's surface (heat from sun causing evaporation of water).

(NGSS, 2013)

Using examples from the book, the instructor guided students to notice explanatory statements as well as technical vocabulary terms outlined in the text. Each day, the students referred back to the book before taking part in an activity that correlates with the unit of study. During the lesson, the instructor noted key vocabulary terms and explanation statements from the text and cited their relevance to the topic. Students were also invited to take part in using key vocabulary to create their own explanations, first as a group and then independently.

Using the anchor text as an example, students discussed the vocabulary terms freeze, crystal and slushy. These words were selected based on their appearance in the text and their relevance to explanation statements concerning the changes that occur as snow falls, melts, and refreezes. Students also took part in an interactive science activity. In this activity students observed water at various stages of freezing and described the process using scientific vocabulary and explanation statements, as modeled by the instructor. At the conclusion of the unit, students' vocabulary acquisition was measured using the vocabulary rubric (see table 2). Students were encouraged to both draw and write to create their own information writing featuring explanations about winter weather.

**Unit two: Polar regions.** Unit two shifted the focus from local winter weather to the Polar Regions. Using the information in the trade book *Animal Habitats: Polar Regions* (Sill, 2015) as a foundation for instruction, students learned about the locations and characteristics of

the Polar Regions, as well as the characteristics of a polar habitat and the animals that live there.

This instructional unit met two of the Next Generation Science Standards:

Standard 4: Gather evidence to support how plants and animals provide for their needs by altering their environment.

Standard 6: Identify and plan possible solutions to lessen human impact on the environment.

(NGSS, 2013)

Using examples from the book, students were encouraged to create their own explanatory and verbal statements concerning polar animals and their adaptations to the harsh Polar climate, as well as how humans impact the climate and the effect this has on animals and their habitat.

This unit followed the same model as unit one, with the instructor modeling the use of key vocabulary and explanatory statements, and inviting students to use these features in their speaking and informational writing. Students also participated in an interactive science activity, using baking grease and plastic wrap as blubber to protect their hands when submerged in icy water. During and after the activity, the class discussed the experience using vocabulary terms and explanations. As in Unit 1, the vocabulary terms survive, blubber, and den were selected based on their appearance in the text, as well as their relevance to the production of explanatory statements.

### **Writing Instruction**

In addition to science instruction, it is important to understand how students were taught writing during the course of the study. Students in both the intervention and nonintervention classrooms were taught using the school's recommended instructional framework for writing. This framework consists of a 45 minute daily writing block featuring teacher and/or student

modeling, independent writing time, and sharing. In order to prevent other students' work from influencing data, students were not allowed to revise their own writing after sharing. However, sharing and revision were taught during when students were not participating in the study.

### **Data Collection**

Data collection involved the following methods in a sequential form (Teddle & Tashakkori, 2009): a vocabulary rubric and observations of student writing samples. Phase one addressed research question one and involved the use of a rubric to determine the impact of information text on students' vocabulary acquisition. Phase two addressed research question two and determine the impact of information text on students' ability to produce explanation statements. Quantitative data from the rubric informed the qualitative components of this study in a sequential manner (Teddle & Tashakkori, 2009). Data was gathered at the conclusion of each instructional unit. Methods for each phase of data are described in the following sections.

#### **Phase One: Vocabulary**

Quantitative data was gathered through the use of a vocabulary rubric. This rubric was administered both before and after the instructional unit and was used to determine students' ability to understand content-specific vocabulary words and use these words in context. The rubric was based on a similar rubric used in a 2015 study by Kuhn, Rausch, McCarty, Montgomery, & Rule. In this study, first and second graders' understanding of information text was determined by their understanding of key vocabulary terms. These terms were included in the text and understanding was rated numerically using a rubric. This rubric was adapted for use with kindergarten students (see tables 2 and 3) In order modify this instrument for use with kindergarten students, students did not read the words, as was done in the original study. Instead, the researcher read the word to the student and asked the student to tell them about the word and

use the word in a sentence. The student was then assigned a numeric score based on their performance according to the rubric. Numeric scores ranged from 0-9 on each rubric, with zero being the lowest and nine being the highest. Three vocabulary terms crucial to understanding the scientific concepts presented in the text were selected from each mentor text. A separate rubric was administered for instructional Units 1 and 2.

Because the rubric was modified it was piloted in a different kindergarten classroom prior to the study in order to ensure validity and reliability. The classroom consisted of 20 five and six-year old students and was in the same school where the research study took place. However, the group of students used to pilot the survey did not take part in the actual study. Sample statements in the following table are actual student responses collected during the pilot study.

Table 2

*Vocabulary Rubric: Unit 1 Winter Weather*

Points awarded and description to guide scoring	0 Points Unable to define word	1 Point Partially defines the word. Is unable to use the word in an example sentence	2 Points Defines the word correctly. Is able to use the word in an example sentence	3 Points Defines the word correctly. Is able to use the word in more than one example sentence
Word 1: Freeze	<i>ex. Don't move.</i>	<i>ex. When it is cold.</i>	<i>ex. You gotta survive so you don't die.</i>	<i>ex. You're freezing cold. Snow can be freezing, too.</i>
Word 2: Crystals	<i>ex. You find something to give to your mom and dad.</i>	<i>ex. Ice.</i>	<i>ex. Crystals are really shiny. You can find crystals in a cave.</i>	<i>ex. Crystals can be in a rock. You can also mine crystals.</i>
Word 3: Slushy	<i>ex. I love those things!</i>	<i>ex. It's cold and icy.</i>	<i>Ex. Like a slushy from Sonic. It can be icy but you can drink it, too.</i>	<i>ex. Your ice pop gets melted and it's slushy all around. Slushy is like kind of melted but kind of icy.</i>

Table 3

*Vocabulary Rubric: Unit 2 Polar Animals*

Points awarded and description to guide scoring	0 Points Unable to define word	1 Point Partially defines the word. Is unable to use the word in an example sentence	2 Points Defines the word correctly. Is able to use the word in an example sentence	3 Points Defines the word correctly. Is able to use the word in more than one example sentence
Word 1: Survive	<i>ex. Just 'viving.</i>	<i>ex. You're not dead.</i>	<i>ex. You survive zombies.</i>	<i>Ex. You just gotta try to survive. You could die, but you still stay alive if you survive.</i>
Word 2: Blubber	<i>ex. That's a funny word!</i>	<i>ex. Is it fat?</i>	<i>ex. I have a book that says animals have blubber.</i>	<i>ex. Blubber keeps animals from getting cold when they swim. Blubber can be on lots of animals.</i>
Word 3: Dens	<i>ex. When you hit stuff it dents.</i>	<i>ex. A place to live.</i>	<i>ex. A squirrel has a den...maybe?</i>	<i>ex. Dens are deep tunnels. Animals live in dens.</i>

Students' understandings of these terms in both Classroom A (the intervention group) and Classroom B (the non-intervention group) were assessed using this instrument. Prior to the instructional unit students were asked to give examples of vocabulary terms as a pre-measure, of understanding. During the instructional unit, both sets of students were exposed to the words using different instructional techniques: interactive read alouds with information text with Classroom A and traditional read alouds of fiction text with Classroom B. Students were then

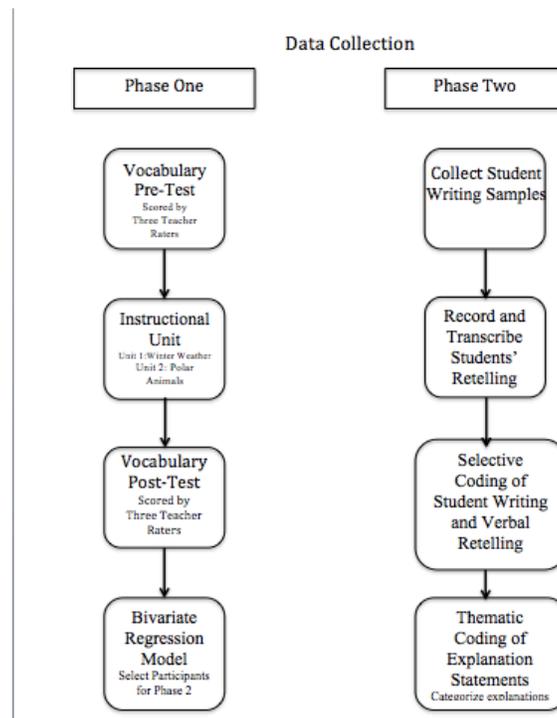
asked to complete the instrument again, giving examples of vocabulary terms as a post-measure. The entire process will be repeated for the second instructional unit.

### Phase Two: Explanation Statements

Qualitative data was gathered through student writing samples. All students in classrooms A and B will be invited to create their own page of writing at the conclusion of each unit. Students in both classrooms received a blank page and were instructed to draw or write on the page to reflect their learning. Data from all students was collected in this phase of the study. Each of these students was audio recorded as they read their writing page aloud to the researcher. These recordings were then transcribed and compared with student work samples for data analysis. This process was repeated for the second instructional unit. An audio recording of the interactive read alouds was also taken and transcribed to identify explanation statements.

Table 4

*Data Collection Flow Chart*



## **Data Analyses**

The data from each phase of the study was analyzed using a variety of methods. A mixture of descriptive and inferential statistics were used to analyze students' vocabulary scores. Statistics were used for the initial analysis of students' vocabulary rubric scores in phase one. In phase two, selective coding was used to identify students' explanatory statements in their own writing (Saldana, 2009). Following this analysis, a round of thematic coding was then conducted to categorize students' explanation statements into themes. These themes were based on Read, Reutzel, and Fawson's (2008) structures of explanation writing and include: description/list, cause/effect, comparison/contrast, and order/sequence. Quantitative analysis was used to address question one and qualitative analysis will be used to address question two.

### **Quantitative Analyses**

Descriptive statistics were used to compare students' scores from Classroom A (intervention) and Classroom B (traditional instruction) on the vocabulary rubric. Students' rubric scores were totaled and entered into SPSS to produce descriptive statistics (e.g., percentages, frequencies) Initial statistics included calculating the standard deviations of each data set, followed by a paired *t* test to determine if there were statistically significant differences in vocabulary scores between Classrooms A and B at baseline. Teacher observations and video lesson recordings were used to triangulate this data.

### **Qualitative Analyses**

Student created information writings were analyzed for explanation statements using two rounds of qualitative coding. The first round, selective coding, involved coding transcriptions of students reading of their own information text, as well as coding of students work samples, for explanation statements. This form of coding was selected in order to establish a core category

around which all other data analysis is centered (Saldana, 2013). Following this round of coding, students' explanation statements underwent a second round of thematic coding, in order to place student explanations into categories (Gilbert, Boulter, & Rutherford, 1998).

### **Trustworthiness of Data**

I triangulated my findings using a variety of data sources. These data included: vocabulary rubric scores, audio recorded lessons, student work samples, and peer review to establish trustworthiness of data (Patton, 2002; Denzin, 1978).

**Audio recorded lessons.** Audio-recorded lessons were used to triangulate the information obtained from the vocabulary rubric and student writing samples. The use of multiple data sources and methods of data collection and analysis provided an opportunity to cross check and validate emerging themes and findings

**Student work samples.** Student work samples were also collected to analyze students' physical work in conjunction with their audio -ecorded discussions. This provided clarification and greater understanding regarding students' words and explanations in audio-recorded statements.

**Peer review.** Peer review also provided an additional tool for increasing the trustworthiness of data collected during this study (Lincoln & Guba, 1985). I invited two kindergarten teachers to serve as peer debriefers. While these teachers were colleagues, they did not have students participating in the study. The peer debriefers analyzed the students' vocabulary rubrics separately in order to promote the likelihood of more consistent and valid scoring. I also worked with a fellow graduate student specializing in both elementary literacy and qualitative research to examine the study design, data sources, and results from data analyses.

## **Summary**

Chapter 3 provided an explanation of the methodology for the present study. This chapter described the use of a Mixed Methods design and how both quantitative and qualitative methods will be used to answer the research questions. Data collection included the use of a vocabulary rubric as well as students' work samples and recorded data of students reading their writing samples. Descriptive statistics were used to generate quantitative data, while two rounds of coding, selective and thematic, were used to develop qualitative data. The trustworthiness of my findings was promoted through method and data triangulation, as well as peer debriefing.

## CHAPTER 4

### RESULTS

This chapter presents the results of both quantitative and qualitative data gathered during this mixed methods study. As noted in Chapter 2, informational science text, when used effectively, can have a positive role on students' ability to understand science concepts and think critically (Flushman, 2012; Hannis & Hyona, 1999; Smolkin & Donovan, 2001). Additionally, the purpose of this study was to explore the role of interactive read alouds with informational science text on kindergarten students' understanding of technical vocabulary and explanation of science concepts. In order to provide a context for data collection and analysis, I developed two to guide this mixed methods study. Data was collected in both an intervention and non-intervention classroom over the course of two instructional units Winter Weather and Polar Animals.

First, the chapter begins by outlining the research questions and then moves on to present the demographic data to describe the participants in this study. An analysis of both quantitative and qualitative data follows. In addition, transcription data from the audio recorded interactive read aloud sessions conducted in the intervention class are also highlighted and discussed. Finally, a summary of the quantitative and qualitative results as they relate to the research questions is discussed.

## **Research Questions**

When analyzing the results of the present study, it is important to consider the following research questions posed. These questions guided both data the collection and analysis. The qualitative data collected answered research question one, while quantitative data collected answered research question two. Below are the research questions that guided the present study:

1. How does an integrated science unit, featuring interactive read alouds, support kindergarten students' ability to understand and explain science concepts, as determined by their own explanation writing?
2. What is the relationship between science information text and kindergarten students' ability to explain scientific concepts using age appropriate technical vocabulary?

## **Demographic Data**

The present study took place in a rural primary school in north Alabama during the 2017-2018 school year. Two classrooms took part in the study. In order to ensure equity for all participants, the researcher and another teacher swapped classrooms for the instructional phases of this study. Classroom A, the intervention class was taught by the researcher and did not consist of the researcher's students. Classroom B, the nonintervention class was taught by another teacher and consisted of the researcher's own students. As shown in Table 5, the intervention class consisted of 18 students for the duration of the study. The nonintervention class originally consisted of 18 students, however; an additional student joined the class during the second instructional unit (Polar Animals).

Table 5. Description of Intervention and Nonintervention classrooms

	Number of Students Unit 1	Number of Students Unit 2
Intervention Class (A)	19	19
Nonintervention Class (B)	18	19
Total	37	38

### Qualitative Results

Qualitative data was gathered to determine the impact of interactive read alouds on students' ability to produce verbal and written explanation statements. Data was collected from students' writings and drawings, as well as transcriptions of verbal retellings. Data was then selectively coded for instances of explanation statements. These explanation statements were then thematically coded using template analysis (King, 1998) to determine the types of explanations produced by students. Template analysis was used to code student explanations in order to gain insight regarding the sophistication of students' cognition, as well as to bring an evaluative lens to the analysis of the data. In order to determine sophistication of cognition, explanation statements were categorized according to categories established by Read, Reutzel, and Fawson (2008). These categories include: description/list, cause/effect, comparison/contrast, and order/sequence and have been used to categorize elementary students' explanation statements in terms of development of higher order thinking skills. The Common Core State Standards (CCSS) as well as the Next Generation Science Standards (NGSS) have placed increased emphasis on developing these critical thinking skills.

#### Categories of Explanation Statements

Students' written and verbal explanation statements were coded using categories developed by Read, Reutzel, and Fawson (2008). A description of these categories follows:

**Description/list.** A main idea followed by some elaboration on the main idea.

**Cause/effect.** The results of an event and the reason the event occurred.

**Comparison/contrast.** Objects, events, people, or places are discussed in terms of similarities or differences.

**Order/sequence.** The steps of a process or the order of a sequence of events.

### **Winter Weather Unit**

In both classrooms, the Winter Weather unit featured instruction on lower temperatures, snow and ice, and the water cycle. When asked to write to share their leaning on winter weather, the vast majority of students from both classrooms chose to write about topics pertinent to the topic of study.

**Intervention classroom.** In the intervention classroom, a total of 19 students produced verbal or written samples. Of these samples, a total of 14 written and five verbal explanations were produced. The majority of explanation statements were categorized as cause/effect. Of the twelve cause and effect statements produced, eleven were written and one was verbal. The student who produced a verbal explanation did so after expounding upon a written, non-explanation statement, “The snow is very cold.” The student produced the verbal explanation after reading his sentence and without prompting from the instructor. An example of the verbal cause and effect explanation follows:

*When I play in the snow it is so cold because the water is frozen. The snow will melt when it is hot.*

This statement was classifies as cause and effect because the student provided an explanation of what happens to snow in warm weather.

The remaining cause/effect statements were written. The following figures display cause/effect statements in students' writings:

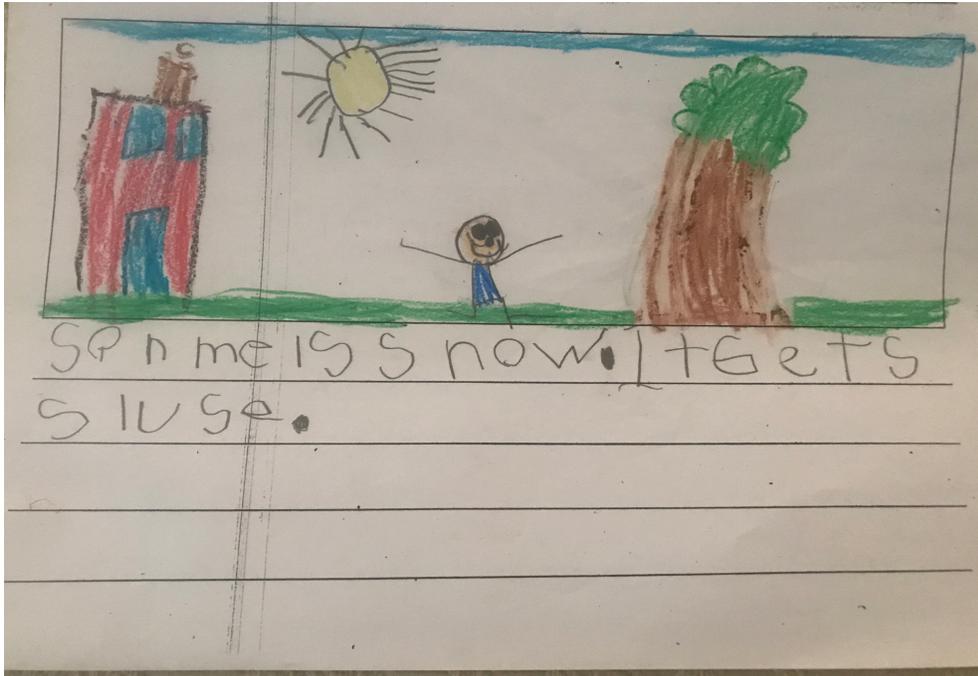
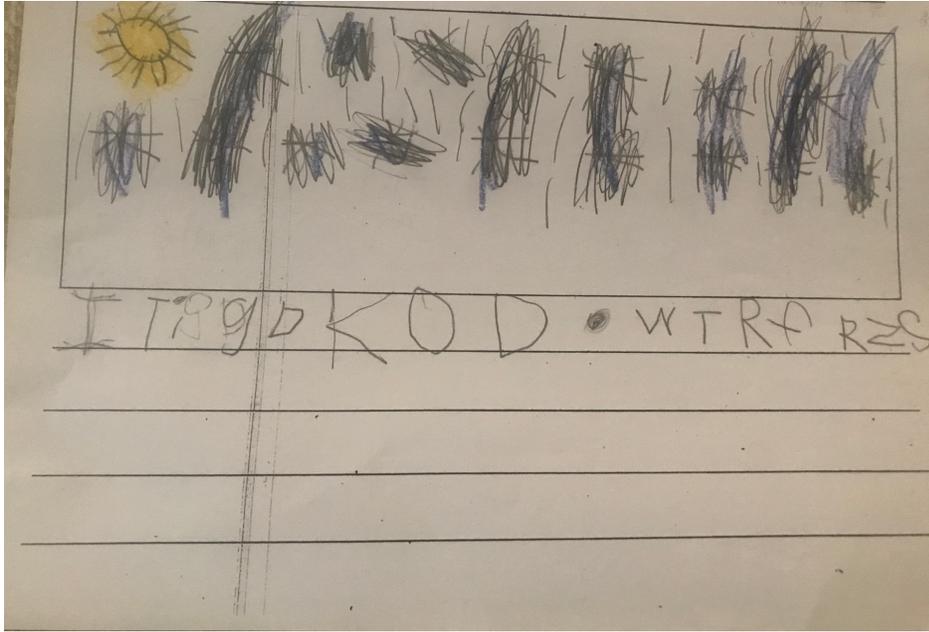


Figure 1. Cause/Effect

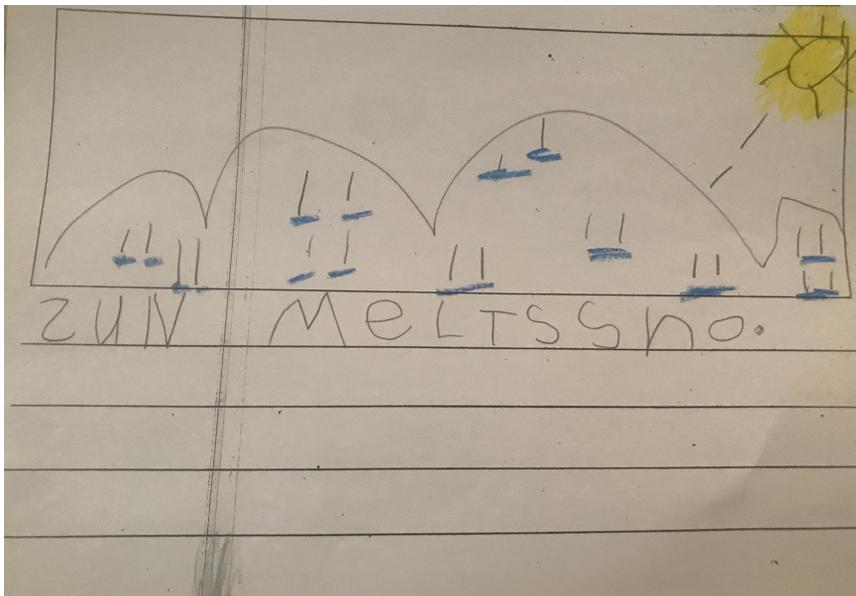
“Sun melts snow. It gets slushy.”

This work sample provides an example of a more rudimentary cause and effect statement. Again, the student explains what happens to snow when it is exposed to sunlight or warmer temperatures. It is also interesting to note the use of the word ‘slushy’ as this was one of the highlighted vocabulary words in the information text used during the instructional unit.



*Figure 2. Cause/Effect*  
"It gets cold. Water freezes."

In contrast to the previous examples, this student provides a statement about the effects of cold weather. This work sample can be classified as cause and effect due to the explanation regarding what happens to water in colder temperatures. It is interesting to note the student also displayed understanding by illustrating ice crystals.



*Figure 3. Cause/Effect*  
"Sun melts snow."

Again, we see an example of cause and effect explanations. In this work sample, the student explains the effects of sunlight on snow and includes an illustration depicting the sun's beams melting snow into water droplets.

It is important to note that while most students produced cause and effect statements, a smaller number of students produced both verbal and written statements categorized as comparison and contrast and order sequencing. All verbal statements expounded upon some form of writing. In one case, a student produced an explanation while "reading" a strand of letter strings. Students added the remaining verbal statements after reading their written non-explanation statements. The verbal statements consisted of the following:

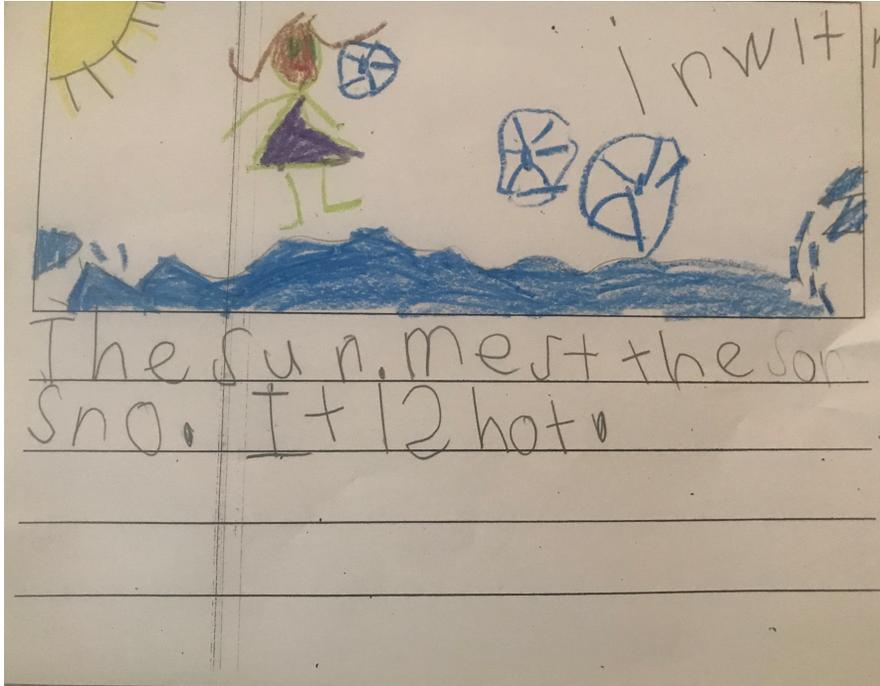
*The water from the clouds comes down and forms into snowflakes.* (order/sequencing)

In this verbal explanation, the student provided an explanation regarding the process by which snowflakes are formed. Because this statement outlines the steps in a process, it was classified as order/sequence.

*In the summer water is like rain but in the winter when it is cold it is frozen. That is like snow.*  
(comparison/contrast)

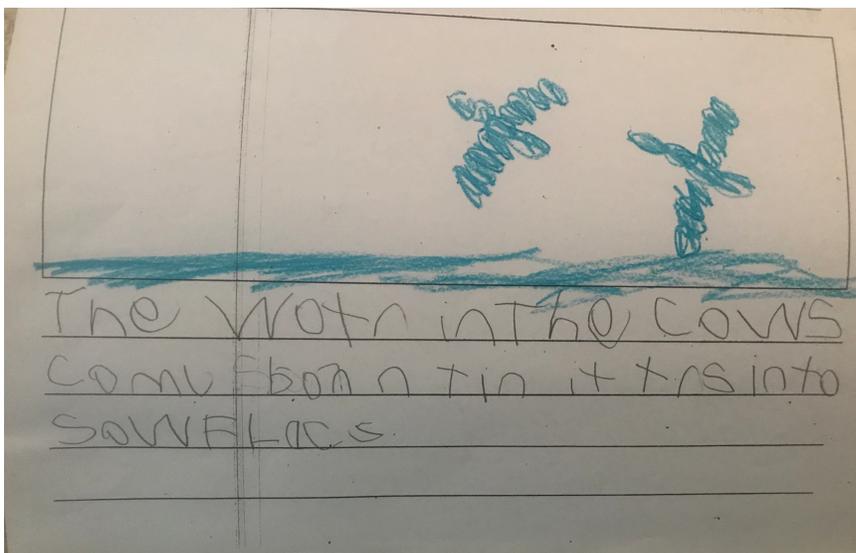
This verbal explanation was classified as comparison/contrast due to the juxtaposition of the qualities of water in both hot and cold weather.

Students' written statements consisted of one comparison/contrast statement and one order/sequence statement. These written statements are located in the following figures:



*Figure 4. Comparison/Contrast*  
 “The sun melts the snow. It is hot.”

This work sample was classified as comparison/contrast based on information the student provided regarding her illustration. After discussing the drawing with the student she indicated her drawing depicts winter and summer, note the label “in winter” on the right side of the drawing.



*Figure 5. Order/Sequence*  
 “The water in the clouds comes down then it turns into snowflakes.”

In this work sample, the student gives an explanation categorized as order/sequence. The work was classified in this way because his writing outlines the steps in the process by which snowflakes are formed. It is also interesting to note the students' illustration of snow crystals; in this way the student conveying additional information about the formation of snowflakes.

**Nonintervention classroom.** In the nonintervention class, a total of eighteen students produced written or verbal explanation statements. Of these statements eleven were written and seven were verbal. Each of the seven students who produced verbal explanations did so in addition to reading written, non-explanation statements.

In contrast with the intervention class, the majority of students in the nonintervention group produced explanation statements in the description/list category. Six students produced cause and effect descriptions and two students produced comparison and contrast statements. No students produced order/sequence explanations. Examples of students' verbal explanations are as follows:

*Water in the winter freezes. It freezes into snow.* (cause/effect)

This verbal explanation was classified as cause and effect because it provides information regarding how snow is formed.

*Snow is snowflakes. Snow is fun to do in the winter.* (description/list)

In this example, the student states a main idea, followed by an elaboration that is not explicative in nature. For this reason, it was classified as description/list.

*Water melts. If you put water in the cold it freezes into ice. Water melts in the summer.*  
(comparison/contrast)

This verbal explanation was classified as comparison/contrast because the student is providing evidence of what happens to water when it is exposed to different temperatures. It is reasonable to assume the student's term 'in summer' indicates warm weather.

In addition to these statements, a total of eleven students produced written statements. Seven of these statements were a description or list, three were cause and effect, and one was comparison/contrast. No students produced sequencing explanations. Examples of students' written explanations are as follows:

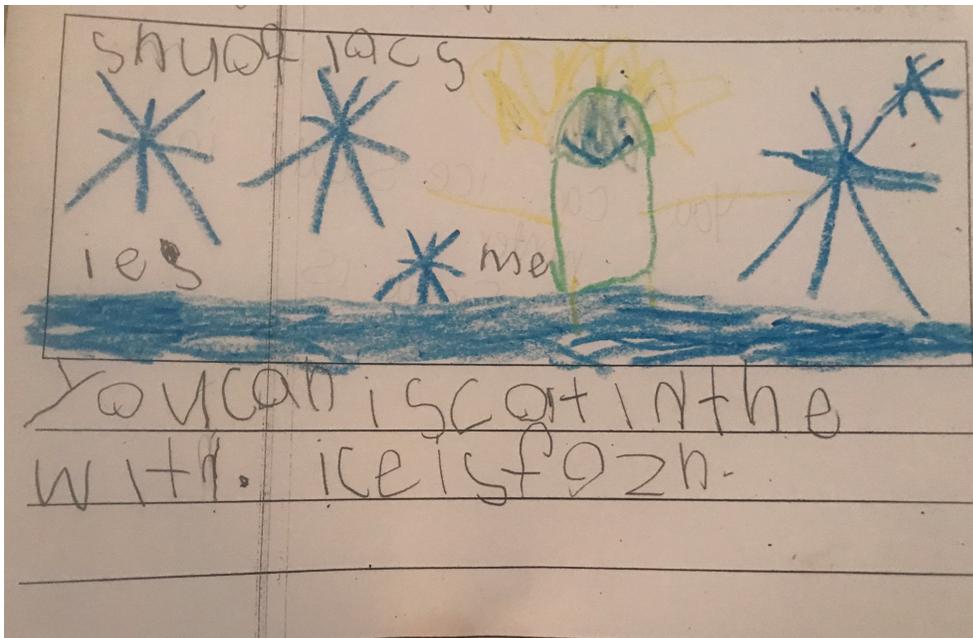


Figure 6. Description/List  
"You can ice skate in the winter. Ice is frozen."

In this example, the student provides a main idea, followed by some elaboration. Because neither of these statements provides a true explanation, the work sample was categorized as description/list. It is noteworthy to mention the students' inclusion of ice crystals and the label "snowflakes" in the illustration.

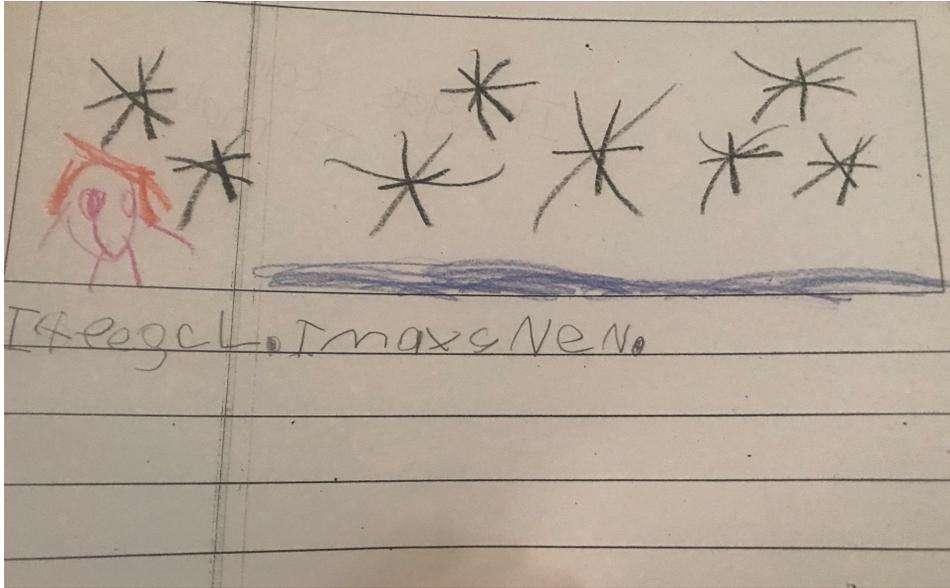


Figure 7. Description/List  
 “It gets icy. I make snowmen.”

Again, the student includes an illustration featuring ice crystals while writing to share a main idea with a follow up statement.

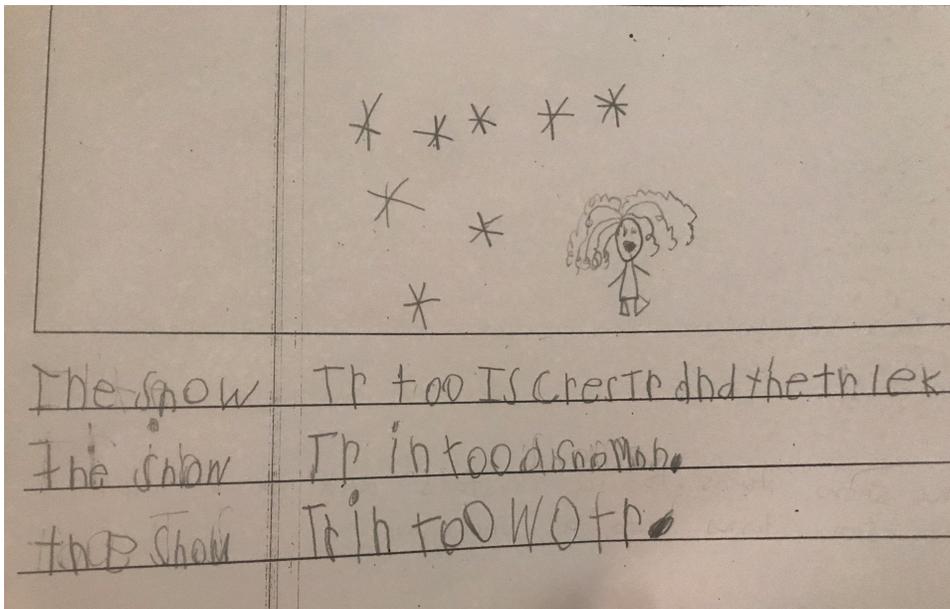


Figure 8. Cause/Effect  
 “The snow turns to ice crystals and turns liquid. The snow turns into a snowman. The snow turns into water.”

Although somewhat confusing, this sample provides an explanation of how snow is formed. Because the student conveyed an understanding that snow is made of ice crystals and can return to its liquid state, this explanation was classified as cause/effect.

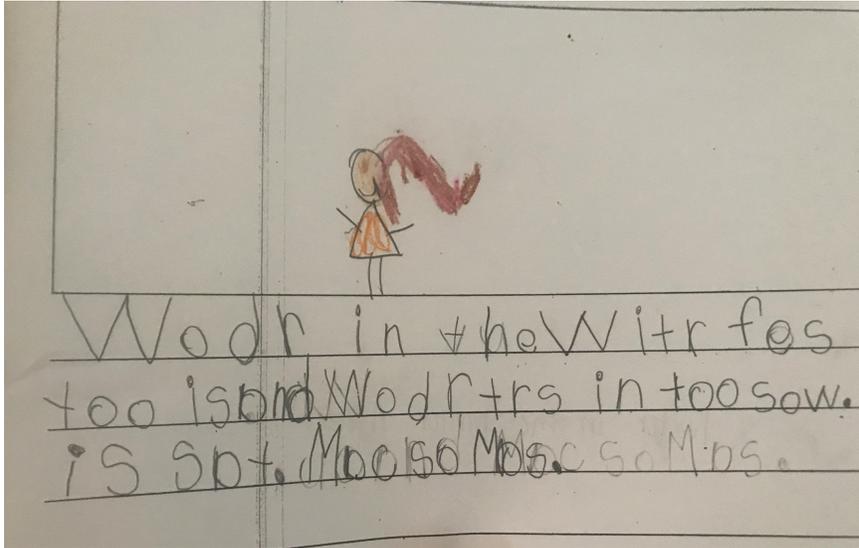
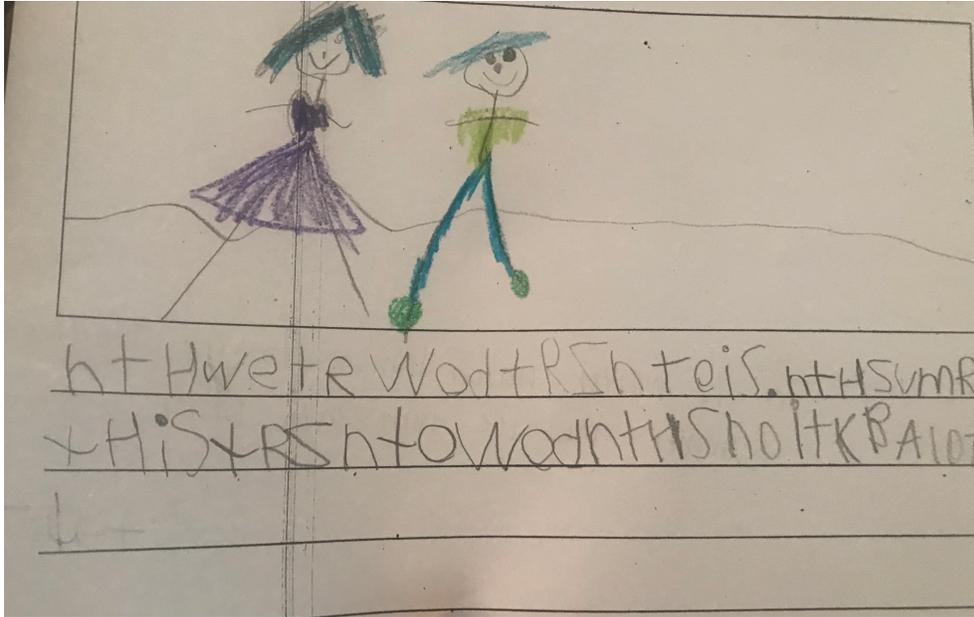


Figure 9. Cause/Effect

“Water in the winter freezes to ice and water turns into snow. [It] is so soft. Makes a mess.”

This student provides an explanation regarding how water changes into ice when exposed to colder temperatures. While the work sample also features purely factual statements, it was classified as cause and effect due to the initial explanation.



*Figure 10. Comparison/Contrast*

“In the winter water turns into ice. In the summer the ice turns into water. The snow it can be a lot.”

In this work sample, the student provides an explanation comparing how water changes states in cold and warm weather. This can be inferred by the terms ‘in winter’ and ‘in summer’. Because of this, the sample was classified as comparison contrast.

In summary, the intervention group produced a greater amount of written explanation statements. Of both written and verbal explanation statements, the vast majority were higher order explanation statements, those other than description/list. The nonintervention class featured a greater amount of written explanations; however, this group featured a greater number of explanations in the description/list category. The following provides a listing of students’ explanations:

Table 6. Student Explanations Winter Weather Unit

	Description/ List	Cause/ Effect	Comparison/ Contrast	Order/ Sequence
Intervention Written	1	11	1	1
Nonintervention Written	7	3	1	0
Intervention Verbal	2	1	1	1
Nonintervention Verbal	3	3	1	0

### **Polar Animals Unit**

In both classrooms, the Polar Animals unit featured instruction on Arctic and Antarctic habitats and the animals living in these harsh regions. When asked to write to share their learning about polar animals, students from both classrooms chose to write about topics pertinent to the topic of study.

**Intervention classroom.** In the intervention classroom, a total of 19 students produced verbal or written samples. Of these samples, a total of 12 written and seven verbal explanations were produced. Students gave six of the verbal explanations after reading written, non-explanation statements. The remaining verbal explanation was given as a student “read” a sentence of letter strings.

The majority of both written and verbal explanation statements were categorized as cause/effect. In addition to cause/effect statements, students also produced verbal comparison/contrast and order/sequence statements. Students verbal statements included five cause/effect statements, one comparison/contrast statement, and one order/ sequence statement. No description/list statements were noted. Examples of students’ verbal explanations include: *He’s walking. Snow is covering it [the ground]. Polar bears have hair. It keeps them warm but the kid has a jacket to stay warm.* (comparison/contrast)

In this verbal explanation, the student compares how a child and a polar bear stay warm in cold temperatures. Because of the comparative nature of this statement, the sample was classified as comparison/contrast.

*Polar bears eat lots of fish. That makes blubber. Blubber helps them stay alive on all of the ice.*

(order/sequence)

In this sample, the student provides an explanation of the process by which polar bears develop blubber and stay warm in cold temperatures. Because this explanation outlines the steps in a process it was classified as order/sequence. It is also important to note the term ‘blubber’ was highlighted in the information text used during this instructional unit.

*The polar bears have thick fur. Without it they might get too cold.* (cause/effect)

This verbal sample explains what might occur if a polar bear did not have thick fur. Because this explanation discusses the possible result of an event it was classified as cause/effect.

Students written statements included two description/list statements and ten cause/effect statements. No comparison/contrast or order/sequence statements were noted. Examples of students written explanations are located in the following figures.

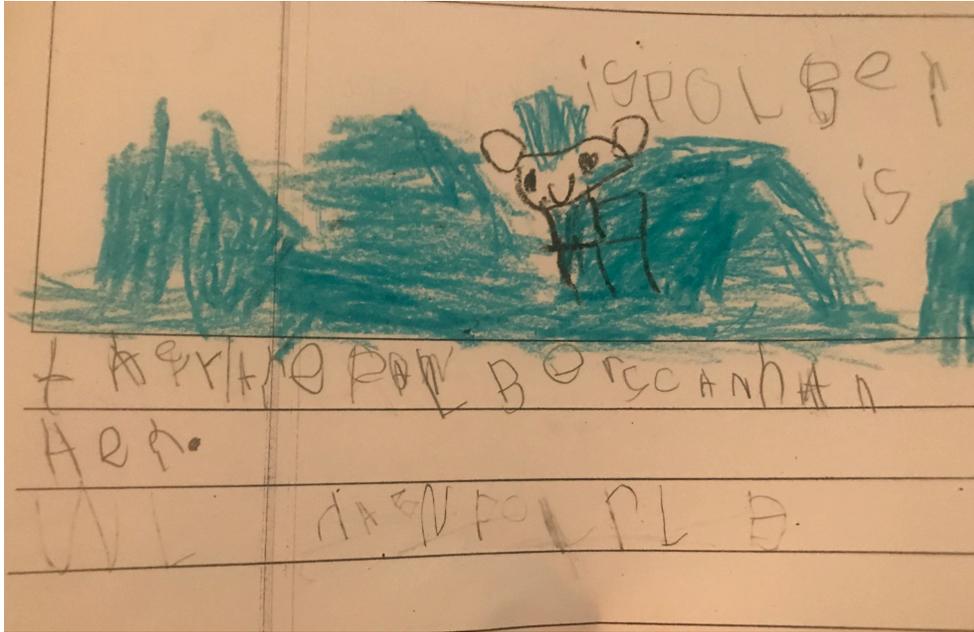


Figure 11. Description/List.  
 "The polar bears can have thick hair."

This work sample features a statement regarding the characteristics of a polar bear. While the student is aware polar bears have fur, he does not provide an explanation regarding how or why fur is useful to the polar bear. Because of this, the sample was classified as description/list.

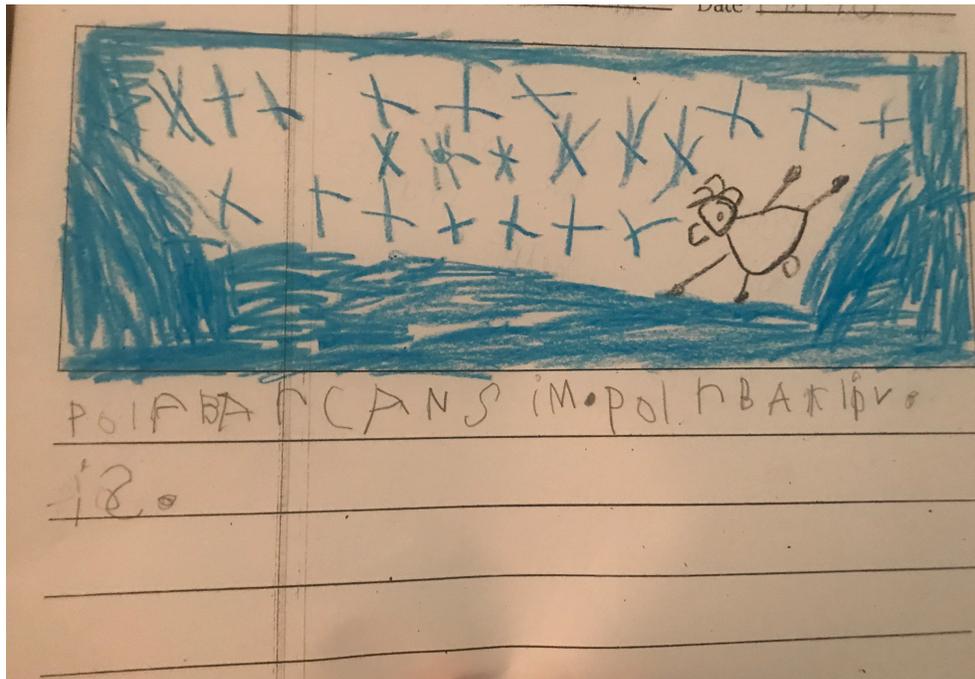


Figure 12. Description/List.  
 "Polar bears can swim. Polar bears live on ice."



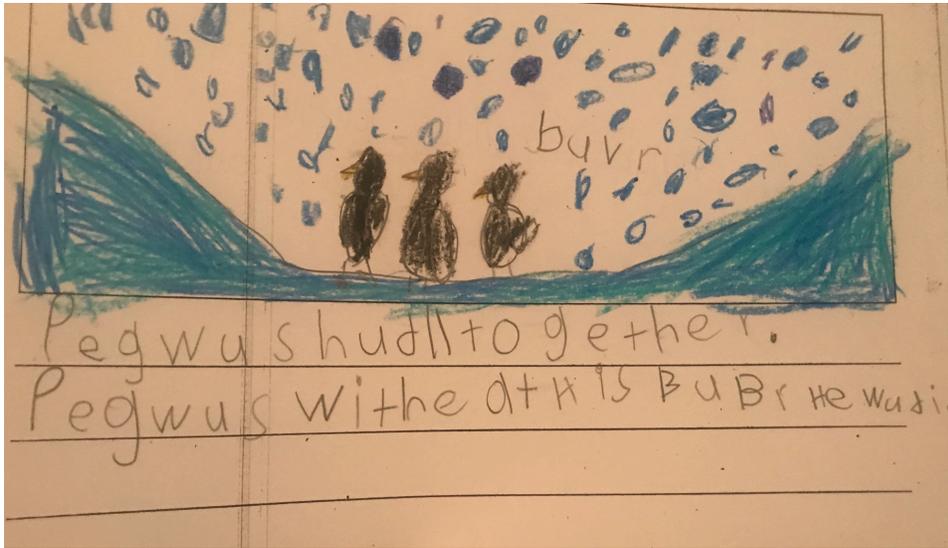


Figure 14. Cause/Effect.

“Penguins huddle together. Penguins without his blubber would die.”

In this sample, the student provides two reasons for penguins’ survival in harsh arctic weather. For this reason the sample was classified as cause/effect. It is also interesting to note the label ‘buvr’ or ‘blubber’ in the illustration. This word was highlighted in the information text used during this instructional unit.

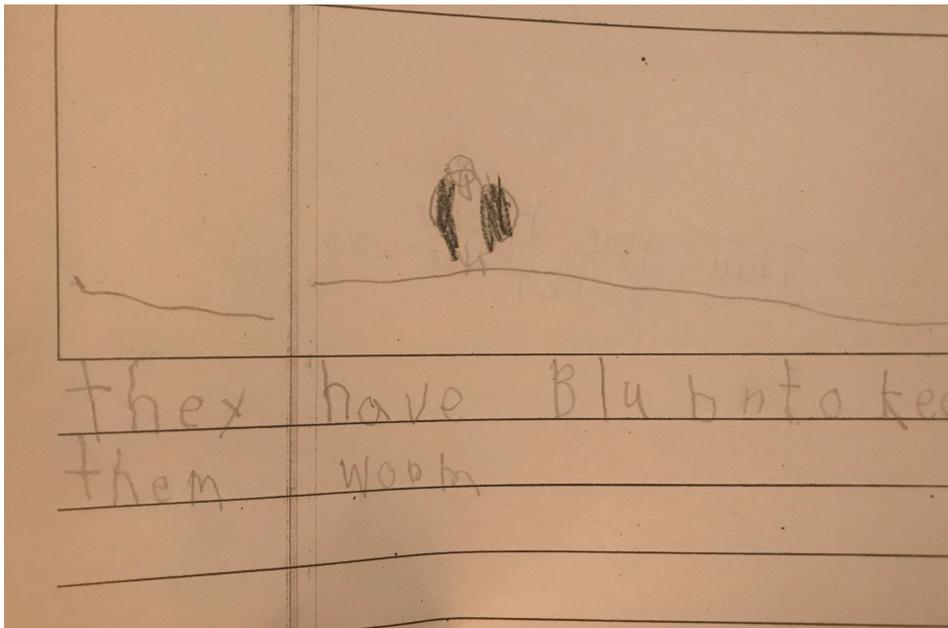


Figure 15. Cause/Effect.

“They have blubber to keep them warm.”

Again, we see the use of the vocabulary term ‘blubber’. In this sample, the student provided a more simplistic reason for penguins’ use of blubber. Because the statement features a reason, this sample was classified as cause/effect.

**Nonintervention classroom.** In the nonintervention class, a total of 19 students produced explanation statements. Of these statements, 14 were written and 5 were verbal. The five students who produced verbal explanations did so after reading their own written, non-explanation statements. The majority of both written and verbal explanation statements were categorized as description/list. This group displayed less variety in the types of explanations produced. Students only produced written and verbal explanations from the description/list and cause/effect categories. The other categories were not represented. Students’ verbal explanations consisted of three description/list and two cause/effect. Examples of students’ verbal explanation statements include:

*Polar bears live in the Arctic and bears are swimming.* (description/list)

Because this sample featured a main idea with some elaboration but lacked an explanation it was classified as description/list.

*Polar animals live in the North Pole and the South Pole.* (description/list)

Again, this sample was classified as description list because of the statement of a main idea with no further explanation.

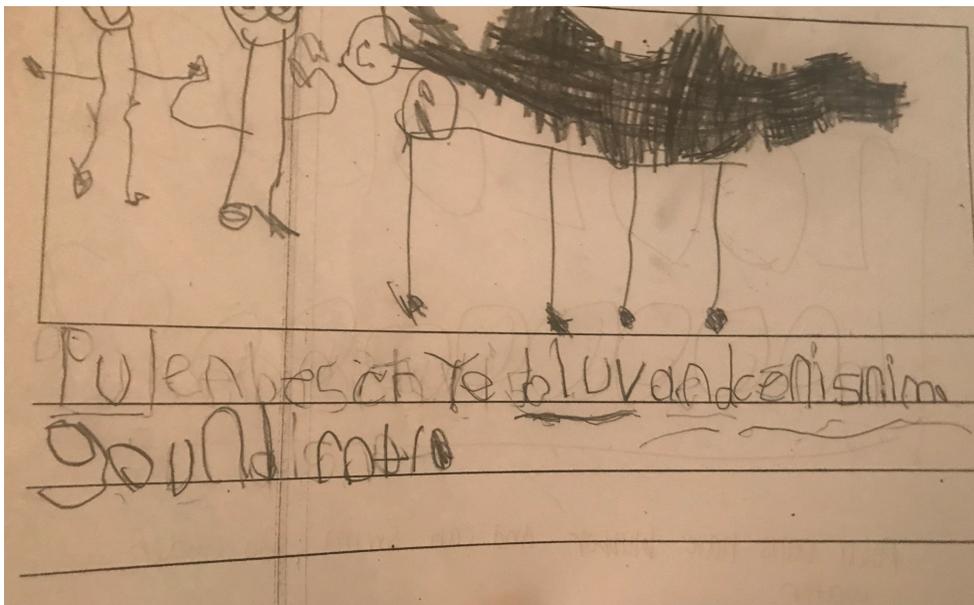
*Polar bears have fat blubber that helps them to live and stay warm.* (cause/effect)

This verbal sample features an explanation of the reason polar bears can survive in harsh arctic temperatures. Because this sample includes a reason it was classified as cause/effect.

*They survive in the water to catch food. They survive with their thick blubber to stay warm.*  
(cause/effect)

In this sample, we also see the inclusion of a reason for a particular event; animals survive because blubber allows them to stay warm in cold temperatures. Because of this, the statement was classified as cause/effect. It is also interesting to note the inclusion of the word ‘survive’. This word was featured on the vocabulary measure given to students; however, this student was a member of the nonintervention class and therefore not explicitly taught this word during the instructional unit.

Students written statements included ten description/list explanations and four cause/effect explanations. Examples of students written explanations are located in the following figures.



*Figure 16. Description/List*  
“Polar bears have blubber and can swim. Go under water.”

In this sample, the student provides a main idea and follows up with an additional statement. Because neither the main idea nor the follow up statement feature an explanation this sample was categorized as description/list.

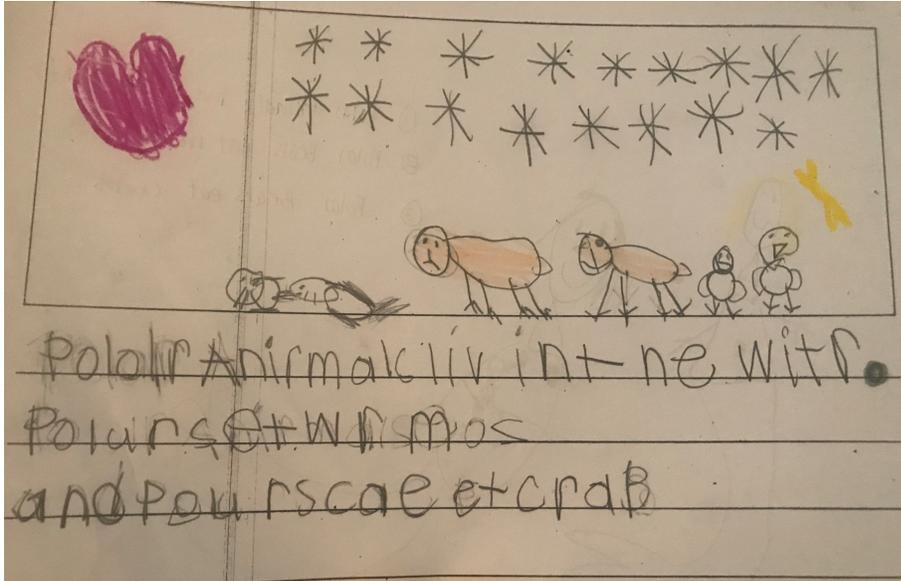


Figure 17. Description/List  
 “Polar animals live in the winter. Polar bears eat worms. Polar bears eat crabs.”

Again, this sample features a main idea followed by an elaborative statement that is not explicative in nature. Because of this, the sample was classified as description/list.

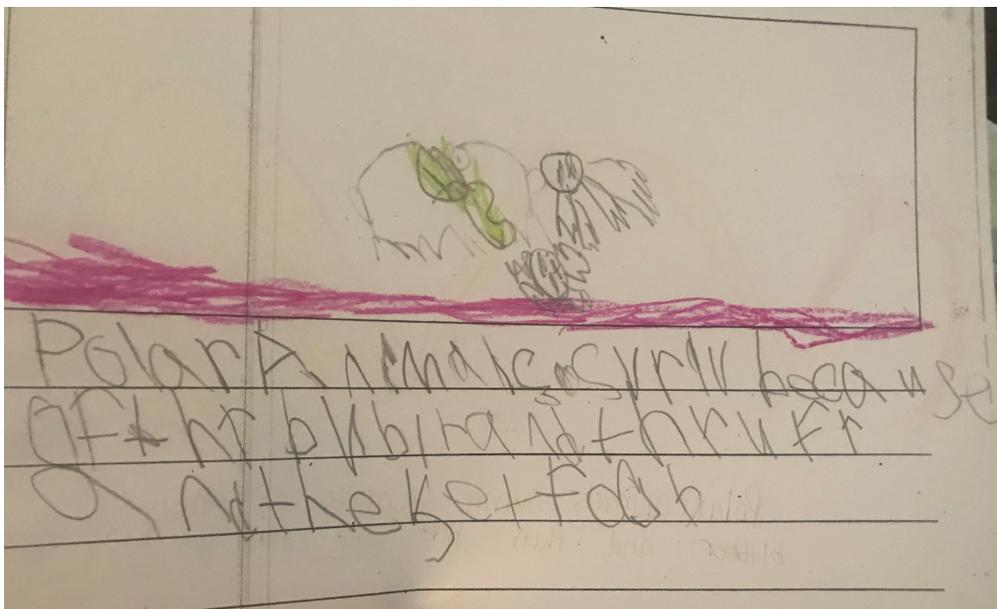


Figure 18. Cause/Effect  
 “Polar animals survive because of their blubber and their fur and they get food.”

This sample was classified as cause/effect because the student provided a reason for polar animals’ survival in harsh arctic weather.

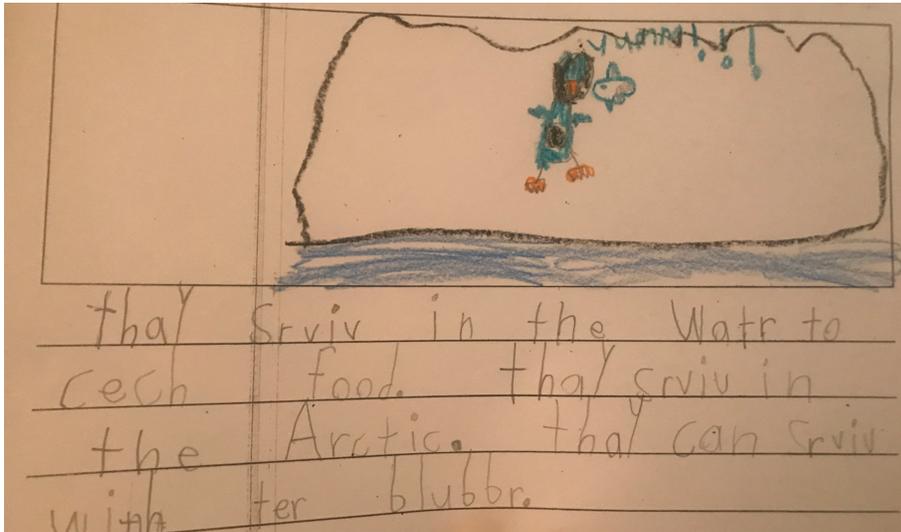


Figure 19. Cause/Effect

“They survive in the water to catch food. They survive in the Arctic. They can survive with their blubber.”

Here, we see another instance of reason provided by the explanation of how animals survive in harsh conditions. Because of the use of a reason, this sample was classified as cause/effect. As with the earlier verbal sample, it is interesting to note the inclusion of the word ‘survive’ despite any formal instruction of this word during the instructional unit.

In summary, both the intervention and nonintervention group produced a greater amount of written explanation statements. Of both written and verbal explanation statements, the intervention group was characterized by a greater number of higher order explanation statements. The nonintervention group was characterized by greater number explanations categorized as description/list. The following table provides a listing of students’ explanations:

Table 7. Student Explanations Polar Animals Unit

	Description/ List	Cause/ Effect	Comparison/ Contrast	Order/ Sequence
Intervention Written	2	10	0	0
Nonintervention Written	10	4	0	0
Intervention Verbal	0	5	1	1
Nonintervention Verbal	3	2	0	0

## Read Alouds

In addition to student data, an audio recording of the intervention instructor reading aloud from informational text was taken during one lesson from each instructional unit. These recordings were transcribed and coded for explanation statements. There were a total of 20 explanation statements made by the instructor during the Winter Weather read aloud and a total of 27 explanation statements made by the instructor during the Polar Animal read aloud. Of these statements, the vast majority of explanation statements made during both instructional units were cause/effect. Explanations categorized as order/sequence and comparison/contrast were also used with less frequency and description/list statements were the least common.

It is important to note that both instructional units unintentionally coincided with a comprehension study on cause and effect. While this skill was not purposefully taught during the instructional units, there was obviously carry over as evidenced by the frequency of cause and effect statements in the qualitative data. See the following table for data regarding the instructor's explanation statements.

Table 8. Intervention Instructor Explanations during Read Alouds

	Description/ List	Cause/ Effect	Comparison/ Contrast	Order/ Sequence
Winter Weather	3	8	5	4
Polar Animals	3	12	7	5

While quantitative data was gathered before the qualitative phase of the study, quantitative analysis was embedded in the analysis of qualitative data. The quantitative results of this study discussed in the following section.

## Quantitative Results

A series of linear regression analyses were conducted to determine the impact of information text on students' understanding of content specific vocabulary. Students' average

scores on a pre and post vocabulary rubric measured this understanding. A separate analysis was completed for each instructional unit, **Winter Weather** and **Polar Animals**. The results indicated that both units including information text had a positive impact on students understanding of content specific vocabulary.

Given that groups were based on students within their assigned classroom, rather than randomly selected groups, there is an inherent threat of selection bias. One of these groups may have been predisposed to greater performance than the other class simply because it contained students with greater academic abilities. To help control for this threat to internal validity, I conducted a regression analysis on students' pretest vocabulary scores. These tests did not yield a significance difference in the pre-test scores between the intervention and non intervention classroom for the Winter Weather unit or the Polar Animals unit. These results indicate the two classes were not significantly different from each other at baseline with respect to students' vocabulary knowledge.

In order to further account the influence of students' pretest scores on student's post-test scores, I conducted another series of regression analyses. The first model estimated the impact of the intervention on my outcome variable (students' post-test score) for each instructional unit. The second model estimated the impact of the intervention on student's post-test scores, controlling for student's pre-test rubric scores. The results of the regressions for each instructional unit are detailed in the following sections.

### **Winter Weather Unit**

As shown in Table 9, my final regression model yielded a significant, positive effect for the intervention on students' post test scores, when their pre-test scores were controlled ( $\beta=.39$ ,  $p<.05$ ). This finding means that students who participated in the intervention classroom had

significantly higher test scores than students in the non-intervention classrooms. The calculated effect size was .88, which is large (Cohen, 1998), indicating that there was nearly a standard deviation difference between the two classrooms with respect to their average post-test score. However, as shown in Table 9, the use of information text accounted for only 15% of the variation in students' posttest scores. This metric is important because it suggests that other factors that are not included in this model may account for a significant proportion of the variance in students' vocabulary scores.

Table 9. OLS Regression Estimates of the Relationship between Text Intervention and Vocabulary (N=37)

	$\beta$	SE	<i>p</i>
Text Intervention	.39	.53	.02
Baseline Vocabulary	.05*	.56	.73

R<sup>2</sup>= .15

### **Polar Animals Unit**

The use of information text accounted for 25% of the variation in students' posttest scores. The calculated effect size was 1.08, a very large effect size according to Cohen (1988). It is important to note an additional student moved into the nonintervention class during the second unit (polar animals). Causing the total N to change from 37 to 38.

Table 10. OLS Regression Estimates of the Relationship between Text Intervention and Vocabulary (N=38)

	$\beta$	SE	<i>p</i>
Text Intervention	.50	.64	.02
Baseline Vocabulary	.03*	.35	.86

R<sup>2</sup>= .25

The analysis of quantitative data was embedded in the analysis of qualitative results, discussed earlier in this chapter.

### **Summary**

This chapter discussed the results of both the qualitative and quantitative data for the present study. Further, the data was reported within the framework of the study's research questions and organized to describe the impact quantitative and qualitative data on their respective research questions. Both qualitative and quantitative data reflect the positive impact informational read alouds have on kindergarten students' academic performance. Concerning research question one, qualitative data shows an increased use of explanation statements by students in the intervention classroom. Cause/effect statements were used by a majority of students in the intervention classroom, while students in the nonintervention classroom more commonly used descriptive/list statements. It is also evident that students in the intervention classroom had ample models of explanation statements, specifically cause/effect statements, based on data from read alouds with informational text.

Similarly, concerning research question two, quantitative data shows significant gains in students' understanding of vocabulary terms related to the topics discussed in informational read alouds during each instructional unit. Students' scores on the vocabulary rubric demonstrated greater understanding of technical vocabulary terms following the use of informational read alouds. It is also interesting to note that many of these terms were found in students' writing. The following chapter will provide a discussion on both qualitative and quantitative data and note the impact of the study. A discussion of limitations and future research will also be discussed in the following chapter.

## CHAPTER 5

### DISCUSSION

In this chapter, I provide a brief summary of this study and the research questions. I then discuss significant findings from each of the research questions. In this section, I link these significant findings to relevant research literature. Lastly, I highlight the implications of these findings for future research and educational practice.

#### **Summary of the Study**

The findings I present in this chapter provide practitioners and researchers with a deeper understanding about the impact information texts have on young students' ability to produce explanation statements. In summary, this study was designed to yield data that would provide increased understanding of kindergarteners' writing and production of explanation statements. First, I began by examining the impact of information text on vocabulary through the use of a vocabulary pre and posttest. Next, I examined the impact of information text, as well as other enriching science activities, on students' explanation statements by analyzing students' writing compositions. Accordingly, the present study sought to address the research questions listed below:

1. How does an integrated science unit, featuring interactive read alouds, support kindergarten students' ability to understand and explain science concepts, as determined by their own information writing?

2. What is the relationship between science information text and kindergarten students' ability to explain scientific concepts using age appropriate technical vocabulary?

In this study, I used an embedded mixed methods design. (Cresswell & Plano-Clark 2007; Teddlie & Tashakkori, 2009). A discussion of the data obtained from this study is outlined in the following sections.

### **Review of the Findings Question 1**

1. How does an integrated science unit, featuring interactive read alouds, support kindergarten students' ability to understand and explain science concepts, as determined by their own explanation writing?

The second research question considered students' ability to produce explanation statement (see research question above). At the conclusion of each instructional unit, students were asked to write and to orally communicate their knowledge about the topic of study. After independently completing this writing composition students "read" or talked about their written sample aloud. To determine the quantity and type of explanation statements, students written compositions and oral retellings/statements were coded using the Read, Reutzel, & Fawson (2008) framework.

For both instructional units, the amount of explanation statements produced by students in the intervention classroom was considerably higher than those produced by students in the nonintervention classroom. Students from both classrooms produced a greater number of written explanations (26 from the intervention classroom and 25 from the nonintervention classroom) than verbal explanations (12 from both the intervention and nonintervention classrooms). When categorized, the majority of students from the nonintervention class produced explanations

classified as description/list while the majority of explanations from the intervention group were classified as cause/effect. This aligns with research stating that young children are developmentally capable of producing cause/effect explanations (Newton & Newton, 2000) and explanations that require higher order thinking skills are often missing from science classrooms (Newton & Newton, 2000; Zimmerman, 2000).

However, this is not surprising, as educational theory states children tend to model what they are exposed to within their environment (Bandura, 1977). Bandura's work states that learning begins with environmental observation, much like students observing a teacher during instruction. Following this stage, the emphasis shifts from the environmental to the cognitive, as learners retain what they have observed. Finally, learners reproduce what they have observed and retained, reinforcing the behavior and resulting in motivation to continue the behavior, specifically based on the feedback and experience received during the reproduction stage.

It is also important to note that a small number of students from both classrooms produced comparison/contrast and order/sequence statements. However, when examining only these explanations types, we find students from the intervention classroom produced five total explanations classified as comparison/contrast or order/sequence while students from the nonintervention only produced two of these types of explanations. In other words, the intervention group produced a wider range of explanation types than their peers in the nonintervention class. The teacher's statements or "teacher talk" clearly played an impact on the types of explanations produced by students in the intervention classroom. For example, when analyzed, interactive read alouds for both instructional units consisted of a majority of teacher explanations classified as cause/effect. While explanations from other categories were present, the relationship between these explanations and those produced by students is likely related.

Because of this relationship, it is important for teachers to expose their students to a variety of explanation types both while reading aloud and while modeling their thinking related to information texts.

The findings concerning the relationship between teacher statements or “teacher talk” are consistent with previous research. Christie (1989) explains the nature of the early childhood classroom capitalizes on the use of teacher and student talk to develop students’ social and academic skills. Through modeling, a child comes to accept behaviors cognitively and replicate these behaviors in similar situations. Calkins (1994) explains as teachers and other adults read aloud and discuss text with young children, they model comprehension skills that children can then replicate in their own verbal discussions and writing; as was found with students in the present study.

After considering the data from both the intervention and nonintervention classroom, it appears that the use of interactive read alouds increased students’ abilities to produce explanation statements. However, the majority of explanation statements produced by students were cause/effect, the category requiring the least amount of higher order thinking skills (Newton & Newton, 2000; Zimmerman, 2000). This is not surprising given the young nature of the students in this study. As children mature, their higher order thinking skills develop, resulting in the ability to produce more sophisticated explanations (Newton & Newton, 2000). The data from this study uses quantitative data embedded in qualitative results to provide evidence of the positive influence information text has in developing kindergarteners’ ability to develop these skills. A detailed discussion of these findings is included in the following sections.

## **The Connection Between Explanations and Information Text**

Oral language and access to the language of science plays an important role in the ability to understand scientific concepts (Shanahan & Shanahan, 2012). Scientific language is characterized by the use of explanations (NGSS, 2013). Through the selection of information texts with strong explanation features, teachers can orally model scientific explanations for students while reading aloud (Read, Reutzel, & Fawson, 2008). Furthermore, information texts provide students with examples of technical, scientific vocabulary. Through modeling the use of these technical terms teachers can enhance students' understanding of scientific concepts (Patrick, Mantzicopoulos, & Samarapungavan, 2009; Shanahan & Shanahan, 2012). Data from this study provides evidence of students' ability to produce scientific explanations when provided with ample verbal and written models. It is noteworthy that students' verbal explanations were often longer and more complex than their written explanations. This provides further insight to young students' unconstrained thinking.

While explanation writing is an important instructional tool, science explanations should also be taught outside the constraints of writing. Because research indicates explanations play a crucial role in science education (Smolkin, McTigue, Donovan and Coleman, 2008) and the use of scientific explanations is required by state standards (NGSS, 2013), it is vital to teach students this skill. In order to effectively teach students how to craft their own explanations, they must hear examples and models of explanation statements (Smolkin, McTigue, Donovan, and Coleman, 2008; Newton & Newton, 2000; Zimmerman, 2000). In the present study, this finding supports the research mentioned above as students in the intervention class were provided with ample opportunities to hear explanations through the use of interactive read alouds with information text. As predicted, the use of these interactive read alouds increased students' ability

to use content specific vocabulary as well as produce explanation statements. These results are consistent with findings from previous studies with older students (Driver, Newton, & Osbourne, 2000; Newton & Newton, 2000). Prior research has established the important role teacher modeling plays on older students' ability to produce written and verbal work (Guthrie & Klauda, 2014; Kuhn, Rausch, McCarty, Montgomery & Rule, 2015); however, we have not seen evidence of this with kindergarten students' early writing.

The use of explanation statements occurred more consistently in the intervention class and the use of higher order thinking skills to produce the explanations was more prevalent in the intervention class. Students in the nonintervention class typically used explanations classified as description/list, the most rudimentary form of explanation. Students in the intervention class used cause/effect descriptions most frequently, and also incorporated the use of higher order thinking skills in their explanations (comparison/contrast and order/sequence) with greater frequency than students in the nonintervention class. This is a key finding because the use of causal and predictive statements have been found to play an important role in the development of children's scientific reasoning (Zimmerman, 2000).

In her study, Zimmerman asserts scientific reasoning skills should be incorporated into the core curriculum, alongside reading, writing, and mathematics. Zimmerman justifies this assertion by stating evidence of the important role reasoning play on developing the critical thinking process as well as comprehension skills. This is certainly an area that is important to develop in young children; and through continued use of informational text using the interactive read aloud format demonstrated in this study, increased utilization of higher order thinking skills through the use of more complex explanations is made possible. The need for increased use of informational text is discussed in the implications section.

Because students in the nonintervention group did not produce higher order explanations as regularly as their counterparts in the intervention group, it is reasonable to attribute the increase in explanations to the use of informational text. This assertion can be made on both empirical and conceptual grounds. To begin, information texts have been found to increase students' vocabulary knowledge and critical thinking skills (Chall, Jacobs, & Baldwin, 1990; Smolkin, McTigue, Donovan, and Coleman, 2008). The increase in both vocabulary knowledge and critical thinking skills can lead to a greater awareness of the author's purpose regarding scientific writing (O' Hallaron, Palinscor, & Schleppengrell, 2015). Finally, information texts typically feature a greater number of explanations which can be modeled during reading (Smolkin, McTigue, Donovan, and Coleman, 2008), ultimately providing an example for students to formulate their own scientific explanations.

In addition, the nature of how the texts are read to the children is also worth mentioning. The use of interactive read alouds provides students with the opportunity to develop an understanding of text through direct instructional practices (Smolkin & Donovan, 2001). In their 1999 study, Hannus and Hyona found the use of interactive read alouds along with discussions and explanations led by the teacher supported students' understanding of abstract concepts. The present study finds similar results. In this study, the intervention teacher discussed the characteristics of information text during reading and invited students to share their ideas using the technical language unique to the topic and discipline. The incorporation of discussion and scientific vocabulary into instruction provided scaffolding for students' reading comprehension (Hooper, et. al., 2011; Read, Reutzel, & Fawson, 2008). The number of explanations produced by students in the intervention class supports these findings.

## **Review of the Findings: Question 2**

2. What is the relationship between science information text and kindergarten students' ability to explain scientific concepts using age appropriate technical vocabulary?

The pre and posttest on vocabulary terms provided the data to answer the first research question listed above. Prior to each instructional unit students were asked to define three vocabulary terms. I recorded their answers and graded on a scale of 0-3 using a modified rubric from a 2015 study by Kuhn, Rausch, McCarty, Montgomery, & Rule. In the previous study, Kuhn, et. al. created a vocabulary rubric to be used by second graders. I modified this rubric to meet the needs of kindergarten students. I then conducted a series of linear regression analyses to determine the impact the use of interactive read alouds with information text had on students in the intervention classroom.

Data revealed a significant relationship between the use of information text and the development of technical vocabulary for both the Winter Weather and Polar Animals units. A strong relationship between the use of interactive read alouds with information text and students' ability to accurately define vocabulary terms was noted. These findings align with previous research on the positive impact information text plays on students' understanding of vocabulary terms (Rimbey, et. al., 2016). In this previous study Rimbey and colleagues found students' understanding of vocabulary terms increased after teachers received professional development on how to use vocabulary terms conversationally. The theory is that through the use of technical terms, or vocabulary, in everyday conversation and discussion, students become more familiar with the terms; resulting in increased understanding.

The development of scientific vocabulary appears to play an important role in students' ability to produce explanations because a core practice of science instruction is the ability to

produce arguments or explanations (Driver, Newton, & Osborne, 2000). In this study, Driver, et. al. found inquiry-based methods of teaching allow students to explore concepts and to interact with scientific ideas in authentic ways by making predictions, asking and answering questions, recording observations, and predicting and summarizing to others what was learned. After analyzing the findings of this study and considering the body of research, it is reasonable to believe that the students in the intervention classroom were better equipped to produce their own explanation statements due to their increased understanding of key vocabulary terms from each instructional unit. This relationship is discussed in the following section.

### **The Connection between Vocabulary and Explanations**

Explanatory statements found in information text can help children make connections between complex relationships and ideas (Smolkin, McTigue, & Donovan, 2008; Varelas, et. al., 2008). These explanations provide support for thinking and ideas, providing learners with a concrete framework to establish understanding of a topic. Because these texts are intended to be read aloud to children, it is vital that teachers understand how to properly use these texts as instructional tools. One way informational texts can be made more accessible to young learners is through the exploration of key vocabulary terms (Driver, Newton & Osborne, 2000). As shown in this study, the use of information text with kindergarten students appeared to yield twin benefits: students' increased understanding of vocabulary terms but also an increased ability to produce explanation statements. Students in the intervention classroom correctly defined vocabulary terms with greater accuracy than their counterparts in the nonintervention classroom. This is shown by the significant difference in scores on the vocabulary post-test between students in the intervention and nonintervention classrooms.

This finding is consistent with other work investigating the use of vocabulary in everyday speech (Rimbey, et al., 2016; Hooper, et. al., 2011). In a 2011 study, Hooper and colleagues explain the importance of oral language skills in children's formal reading and writing development. Through developing technical vocabulary, students are provided with a way to contextualize scientific information; thus increasing their understanding.

Further, research supports the use of interactive read alouds that encourage students to discuss and use vocabulary terms in their own language. In this way, children develop understanding and create a greater opportunity for children to garner meaning from vocabulary terms (Palinscar & Magnusson, 2000; Stylianidou, Ormerod & Ogborn, 2002; National Research Council, 2007). When students have the opportunity to use vocabulary terms in their own language, they are better able to produce explanations about their learning (O' Hallaron, Palinscor, & Schleppengrell, 2015). In this study, O'Hallaron and colleagues educated both students and teachers on the use of author's voice in informational text and, in turn, offered students their own opportunities to use their voices to share scientific knowledge. This resulted in increased understanding of scientific concepts.

Through book-based discussions, teachers can provide students with a model of how to explain their thinking both orally and visually. Information texts expose students to concepts and specialized vocabulary, building background knowledge and language students can draw upon when reading more complex books later (Kuhn, Rausch, McCarty, Montgomery & Rule, 2015). Interactive read alouds can be used to capitalize on this feature of information texts. As shown in the present study, interactive read alouds with information text provide students with important opportunities to discuss topics using scientific terms, thus contributing to students' understanding of scientific content. As evidenced in their 1999 study Hannus & Hyona, recommend teachers

use specific verbal cues when using science texts with young children. In addition, the use of interactive discussion amongst teachers and students is also suggested to help scaffold students' understanding. Interactive read alouds, such as those featured in this study, provide an opportunity for this form of instruction.

### **Major Findings**

This study produced two major findings. The first is the greater number of written explanation statements versus verbal produced by both the intervention and nonintervention classes. Second, the greater number of cause and effect statements produced by both students in the intervention class, as well as by the teacher during interactive read alouds. These findings are discussed in greater depth in the following sections.

### **Written Versus Verbal Explanations**

Students in both the intervention and nonintervention classes produced more written explanation statements than verbal explanation statements. This was unexpected given the emergent nature of kindergarten writing (Clay, 1967; Goodman, 1986). Clay's *Words this Way* (1975) discusses a developmental writing continuum and shows how children's writing develops in conjunction with literacy development. Similar to learning to read letters and words in print, students also progress through a series of stages in their writing abilities if they are to grow into successful writers. Clay describes these stages as 'principles'. Each of these principles has certain characteristics that are foundational to the development of traditional writing skills.

These principles include the recurring principle (writing repeated words or phrases to establish habitual patterns and produce feelings of competence), the directional principle (understanding that print is written from left to right and top to bottom), the generating principle (combining elements of writing in an inventive fashion), and the inventory principle (taking

ownership of learning by writing or listing known concepts), the abbreviation principle (understanding that words are composed of letters that stand for fuller forms of words), and the flexibility principle (repositioning or decorating standard letters to explore the limits within each letter may be changed and still retain its identity and meaning).

As can be seen in students' writings featured in Chapter 4, the vast majority of students in this study demonstrate an understanding of each of these principles. Using Clay's work as a basis, Calkins, Eherenworth & Lehmen (2012) developed a listing of developmental writing stages ranging from preconventional to fluent. Kindergarten students typically fall in the "emerging" stage, characterized by students phonetically spelled words using beginning and ending consonant sounds and pretending, but not accurately, reading what they have written. The following stage is the "conventional" stage. The independent writing of names and sight words, as well as more complete phonetic spellings of words characterize this stage. In addition, students are able to more or less accurately read what they have written. The majority of students written work and retellings were characteristic of the conventional stage. While it is not abnormal for some kindergarten students to reach the conventional stage, the number of students displaying these writing characteristics was a notable factor in this study; leading to a larger number of written explanations than verbal explanations.

One possible cause is the time of year in which the study took place. This study was conducted in the latter part of the year, when students begin to show greater comfort with writing. Had this study taken place earlier in the year, students' writing perhaps would not have been as sophisticated, creating the opportunity for more verbal explanations. Another possible cause is the culture and the instructional emphasis upon writing in the school in which this study took place. For example, in all grades (K-1), include at least 45 minutes of writing instruction

daily. Because of this increased emphasis on writing, students in this school may display more sophisticated writing than their peers in other comparable contexts. The amount of instructional time allocated to writing should be considered in future research on kindergarteners' ability to produce written explanations.

### **Cause and Effect Statements and Teacher Modeling**

It is also important to note the majority of explanations made by the intervention teacher during the interactive read aloud session could be classified as cause/effect statements. In other words, students in the intervention classroom tended to produce statements in the same way modeled by their teacher. This trend was mirrored in students' written and verbal explanations. Previous research provides examples of students' abilities to produce explanations based on models from adults (Patrick, Mantzicopoulos, & Samarapungavan, 2009; Newton & Newton, 2000). An increased use of causal statements when teaching young children is recommended by Newton & Newton (2000) who found many teachers of young children sparingly use these kinds of statements. While language relating to facts description is more common in early grades, these statements do not encourage students to develop the critical thinking skills necessary for future success in scientific inquiry, as well as other subjects (Patrick, Mantzicopoulos, & Samarapungavan, 2009). The ability to inquire about a scientific event or phenomenon, and then explain one's findings is the cornerstone of science education (Smolkin, McTigue, Donovan, & Coleman 2008; Patrick, Matzicopoulos, & Samarapungavan, 2009). This study corroborates this previous research by demonstrating the impact modeling causal statements plays on students' ability to produce their own scientific explanations.

In addition, the result of an increased number of cause and effect statements based on teacher modeling fits nicely with Bandura's (1977) social learning theory. Bandura's (1977)

theory asserts that young children will observe and imitate what they see and hear in their environment. In this way, Bandura's theory can perhaps be extrapolated to the teaching of explanation statements to young children. Through modeling these explanation statements using texts and teacher talk, students begin to replicate these statements in their own speech, and ultimately writing. In the case of this study, students may have produced a greater amount of cause and effect statements because the teacher modeled those types of explanations more frequently. Consequently, a teacher's modeling practices may have impacted student understanding by providing a framework for understanding science concepts.

The impact of teacher modeling is also discussed by Smolkin & Donovan (2001). In their study, first grade students' reading comprehension was increased through the use of constructive talk during interactive read alouds. Through modeling comprehension strategies during reading, teachers can scaffold students' understanding; ultimately helping students make meaning from what is being read. In a similar way, students in the present study developed greater understanding of science concepts based on the teacher's use of cause and effect explanations while reading aloud. This understanding was demonstrated through students' own use of explanation statements, a majority of which feature cause and effect structure, in their writing.

In addition to teacher modeling, child's environment has on developing literacy. While home environments certainly play an important role in literacy development, the classroom environment can also greatly impact this development, particularly in young students. Barton & Hamilton (2000) and Street (1985) describe the affect a child's environment has on his or her developing literacy. Further, students from a variety of literacy backgrounds can benefit from discussing text with adults and peers. In a 1983 study, Heath found through discussion of texts and text features, children are more likely to develop the ability to actively garner information

from texts. These findings are corroborated in the present study. When students participated in interactive read alouds with their teacher, they were more likely to produce explanation statements; and most frequently cause and effect explanation statements, much like those most frequently modeled by the teacher.

### **Implications for Research and Practice**

The use of interactive read alouds with information text proved to have a positive impact both on students' vocabulary understanding and ability to produce explanation statements. This study provides a basis for future research and educational practice in a variety of areas.

### **Future Research Directions**

A number of research studies have been conducted to garner insight into the role of explanations in science education (Driver, Newton, and Osborne (2000; Gilbert, Boulter, & Rutherford, 1998; Newton & Newton, 2000; Smolkin, McTigue, Donovan, & Coleman, 2008; Zimmerman, 2000). Despite the number of studies, little research has been done with young children. This study provides a basis for such studies. Future research replicating this study in different environments is needed to provide additional insight into the impact information text plays in young children's ability to produce explanation statements. Because this study was conducted within a single school and only examined students in two classrooms, additional study is needed to generalize these findings.

In addition, further research examining the use of interactive read alouds and information text could investigate the specific ways in which students use vocabulary terms in written and verbal explanation statements. Additionally, this study could be replicated with students of varying age levels to determine how interactive read alouds impact students of varying writing abilities. Another interesting research prospect includes incorporating information text with

multiple classes, but only utilizing the interactive read aloud format with an intervention group. In this way, researchers could determine the true impact of the interactive read aloud format.

The design of this study also provides additional areas for possible research. As a mixed methods study, this research methodology invites researchers to conduct research in areas valued by the researcher and in ways the researcher deems appropriate (Teddle & Tashakkori, 2009). The use of multiple approaches provides an opportunity for researchers to gain a more in depth understanding of the phenomena being studied (Guba & Lincoln, 1994). Mixed methods design, particularly when used in the context of educational research, allows researchers to “capture and explain the complexity of the teaching and learning process as a phenomenon” (Ponce & Pagan-Maldonado, 2015, p.131) by examining both teaching strategies and student learning.

### **Impact on Practitioners and Teacher Educators**

This study provides ample basis for teachers to improve their own practice. It is evident from this study, as well as previous research (Hannus & Hyona, 1999, Zimmerman, 2000), that young students are capable of using higher order thinking skills to produce explanation statements. However, this can only occur when teachers are instructed on how to correctly model these statements for students. This study shows us that interactive read alouds with information text serve as an effective way to encourage students to develop their own scientific explanations.

Teachers and teacher education programs can implement the interactive read alouds with information text to enhance science education. By learning how to properly conduct interactive read alouds in their own classrooms and how to purposefully choose text that will develop student understanding of science concepts, teachers and teacher educators create opportunities to scaffold students’ understanding. This is an exciting prospect for future professional

development for teachers of all grade levels, but specifically for teachers of young children who often do not incorporate information text in their lessons (Duke, 2000).

### **Impact on Educational Policy**

The results of this study can also provide insight for both school and district policy. The number of written statements produced in comparison with verbal statements provides evidence of the ability of students from this school to successfully record their thoughts on paper. While students featured in this study were successful writers, the instances of explanation statements produced by the intervention group are evidence of the need for the integration of science into the literacy curriculum. This is recommended by both the NGSS (2013) and educational research (Shanahan & Shanahan, 2012). In the future, administrators and curriculum leaders at the school should analyze the inclusion of science instruction alongside literacy, specifically through the use of information text, in order to develop students' ability to think critically and develop content knowledge (O' Hallaron, Palinscor, & Schleppengrell, 2015; Tucker- Raymond, Varelas, Pappas & Ortiz, 2013; Smolkin, McTigue, Donovan & Coleman, 2008)

### **Final Remarks**

Collectively, data from both the quantitative and qualitative analysis indicate the use of interactive read alouds with information text has a positive impact on kindergarteners' ability to understand scientific vocabulary terms and produce explanation statements. This study provides information about how teachers of young children can best use information text in their own classrooms. With the understanding developed from this study, teachers can begin to incorporate interactive read alouds with information text to scaffold student understanding of abstract science concepts. This study also serves as a way to integrate science and literacy instruction, providing teachers with an opportunity to teach science concepts to young children in a school day

crowded by the demands of reading instruction. These findings suggest that the teacher, or reader of information text, plays an integral part in students' ability to ultimately produce written and verbal scientific explanations. It is therefore vital that teachers be exposed to this method of instruction in order to provide young students with access to effective and impactful literacy and science instruction.

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## APPENDIX A: IRB APPROVAL



February 22, 2018

Erica Rutherford  
Dept. of Curriculum & Instruction  
College of Education  
Box 870231

Re: IRB#: 18-OR-080 "The Impact of Informative Text on Kindergarten Students Explanatory Writing and Technical Vocabulary Acquisition"

Dear Erica Rutherford:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Your application will expire on February 20, 2019. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Request for Study Closure Form.

Please use reproductions of the IRB approved stamped consent/assent forms to provide to your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

## APPENDIX B: LETTERS OF CONSENT AND ASSENT

Dear Parent/ Guardian,

You are being asked to give permission for your child to take part in a research study. This study is called The Impact of Information Read Alouds on Kindergarten Students Technical Vocabulary Acquisition and Explanatory Writing. This study is being done by Erica Rutherford who is a graduate student at the University of Alabama. Ms. Rutherford is being supervised by Dr. Julianne Coleman who is an education professor at the University of Alabama.

This study is being done to find out if a reading assignment that accompanies the lesson can help kindergarten students become more effective writers. Research shows reading books can help students in elementary grades improve their writing. Ms. Rutherford is trying to determine if reading books will help young students improve their writing, as well. This knowledge is useful because it can help other teachers use nonfiction texts in their classrooms. You have been asked to be in this study because your child is a student in Mrs. Ponder's classroom. About 40 students will be included in the study.

If you agree for your child to be in this study, he or she will receive science instruction using nonfiction texts. Mrs. Rutherford will visit your child's classroom to teach these lessons. Your child will also be asked to complete a vocabulary assessment both before and after two science units. He or she will also be asked to write about what they learned during the unit. Your child will receive the same instruction as the other students in the class regardless of their participation in the study. Your child will also be video recorded during science lessons and audio recorded during as they read their writing aloud. These audio and video recordings will only be viewed by Ms. Rutherford and will be destroyed after they are analyzed for data collection. Mrs. Ponder (your child's teacher) will not know if your child has chosen to participate in the study.

Data will be collected in the spring of 2018 and will take place entirely during class time. No time outside school will be required for your child to participate in this study. There is no cost for your child to participate in this study and you will not be compensated for being in this study. No risk is foreseen as a result of participating in this study. Your child's identity will not be revealed to anyone but the researcher, Ms. Rutherford. Other students and teachers will not know which students are participating in the study.

Your child's privacy will be protected throughout this study. Your child will not miss instructional time to participate in this study. Ms. Rutherford will be the only person analyzing data from your child during this study. Your child will be asked to draw or write to display their understanding of words from an informative book. Your child may also be asked to read or tell about a nonfiction book they have created. If you consent, your child will be told they do not have to answer any questions they do not want to and do not have to participate in the study if they want to stop.

Your child's confidentiality will also be protected throughout this study. Students will be assigned a different name to protect their identity. All student work, audio, and video recordings will be stored on a password-protected computer that is accessed only by Ms. Rutherford. Student work samples will not have student names and will be stored in a locked filing cabinet that is only accessed by Ms. Rutherford. At the completion of the study all electronic data will be erased and work samples will be shredded.

Taking part in this study is voluntary. It is your free choice. You can refuse to be in this study. If you give your child permission to start the study, you may request for them to stop at any time. The alternative to being in this study is not to participate. Your child will not be penalized by not participating in this study. There will be no effect on your relations with Ms. Rutherford or the University of Alabama.

UNIVERSITY OF ALABAMA  
CONSENT FORM APPROVED: 2/21/18  
EXPIRATION DATE: 2/20/2019

1

The University of Alabama Institutional Review Board (IRB) is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned. If new information becomes available that may affect your willingness to participate in this study, you will be notified by the IRB.

If you have questions, concerns, or complaints about the study right now, please ask them. If you have questions, concerns, or complaints about the study later on, please contact Ms. Rutherford at [ruthe002@bama.ua.edu](mailto:ruthe002@bama.ua.edu). If you have questions about your rights as a person in a research study, call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB outreach website at [http://osp.ua.edu/site/PRCO\\_Welcome.html](http://osp.ua.edu/site/PRCO_Welcome.html) or email the Research Compliance office at [participantoutreach@bama.ua.edu](mailto:participantoutreach@bama.ua.edu).

After you participate, you are encouraged to complete the survey for research participants that is online at the outreach website or you may ask the investigator for a copy of it and mail it to the University Office for Research Compliance, Box 870127, 358 Rose Administration Building, Tuscaloosa, AL 35487-0127.

I have read this consent form. I have had a chance to ask questions. I agree to allow my child to take part in this study. I will receive a copy of this consent form to keep.

---

Signature of Parent/Guardian

Date

---

Signature of Investigator

Date

UNIVERSITY OF ALABAMA IRB  
CONSENT FORM APPROVED: 2/2/18  
EXPIRATION DATE: 2/20/2019

Hi, (Child's name). My name is Ms. Rutherford (researcher). I am a teacher at this school and I also go to school at the University of Alabama. She is doing a study of about how reading information books changes how kindergarteners write about science. You are a student in Mrs. Ponder's class so I am asking you if you would like to be in this study.

Here's what will happen. I (Ms. Rutherford) will come to your classroom to teach you about science. I will ask you to tell what you know about some science words. Next, I will teach you about winter weather and polar animals in your class. You will read information books to learn about these animals. I will record the class on the iPad while we read these books. After you learn about winter weather and polar animals, I will ask about the science words again. Then I will ask you to draw a picture or write to tell about what you learned. After you are finished writing, I will ask you to tell me about your writing. I will audio record what you say so I don't forget your words. I will also take your writing and put it into a folder so she can look at your great work! You will do this work during your normal class time. You will be finished with this work in by the end of the school year. If you decide not to do this study, that is OK. You will still do the same fun activities in class and learn all the same things as your friends. Ms. Rutherford just won't record your voice while you read your writing or record you on the iPad during lessons.

Your parents know I am asking you to do this and it is OK with them.

Nobody but me (Ms. Rutherford) will know what you write, draw, or say to me.

If something makes you feel bad during this time, please tell me or your teacher. If you decide you do not like this, you can stop anytime.

Do you have any questions about this? You can ask me right now.

Do you think you would like to be in this study? YES NO (circle one)

\_\_\_\_\_  
Signature of Person Obtaining Assent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant's Name

\_\_\_\_\_  
Participant's Signature

UA IRB Approved Document  
Approval date: 2/21/18  
Expiration date: 2/20/2019

APPENDIX C: INSTRUCTIONAL UNITS

Unit One: Winter Weather	
Day	Activity
1	Interactive read aloud <i>Best In Snow</i> (Sayre, 2016) introducing winter weather. Students and the teacher will discuss the features of the information text and explanation statements in the text, as a group.
2	Students will participate in a picture walk of <i>Best in Snow</i> . The teacher pause to draw students' attention to visual representations in the book. Students will discuss the meaning of these visuals as a group and then with a partner.
3	Using the text as a model, the class will discuss the features winter weather, including colder weather, ice, and snow. Students will sing a song about snowfall and mimic the process of water vapor freezing to create snow. Students will learn the vocabulary term and definition for the word freeze: when liquid turns to ice because of cold.
4	The instructor will review the vocabulary term freeze and identify this word in the text. Students will use this word in a sentence with a partner. Students will then practice verbally creating explanation statements using the vocabulary term.
5	Using the text as a model, students will review the features of winter weather. Using their understanding of the word freeze, students will discuss the development of snowflakes and the vocabulary word. For the purposes of this lesson crystal is defined as a six-sided pattern of a snowflake. Students will create their own snowflakes using pipe cleaners. In a science experiment, students and parent helpers will soak the pipe cleaners in water and borax overnight.
6	Students will analyze their snowflakes and observe the crystals that developed overnight. The class will revisit the vocabulary word crystal in the text and students will partner together to use this word in a sentence. Students will then practice verbally creating explanation statements using these vocabulary terms.
7	Using the text as a model, students will review the features of winter weather, paying specific attention to the section of text that discusses how the sun melts snow. The teacher will introduce the vocabulary word slushy: partly melted or watery snow. In a whole

	group demonstration, students will take turns holding a hair dryer over a bag of crushed ice. The teacher will explain that the crushed ice represents snow, and the hair dryer represents the heat of the sun. During the demonstration, the class will pause to discuss the qualities of the ice, utilizing the word slushy as appropriate.
8	Students will review the word slushy and revisit the vocabulary word in the text. Students will partner together to use this word in a sentence. Students will then practice verbally creating explanation statements using these vocabulary terms.
9	Students will use construction paper, scissors, and glue to create a representation of snow falling from clouds and then melting away as the sun evaporates the liquid. Using photographs from the text as a model, students will be given small cards with the words freeze, crystal, and slushy. Using these cards, students will label their drawings. Students will then be invited to share their work with a partner, using verbal explanation statements to describe their picture.
10	Students will be invited to create their own information books about winter weather. The teacher will review the components of information text, using <i>Best in Snow</i> as a model. Students will then write and draw to explain their understanding of winter weather. Students will also be assessed on their vocabulary acquisition using the vocabulary rubric. This assessment will be done during free center time.

Unit Two: Polar Regions	
Day	Activity
1	Interactive read aloud <i>Animal Habitats: Polar Regions</i> (Sayre, 2016) introducing winter weather. Students and the teacher will discuss the features of the information text and explanation statements in the text, as a group.
2	Students will participate in a picture walk of <i>Animal Habitats: Polar Regions</i> . The teacher pause to draw students' attention to visual representations in the book. Students will discuss the meaning of these visuals as a group and then with a partner.
3	Using the text as a model, the class will discuss polar regions including geographic location, features of the region, and the region as an animal habitat. Students will learn the vocabulary word and definition, survive: to stay alive. The instructor and students will observe animals in the text and discuss various ways these animals survive in the harsh polar climate.
4	The instructor will review the vocabulary term survive and identify this word in the text. Students will use this word in a sentence with a partner. Students will then practice verbally creating explanation statements using the vocabulary term.
5	Using the text as a model, students will review the characteristics of polar regions. Using their understanding of the word survive, students will discuss the need for animals to develop special adaptations in order to survive. The instructor will introduce the vocabulary word and definition blubber: a layer of fat used to keep animals warm. Students will participate in a science experiment, covering their hands in Crisco and submerging them in icy water. The class will discuss how the water feels when their hand is covered with Crisco and when it is submerged in water with no covering. The instructor will compare the Crisco to animal blubber and students will discuss why they believe animals need blubber based on their observations.
6	Students will discuss the observations from the previous day's experiment. The class will revisit the vocabulary word blubber in the text and students will partner together to use this word in a sentence. Students will then practice verbally creating explanation statements using these vocabulary terms.
7	Using the text as a model, students will review the characteristics of polar regions, paying specific attention to animal adaptations. The teacher will introduce the vocabulary word dens: a cave or hole used as a home for an animal. Students will sing a song and mimic the behavior of animals in their den. The class will discuss how certain animals in the text use dens as protection during harsh weather.
8	Students will review the word den and revisit the vocabulary word in the text. Students will partner together to use this word in a

	<p>sentence. Students will then practice verbally creating explanation statements using these vocabulary terms.</p>
9	<p>Students will select an animal featured in the text to research. Using online resources and books, students will research their animal and use construction paper, scissors, and glue to create a representation of how their animal survives in the harsh polar climate. Students will then share their work with a partner to describe how their animal survives in the polar regions.</p>
10	<p>Students will be invited to create their own information books about polar regions. The teacher will review the components of information text, using <i>Animal Habitats: Polar Regions</i> as a model. Students will then write and draw to explain their understanding of polar regions and the animals that live in these regions. Students will also be assessed on their vocabulary acquisition using the vocabulary rubric. This assessment will be done during free center time.</p>