

SCIENCE VOCABULARY ACQUISITION: A NONEQUIVALENT CONTROL-GROUP
EXAMINATION OF VODCASTS AND FIFTH GRADE STUDENTS

by

Debra Bailey Lester

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

This study investigated the effect of using video podcasts (vodcasts) as a supplement to traditional science instruction in fifth grade students and those students who participated in traditional science instruction only. In this quantitative study, a quasi-experimental, pre-test/post-test nonequivalent control-group design was conducted using a sample population of fifth grade students at Bailey Elementary. After approval, the fifth grade students completed a pre-test of a released version of the North Carolina READY Science End of Grade Assessment, which also served as the study's post-test. Participants in the treatment group received supplemental science instruction using content specific vodcast viewing sessions, provided by the classroom teacher, in addition to traditional classroom instruction. Participants in the control group received traditional classroom instruction only. Upon completion of the vodcast viewing sessions, all participants completed a post-test. Data from the pre-test and the post-test was statistically analyzed using a one-way analysis of covariance (ANCOVA). The conclusion was that, after controlling for pre-test scores, the treatment group post-test mean was significantly different from the control group post-test mean, with indications that the post-test mean scores for those participants receiving traditional science instruction plus the supplemental vodcast viewing sessions were higher than the post-test mean scores for those only receiving traditional instruction with no vodcast viewing sessions.

Key words: STEM, science vocabulary acquisition, vodcasts, fifth grade

Dedication

For my grandmother, Leona Bellew Bailey, who never got to see many of my successes but always knew that I would have 'bushels' of them. To my children, Drew and Carson, without whom this journey would have been finished three years prior.

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List of Abbreviations

Academically and Intellectually Gifted (AIG)

American Association for the Advancement of Science (AAAS)

Cognitive Learning Theory (CLT)

End-of-Grade (EOG)

English Language Learners (ELL)

Exceptional Children (EC)

Institutional Review Board (IRB)

National Board of Certified Teachers (NBCT)

National Council for Accreditation of Teacher Education (NCATE)

National Reading Panel (NRP)

Next Generation Science Standards (NGSS)

North Carolina READY Science End-of-Grade Assessment (NCRSEOGA)

Response to Intervention (RtI)

Science Technology Engineering and Math (STEM)

Socio-economic Status (SES)

CHAPTER ONE: INTRODUCTION

Overview

The following chapter will disclose background information concerning this study of science vocabulary acquisition in students, specifically the effect of a technology tool on science vocabulary acquisition of fifth grade students. The chapter includes a historical, social, and conceptual overview. Recent scholarly literature will support the given problem and purpose statements as well as the significance of the study. This chapter ends with the research question guiding the study and a list of pertinent definitions.

Background

Technology has often been referred to as the savior of education (Hernández-Ramos, 2010). Today's students are surrounded by technology from personal smart phones and tablets to school district initiatives providing students with portable devices making technology readily accessible (Chacko, Appelbaum, Kim, Zhao, & Montclare, 2015). Because of the substantial appeal of technology to young people, teachers are now embracing it as a means to increase student achievement in the classroom (Chacko et al., 2015). While technology clearly has mass appeal, teachers must ensure the chosen technology tools are effective (Neuman, Neuman, & Dwyer, 2011). The use of technology for classroom instruction can increase student learning by capitalizing on the appeal of technology for students coupled with a teacher's ability to choose the content and method of delivery (Chacko et al., 2015; Neuman et al., 2011). Dellicarpini and Sims (2010) researched the use of vodcasts with high school students and science vocabulary. Providing opportunities for students to further develop their science vocabulary base with the use of a technology tool, like vodcasts, will help students better connect to the subject area, thus, increase student learning. Since vodcasts have not been used in the elementary setting, this study will fill the gap of understanding if vodcasts affect student science vocabulary acquisition.

Historical Overview

This section includes a brief historical overview of the role of vocabulary and science in education. The overview discloses how vocabulary and science in education have evolved over time. A more in-depth examination of these issues will be revealed in the literature review section.

Vocabulary. Reading instruction has changed over the years. While reading dates back to biblical times, the bulk of history concerning classroom reading instruction generally begins in the middle of the 19th century and the use of the McGuffey's Readers (Corinth, 2009). Reading instruction did not change much until the National Institute of Child Health and Development released the National Reading Panel Report in 2000. The National Reading Panel Report is widely considered by experts to be the golden standard of research based reading instructional strategies (Moats, 2015; Stuebing, Barth, Trahan, Reddy, Miciak, & Fletcher, 2015; Wang & Williams, 2014).

According to the report of the National Reading Panel (NRP), one of the five critical areas of reading instruction is vocabulary acquisition (National Institute of Child Health and Development, 2000). The remaining four areas, which are not the subject of this study, include phonemic awareness, phonics, fluency, and text comprehension (National Institute of Child Health and Development, 2000). Since the reading component of vocabulary acquisition is the focus of this study, a deeper exploration of the concept will be provided in the Literature Review section of this study.

Currently, to increase reading skills in elementary schools even more attention is being drawn to reading instruction due to a national incentive called Response to Intervention (RtI). RtI is a government educational initiative that involves a systematic approach to reading

instruction using evidence-based instructional strategies and the close monitoring of each student's progress (Orosco & Klingner, 2010; RtI Network, 2014). The National Reading Panel Report largely influenced the RtI reading instructional requirements including vocabulary acquisition for the elementary setting (Hughes & Dexter, 2011; RtI Network, 2014).

Additionally, the National Reading Panel Report is credited for many of the scientifically based instructional strategies that support the RtI reading essentials still being used in classrooms today (Hughes & Dexter, 2011; National Institute of Child Health and Development, 2000; Stuebing et al., 2015).

Science. In the past two decades, educators of American children have narrowed their focus from education as a whole into a more specific target of science and math education (Laugksch, 2000; Shelton, 2015). This concentrated focus initiated a necessity for science and math learning in schools as a means to support the current U.S. industry demands (Starnes, 2011). In 1985, the American Association for the Advancement of Science (AAAS) began a monumental science initiative in the United States called Project 2061, which promotes literacy in the content areas of science, math, and technology (American Association for the Advancement of Science, 2016). In an effort to increase science in the classroom, the National Research Council provided official K-12 science learning goals including key vocabulary terms for both the state and national science standards (National Academy of Engineering, 2013; Shelton, 2015). The push for more science in education was furthered by the Next Generation Science Standards (NGSS) which specifically identifies science learning goals for the K-12 classroom currently in use today (Next Generation Science Standards, 2015; Next Generation Science Standards Lead States, 2013).

Social Overview

Contributing to the success rate of students is not just an educational issue. Corporate America is pushing for a new breed of innovative and forward thinkers (Fairweather, 2008; Starnes, 2011). Trending economic analysts demand that students be well versed in the content areas of science, technology, engineering, and math (STEM) (Xie, Fang, & Shauman, 2015) in response to the economic need for American students to become more locally and globally competitive academically (United States Department of Education, 2014a). In order to spawn a new generation of problem solvers and forward thinkers, classroom teachers need to increase the level of student learning in terms of education and teacher effectiveness; namely in the content area of science (Klieger & Yakobovitch, 2011). Researchers have suggested that effective teachers increase student learning and close student achievement gaps using effective instructional means (Bryk & Harding, 2012). Finding a specific instructional means that will contribute to the academic success rate of learners could potentially contribute the local and global economic appeal for 21st century learners.

Theoretical Background

Learning new vocabulary forces students to rely heavily on their working memory. Working memory, the ability to retain information long enough to apply it, plays a key role in how students learn (Sweller, 1994). Working memory is the brain's ability to attach meaning to pictures and words and is the essence of learning new vocabulary words (Sweller, Ayres, & Kalyuga, 2011). Using one's working memory allows some of the abstraction of vocabulary words to be removed, making the learning connection become more precise and predictable (Carrier, 2013). Sweller (1994) studied student working memory in the cognitive load theory (CLT). Cognitive load refers to the mental effort used in working memory as students learn new

vocabulary words. The importance of vocabulary acquisition in student learning is supported by Sweller's CLT and provides a baseline for understanding how students learn new words (Van Gog, Paas, & Sweller, 2010). The CLT can be used by educators in choosing effective instructional means and is the theoretical basis in this study (Sweller et al., 2011).

The goal of this study is to determine whether the use of vodcasts assists in increasing students' science vocabulary acquisition. The cognitive load theory supports this study's examination of vocabulary acquisition as the students will be provided a specific technological learning tool for intentional science instruction in an effort to improve their working memory, thus, increasing science achievement. Additional information on CLT is discussed in the literature review section.

Problem Statement

Due to the demands of today's classroom, teachers maximize student learning through the most effective activities and skill practice (Kissinger, 2010). Meeting the needs of all learners is coupled with the country's push to prepare K-12 students for real world applications by increasing science, technology, engineering, and math (STEM) instruction (National Science Teachers Association, 2015; Next Generation Science Standards, 2013). The interest in science has brought attention to a need to improve student learning specifically in K-12 (National Science Foundation, 2010). Despite the current efforts to promote science and math in schools, there is a gap in the research concerning student academic achievement in science content areas (Ciarrochi, Heaven, & Davies, 2007; Minner, Erickson, Wu, & Martinez, 2012).

Vocabulary acquisition plays a supportive role in helping students understand academic content, especially in the subject area of science (Shook, Hazelkorn, & Lozano, 2011). While many researchers have studied vocabulary acquisition in the content area of language arts (Berne & Blachowicz, 2008; Moats, 2015; National Institute of Child Health Development, 2000), the

research on vocabulary acquisition and effective instructional means in science is limited (Duncan, 2010; Grillo & Dieker, 2013). Since science tends to be vocabulary laden using effective instructional means that support science vocabulary acquisition is imperative (Bryk & Harding, 2012).

Most research concerning the use of technology as an instructional means showed an increase student achievement (Bryk & Harding, 2012; Chuang, 2014). However, while considerable amounts of research currently exist on the use of technology in the content areas of reading and math, information concerning the content areas of science and technology is quite sparse (Aronin & Haynes-Smith, 2013). Further, Kersaint, Ritzhaupt, and Liu (2014) recommended that more effort be given to discovering which specific technology tools are the most effective for enhancing science learning. The problem is that teachers must determine which technology tools, if any, can be used to provide enough intentional and targeted vocabulary instruction to assist students in enhancing content knowledge and, thus, increasing science achievement. In this study, the technology tool to be tested is vodcasts.

Purpose Statement

The purpose of this quantitative non-equivalent control group design study is to examine student science achievement scores to see if the provided instructional means will contribute to increased vocabulary acquisition in the content area of science. Specifically, will fifth grade students who watched science vocabulary rich vodcasts perform better on a given science assessment than those students who were not provided vodcasts? The independent variable (vodcasts) is generally defined as a treatment using supplemental science vocabulary instruction via the use of vodcast lessons in addition to traditional classroom instruction. The dependent variable (science achievement post-test scores) is generally defined as the released version of the

North Carolina READY Science End-of-Grade Assessment (NCRSEOGA) (Department of Public Instruction North Carolina, 2015). The study will include a covariate. The covariate is identified as the pre-test using the same North Carolina READY Science End-of-Grade Assessment (NCRSEOGA) as the post-test (Department of Public Instruction North Carolina, 2015). The covariate will ensure statistical control to maintain equivalency between the groups to ensure a fair and accurate study (Warner, 2013). A non-equivalent control group design will be used to measure the differences in the students' science achievement scores. A one-way analysis of covariance (ANCOVA) will be used to analyze the differences between groups of fifth grade students in a local Title I school.

Significance of the Study

The connection between literacy and science is best supported by instruction aided by vocabulary acquisition (Grillo & Dieker, 2013). Vocabulary knowledge plays a pertinent role in the students' understanding of concepts; however, the bulk of research reported about science vocabulary involves students in the middle and high school setting (Slavin, Lake, Hanley, & Thurston, 2014). Support for discovering effective science vocabulary instruction in the elementary classroom setting is the result of a gap in the research concerning science vocabulary acquisition (Carrier, 2013; Scott, Grillo, & Decker, 2013). The results from this study could provide elementary teachers with information about an effective instructional means that may increase student vocabulary acquisition in the content area of science.

Economically speaking, what corporate America needs versus what is being provided is causing a current national debate. This mismatch of supply and demand centers on the difficulty of fulfilling the demands of future occupations due to the lack of workers with the desired skill set in the U.S. (Furchtgott-Roth, 2013). Experts have suggested that better preparation in math

and science in students' early education could make a significant difference in training qualified workers (Furchtgott-Roth, 2013; Zhang, McInerney, & Frechtling, 2011). This study may help address the significant local and national pressure to produce students strong in science and increase overall student achievement (Berghel, 2014; Davis, 2014; Educational Outreach, 2010; Snyder et al., 2006). Additionally, numerous national incentives are available for STEM learning opportunities in the middle and high school age range (Chesloff, 2013; Berghel, 2014). However, little is available for the elementary school aged child despite the fact that research indicates early exposure to science has a positive impact on learning (Chesloff, 2013). Theoretically this study's data could also be used to show that technology may increase vocabulary acquisition and academic achievement in science. With the trending issues in education concerning the improvement of student learning (National Education Association, 2015; U.S. Department of Education, 2014a) coupled with the economical demands from society (Furchtgott-Roth, 2013), this study is timely and significant.

Research Question

The research question that will be examined in this study is as follows:

RQ1: When used as a supplement to traditional instruction, can content-specific vodcasts increase science achievement scores in fifth grade students?

Definitions

Terms pertinent to this study are listed and defined as follows.

1. *Common Core Standards* - The Common Core State Standards are the set of curriculum standards for students in the state of North Carolina and 41 other states in the U.S. in grades K-12, (Common Core State Standards Initiative, 2015). The standards provide teachers with the objectives that students need to learn in reading, math, social studies,

writing and science (Department of Public Instruction North Carolina, 2011; Georgia Department of Education, 2015).

2. *North Carolina READY Science End-of-Grade Assessment (NCRSEOGA)* - The NCRSEOG is a science cumulative standardized test given to fifth grade students in North Carolina (Department of Public Instruction North Carolina, 2011). Similar end-of-grade assessments are given in various states but the name of the assessment and the grade given may vary (Georgia Department of Education, 2015).
3. *Response to Intervention (RtI)* – RtI is a government educational initiative that involves providing evidence-based instruction by a classroom teacher who then closely monitors students in their progression of a given learning goal (Orosco & Klingner, 2010).
4. *Science Assessment/Science Achievement* – The science assessment, in this research, refers to the North Carolina READY Science End-of-Grade Assessment (NCRSEOGA) which is a standardized science assessment required for all fifth grade students in North Carolina (Department of Public Instruction North Carolina, 2011).
5. *Science Vocabulary* – Science vocabulary refers to the key academic terms listed in the fifth grade science Common Core Standards (Department of Public Instruction North Carolina, 2011).
6. *STEM* – The acronym referring to education including the content areas of science, technology, engineering, and math (Froschauer, 2015).
7. *Vocabulary Acquisition* – Vocabulary acquisition is the process of learning academic vocabulary words in order to better understand the material (Pigada & Schmitt, 2006).
8. *Vodcasts* – In this study, vodcasts are short films with audio that can be accessed and shared using computers or other portable technology devices for the purpose of providing

lessons that focus on content specific vocabulary (Hill & Nelson, 2011). Vodcasts can be teacher or student made and are also available for download commercially (Hill & Nelson, 2011).

CHAPTER TWO: LITERATURE REVIEW

Overview

Education continues to be at the forefront of today's discussions and forums with a concern for teacher effectiveness, standardized test scores, and closing student achievement gaps, (National Education Association, 2015). The educational community is working to find a solution that will not only increase student performance but also settle economic pressures to produce students equipped with the desired workforce skillset for the onslaught of math and science industry positions (Berghel, 2014). This study may contribute to boosting student achievement through its examination of student science achievement scores to see if a provided instructional means will improve fifth grade students' science vocabulary acquisition. In this chapter, the theoretical framework section will provide the theoretical perspective, cognitive load theory (CLT), and will include what other researchers have to say in regards to vocabulary acquisition, science, and technology. An overview of the dynamics of an average fifth grade classroom and how these students learn will be provided. Also included will be a discussion concerning the importance of increasing student vocabulary acquisition, namely in the content area of science, and how the increase of science vocabulary could contribute to society on a local and global level. Last, this chapter will explain the importance of using the technology tool of vodcasts and how using this instructional means is supported by the research for student learning and motivation.

Theoretical Framework: Cognitive Load Theory

Learning consists of thinking while using the brain. Each individual's brain consists of a vast networking processing center that connects thoughts in the past with thoughts in the present to build upon and create new learning (Sweller, 2010). This section will define the CLT and

discuss the history of the theory including recent applications of its use. An explanation of the various types of memory that contribute to student learning will also be included. Last, this section will divulge the developmental ability and processes of learning in fifth grade students.

CLT was made popular by Sweller (1988) and is often applied to the field of education for input on student learning (Boser, 2017; Paas, Van Gog, & Sweller, 2010; Sweller, 1994). CLT is a valuable theory of instruction in terms of cognitive processing and instructional design for learners (Paas, Renkl, & Sweller, 2003). Understanding how individuals are able to absorb and retain information is the basis for the theory being used in this study (Sweller, 1994).

Vocabulary acquisition involves the process of learning new words through the brain's connection to pictures and words and how these pictures and words work together to produce long-term learning (Nordquist, 2015; Sweller, 1994; Van Gog et al., 2010). Naturally, the more vocabulary words students know, the more the students are able to understand, therefore, increasing student vocabulary will result in an increase in learning according to the CLT (Paas et al., 2010). The CLT is foundational to previous research concerning vocabulary increasing learning for all learners (Snyder, 1989; Sweller, 1994).

Learning is a complex and multifaceted process involving various elements related to cognitive load (Ozcinar, 2009). Cognitive load refers to the amount of mental effort used by the brain in order to process and recall information (Sweller, 1998). More specifically, cognitive load consists of two major components; the interaction of the material being learned and the brain's processing of the information being learned (Sweller, 2010; Paas et al., 2010). Within each component of cognitive load are three separate categories: intrinsic, extraneous, and germane (Van Merriënboer & Sweller, 2009). Intrinsic load refers to the level of complexity of a performed task as well the existing expertise of the learner. Intrinsic load can be managed

through the strategic pacing of providing learners simple to more complex learning concepts and tasks over time (Sweller, 2010). The extraneous load is the result of instructional material being presented (Sweller, 2010). The larger the extraneous load, the more comprehension is needed to understand the presented concept. A high extraneous load is not conducive to learning in that the individual will experience extreme mental fatigue and a sense of feeling overwhelmed (Sweller, 2010). Extraneous load can be reduced, however, through the use of examples and the integration of multiple information sources (Van Merriënboer & Sweller 2009). Last, the germane load is the result of the learning process in relation to the intrinsic cognitive load where learning becomes innate (Sweller, 2010). Intrinsic load can be increased by varying the learning task and repeating the students' exposure to the material being taught (Van Merriënboer & Sweller, 2009). In this study, germane load is the specific area of cognitive load theory that will be referenced as it directly aligns with how students learn vocabulary and supports how student vocabulary acquisition can be increased.

A history of CLT reveals the major focus concerning cognitive load and memory was previously more centered on understanding the capacity that working memory has inside the brain and its effect on long-term memory (Van Merriënboer & Sweller, 2005). Working memory is often referred to as short-term memory and is the gateway to achieving long-term learning (McLeod, 2012; Sweller, 1988). Working memory is used for temporarily storing information the brain needs to process and is an imperative component of cognitive tasks that require holding information for brief periods of time (Barak & Tsodyks, 2014; Sweller, 2010). Working memory is also used in other areas of learning, helping to contribute to the recall of information. For instance, in the classroom, working memory is used in a variety of cognition

applications such as visual and auditory observations, comprehension, and problem solving (Sprenger et al., 2013).

Sweller et al. (2005) expanded their own CLT research regarding learning by examining the instructional aspect of how teachers can help build student working memory in an attempt to increase long-term memory. Sweller noted that when new information is presented to a student, the information will generally be forgotten in fewer than 20 seconds unless the information is repeated and/or presented in a motivating manner (Van Merriënboer & Sweller, 2005). Further, the average adult mind can only hold about four separate pieces of information in its working memory at a time (Cowan, 2010). Children from ages six to twelve years of age generally hold two to three bits of information at a time in their working memory and those children from lower IQ and low socioeconomic (SES) backgrounds generally hold even less (Cowan, 2016). The average age of a fifth grade student is eleven years old.

A more recent extension to Sweller's (2010) CLT includes the importance of instructing students using real-world experiences and examples that are relatable for various learners. The ability to remember information varies among individuals because of the diverse background and unique experiences that contribute to the formation of each individual's schema (Snyder, 2002). Schema is the basic foundation by which an individual is able to make a connection to learning based on former experiences (Sweller, 2010). In terms of learning information, the mind considers each schema as a completely separate item akin to various files being stored in a filing cabinet for the purpose of organizing thoughts (Snyder, 1996). Schema separates each thought through a filtering process that determines important information to remember from unimportant information to forget (Snyder, 2002). The more practice an individual has with new learning that can attach to existing schema, the more the individual will be able to learn and recall the

provided information (Sweller, 2010). Making repeated connections between the new learning and the existing schema allows the brain to retrieve the correct file of related information, thus, proving that learning has taken place. Extending an individual's working memory allows an increased quantity of information to be learned and more difficult information to be processed (Van Merriënboer & Sweller's (2005) thoughts regarding repetition for student learning and maintaining student motivation for increasing working memory will be applied to study's examination of increasing student science vocabulary acquisition.

Working memory not only helps individuals recall information but it also helps them stay focused so that a provided task can be completed (Bhandari & Badre, 2016). For example, when an individual goes to the grocery store for bread, despite the thousands of items available coupled with other typical distractors, working memory allows individuals to recall the goal of buying bread, thus ensuring successful completion of the task. Likewise, when students are given a task to complete or a question to answer, a strong working memory helps the student to not only hold focus to complete a desired task, but to also recall and connect information necessary for thinking about and answering questions (Bhandari & Badre, 2016). While student focus is crucial for learning and inevitably coincides with the student motivation portion of the CLT, focus time is not a fit for this particular study and will not be highlighted.

Cognitive load theory is founded on the premise that working memory can be built upon through repeated exposure, sustained student motivation, and relatable learning tasks, leading to long-term memory of the information under consideration (Paas & Ayers, 2014; Sweller, 2005, 2010). Long-term memory has been defined by the Centers for Disease Control and Prevention (2013) as remembered information over an extended period of time, loosely ranging from a few minutes to that of the lifetime of an individual. Tulving's (1972) research regarding long-term

memory further contributes to this study. Tulving (2002) listed three separate domains of long-term learning: procedural, episodic, and semantic. Procedural long-term memory involves motor-skill memory and explains how an individual is able to recall how to do something like riding a bike (McLeod, 2010; Tulving, 1972). Episodic long-term memory refers to a specific memory of an experience like the event of a birthday party or going to a theme park (Tulving, 2002). Semantic long-term memory is knowing information about the world and also the meaning of words. For instance, semantic long-term memory could be knowledge of states and capitols and also includes the understanding of vocabulary words (Rinne, Gregory, Yarmolinskaya, & Hardiman, 2011). For the purpose of this study, all references to long-term memory will relate to semantic long-term memory in the area of vocabulary knowledge.

CLT has been used to ground other studies in which supplemental instruction with a technology tool was used to increase student learning but in non-science content areas (Kissinger, 2010; Powell, 2014; Mestre & Ross, 2015). A recent study grounded by CLT was an examination of vocabulary and novel instruction for computer-based instruction (Chen, Woolcott, & Sweller, 2017). Another study concerning working memory and teacher effectiveness also used CLT to ground its study (Kalyuga & Liu, 2015). Additionally, multiple studies directly relating to vocabulary acquisition were also grounded using CLT (Lan, Fang, Legault, & Li, 2015; Shore, Ray, & Gooklasian, 2015; Soleimani & Rahmanian, 2015).

In the classroom, working memory is used in a variety of cognition applications such as visual and auditory observations, comprehension, and problem solving (Sprengr et al., 2013). In this study, working memory will be used to measure student science vocabulary acquisition. A goal of this study is to replicate the cognitive load theory's guidance on increasing working memory in students (Alessi & Dwyer, 2008; Ayres, 2006; Sweller, 1994) and will add to the

body of literature concerning science vocabulary acquisition and the technology tool of vodcasts as an instructional means. While considering an individual's learning pace as well as the teaching of prerequisite skills before introducing more complex ones are key components to student learning, this study's focus on increasing student working memory will be implemented through repeated exposure using a format that should keep students motivated (Sweller, 1988; Van Gog, Paas, & Sweller, 2010). CLT is applicable for examining student vocabulary acquisition in an effort to provide effective instruction meeting individual student learning needs (Sweller, 2010; Van Merriënboer & Sweller, 2005).

Related Literature

Student learning and teacher effectiveness are core topics in public education; however, a more operational look at the American educational system reveals issues concerning global and financial demands of corporate America are added to the long list of important matters educators face (Baker, 2016; National Research Council, 2013; Weingarten, 2015). Further, a special interest in the subject area of science and the use of technology is currently trending in the middle and high school educational community as a response to pressure from corporations to produce students equipped with a desired skillset in the workforce (Barnett, VanDerHeyden, & Witt, 2007; Basham & Marino, 2013; Berghel, 2014). This research supports the need for teachers to find effective instructional means in order to close student achievement gaps. Additionally, this study will address the national and global demands of needing students well versed in science-based content in an effort to promote workforce readiness. A focus on the lesser-investigated people group of elementary students will be included in this study. The literature review will provide an overview of the study's target population of fifth grade students and the major learning barriers many of these students face. The review will further explain the

importance of vocabulary to student learning and how vocabulary acquisition is connected to student performance measurements like standardized test scores. Additionally, the effect of the country's special interest in science based learning and the inclusion of technology to enhance instruction will also be listed. The following review of the literature will demonstrate what has previously been discovered and will identify a major gap in the literature. The defined gap, the extent to which a typical group of fifth grade students learn science vocabulary via vodcasts, is the basis of this study.

Fifth Grade Learners

Piaget and colleagues (1952) studied how children learn through cognitive development research. According to Piaget (1964), fifth grade students are in the concrete operational stage of cognitive development. In the concrete operational stage of development, children are still very much concrete learners but are beginning to move into more logical and organized realms of thought (Piaget, 1964). Typical fifth grade students struggle with abstract concepts and more hypothetical situations (Kose & Arslan, 2015). Additionally, fifth graders are also learning about the world around them and recognizing that opinions and hypotheses may differ (Piaget, 1964).

Some content areas contain more abstract thought than others. Specifically, science content for fifth grade learners contains significant portions of theoretical and problematic scenarios (Trundle & Saçkes, 2015). For example, learning standards like Newton's Laws of Motion are based on the theories by which objects move and topics like weather promote the notion of students considering hypothetical situations based on patterns of previous information (Department of Public Instruction North Carolina, 2016). Since the subject matter of science for fifth graders is considerably abstract and their learning processes are still mostly concrete, effective instruction needs to include means that would help interpret the abstract concepts into

more concrete thoughts so that the information can be committed to the student's memory (Trundle & Saçkes, 2015). A more in-depth explanation of student memory will be revealed later in the literature review. This section will further discuss the typical fifth grade student learning environment including several major limitations that can impede learning in fifth grade students. Learning impediments like limited experience with the English language and limited exposure to related material due to variances in ethnicity and socioeconomic status will be included in the discussion.

Learning environment. Student ability grouping has mostly dissipated, especially in the elementary setting. Today, most public school classrooms consist of heterogeneous groupings of students with mixed abilities (Solis, Vaughn, Swanson, & McCulley, 2012; Yearta, Jones, & Griffin, 2014). Current classrooms of varied academic abilities have challenged teachers with the task of addressing academic needs while simultaneously preparing students to be globally competitive in an effort to become more viable contributing members of society by meeting the demands of corporate America (STEM Education Coalition, 2014). This learning atmosphere leaves teachers grappling for the most effective instructional means that will reach all types of learners (Patterson, Connolly, & Ritter, 2009; Tkachyk, 2013). While providing instruction to close learning gaps for diverse learners is challenging, a mixed abilities classroom setting best mimics the real-world scenario of a society with various-abled participants and remains the setting of choice in the public school setting (Casale-Giannola, 2012; Dewey 1938; Heineke, Coleman, Ferrell, & Kersemeier, 2012).

American classrooms are more diverse than ever (Finke, McNaughton, & Drager, 2009). The classroom divergence not only stems from varying cultures, nationalities, and socio-economic backgrounds, but also from differing levels of student academic ability. Multiple

factors contribute to students who experience learning gaps and varied learning paces in school like a student's experience with the English language or life experiences in general (VanDerHeyden, 2016). The following section will present the major factors hindering student learning like the prominence of non-English speaking learners and limited exposure to words and experiences based on race and socioeconomic status.

English language learners. Currently, the fastest growing population of school age children, approximately 10% of the population in American classrooms, belongs to English Language Learners (ELLs) (National Center for Educational Statistics, 2014). The ELL student population is considerably higher than the national average in Texas, California, Colorado, Nevada, New Mexico, and the District of Columbia (National Center for Educational Statistics, 2014). ELLs are individuals with non-English speaking backgrounds who speak English as a secondary language (Genesee, Lindholm-Leary, Saunders, & Christian, 2005). Students with a limited exposure to the English language have difficulty learning, especially in vocabulary rich subject areas like language arts and science (Gándara & Hopkins, 2010; Spycher, 2009). Students who were born in other countries or whose parents speak a language other than English in the home may have less experience with the terminology being used for instruction at school. School can be difficult for ELL students because they must interpret and make sense of symbols and print across all subject areas in a language that is foreign to their learning process (Fatham & Crowther, 2006). Learning in an unfamiliar language forces students to receive instruction in one language and then translate that information in another language. One effective strategy used to help ELL students is to give these students an opportunity to use vocabulary words in relation to other concepts, also known as a cross-curricular approach (Carrier, 2013). Teachers must consider language diversity when choosing an instructional means for vocabulary

acquisition instruction especially in the elementary classroom setting (Christ & Wang, 2010; Helfrich & Bosh, 2011).

Limited exposure. The critical role that race and economics play in education is hardly a new concept. Minority and economically disadvantaged children generally perform more poorly in school and have a lower level of vocabulary acquisition than students from Caucasian and middle to higher socioeconomic status (SES) (Shore, Ray, & Gooklasian, 2015). Further evidence suggests that a student's SES is significantly correlated to limited vocabulary knowledge. For instance, children born into welfare recipient families only possess about 45% of the vocabulary knowledge base of the same aged children born to professional families (Hart & Risley, 1995). Students of lower SES also tend to have fewer life experiences, additionally contributing to their limited vocabulary and exposure to specific content covered by the curriculum (Fisher & Frey, 2014). For example, students who have never been to the beach may have a difficult time understanding that the sand can be extremely hot and the water be very cold at the same time.

Vocabulary

According to Johnson (2012) and Sweller (2010), vocabulary acquisition is a contributing component to improving overall student performance. Vocabulary in student learning has been examined at great length and remains at the core of instruction (Davis, 2014; Vygotsky, 1978). This section will focus on an in-depth examination of vocabulary and the important role it plays in student learning and student standardized test performance.

Specifically, vocabulary refers to the words and language used to describe and discuss a given topic within a specific discipline (Ambika, 2013). Contrary to the thoughts of many, vocabulary does not refer to a long list of words given to students to be memorized (National

Institute of Child Health and Development, 2000). Vocabulary plays a critical role in everyday life. Bloom (2002) stated that children need exposure in order to learn new vocabulary. For instance, the average child learns approximately ten new words per day when exposed to new vocabulary (Bloom, 2002). Operationally speaking, reading requires individuals to interact with words and symbols and then interpret those symbols in an effort to make sense of them (Ru et al., 2011). Researchers have suggested that associating new vocabulary words with mental pictures or symbols is one of the most effective ways students can learn (Marzano, Pickering, & Pollack, 2001; Ward & Williams-Rossi, 2012). Vygotsky (1962) laid a foundation for further study with his understanding of how pictures and words work together for meaning. Vygotsky's (1962) ground-breaking thoughts on cognition and the importance of learning vocabulary is the basis for understanding the developmental thinking of students as they process abstract and symbolic print while reading. When teachers examine strategies that help students make sense of what they see and read, vocabulary acquisition is a critical component (Mestre & Ross, 2015).

Comprehension. Comprehension is the understanding of words and their corresponding meaning (National Institute of Health and Development, 2000). Readers will experience a breakdown in understanding when they approach a word for which they do not know the meaning. When students understand words and their meanings, their confidence levels and critical thinking skills improve (Dellicarpini & Sims, 2010). According to the National Reading Panel Report, a predictor of student success lies in the student's ability to comprehend text (National Institute of Child Health and Development, 2000). Bromley (2007) found that vocabulary acquisition and reading comprehension are two intertwined skills.

Student vocabulary reading skills and vocabulary acquisition are common predecessors of reading comprehension success (Fisher & Frey, 2014). A student's inability to comprehend

the intended meaning of a text is generally the result of a student's lack of vocabulary acquisition (Ru et al., 2011; Wagner, Muse, & Tannenbaum, 2006). The Common Core State Standards (CCSS) has emphasized the importance of students' learning key vocabulary by adding additional strands to the curriculum concentrating on vocabulary acquisition (Common Core State Standards Initiative, 2015; Fisher & Frey, 2014). Since vocabulary acquisition plays such a key role in understanding the context of a specific text (National Institute of Child Health Development, 2000), teachers need to implement instructional strategies that encourage vocabulary acquisition (Mestre & Ross, 2015).

Standardized test scores. Accurately measuring student learning is a debatable issue amongst educators. To date, standardized testing is the most commonly utilized method for assessing student achievement and is what the U.S. currently uses to rank student learning among peers on local, state, and national levels (National Center for Educational Statistics, 2015; Next Generation Science Standards, 2013; Organization for Economic Cooperation and Development, 2015). Locally, the state of North Carolina also uses student standardized test performance to assess teacher effectiveness with a program called Education Value-Added Assessment System (EVAAS) (Department of Public Instruction North Carolina, 2011). Nationally, standardized test scores are the decisive factor when comparing the education of American students among states and abroad (National Assessment of Educational Progress, 2009; National Science Foundation, 2010; U.S. Department of Education, 2014a).

Polling has consistently ranked U.S. students' science standardized test scores as showing no increase—a lack of improvement compared to thirty other countries despite the updates to the science curriculum (Fensterwald, 2013). According to the Programme for International Student Assessment (PISA), when compared to the students of other countries, U.S. students continue to

show dormant results in science standardized test proficiency, leaving American students out the top 20 when compared to the competency of students in other nations (Organization for Economic Cooperation and Development, 2015). Further, in the past 20 years, math standardized test scores have risen while science scores have been stagnant (National Center Education Statistics, 2009). In fact, since 1994 U.S. science standardized test scores among eighth grade students have consistently underperformed eighth grade students of other developed countries, especially those students belonging to disadvantaged populations, regardless of the country's recent efforts to increase scores (National Science Foundation, 2010).

The nation's inferior standardized test scores in science have brought considerable attention to the educational needs for improving student learning and an influx of interest in science, technology, engineering, and math (STEM) content areas (National Science Foundation, 2010). One reason for the disparity in U.S. standardized science scores compared to other countries is that many U.S. students lack academic science vocabulary; this lack leads to limited retention and comprehension of science concepts (Shore, Ray, & Gooklasian, 2015). According to Johnson, Levine, Smith, and Stone (2010), increasing student vocabulary will help students perform better in class and can help students meet the demands of standardized testing in science. Both vocabulary reading skills and vocabulary acquisition have a large effect on standardized test scores (O'Reilly & McNamara, 2007). Vocabulary is a significant predictor of student comprehension and is often considered a critical component to passing standardized tests (Dong, 2013; Thoma, 2011). For instance, in a study of high school students (n=1,651) reading skills, including vocabulary, were shown to increase the students' science comprehension resulting in increased state science test scores (O'Reilly & McNamara, 2007). The pressure to

increase standardized test scores lends support to this research and its attempt to increase science vocabulary in students in the elementary setting.

Vocabulary Instruction

The National Reading Panel's findings on vocabulary instruction led to the suggestion of nine widely acclaimed recommendations specific to vocabulary instruction (Hairrell, Rupley, & Simmons, 2011; National Institute of Child Health Development, 2000). Of the nine recommendations for vocabulary instruction, this study is supported by four of the recommendations. Specific to this study, the four recommendations made by the National Reading Panel Report in reference to increasing student vocabulary acquisition are as follows: provide multiple exposures to words, maximize active engagement, use computer technology, and avoid reliance on a single method of vocabulary instruction (National Institute of Child Health and Development, 2000). Researchers have supported the aforementioned components necessary for students to have success in vocabulary acquisition (Blanchowicz, Beyersdorfer, & Fisher, 2006; Christ & Wang, 2010). The following section will describe two important approaches to instruction that are currently trending in education in regards to vocabulary instruction. Response to Intervention and a cross-curricular approach to learning are two research-based instructional methodologies currently used to fill learning gaps and improve student knowledge.

Response to Intervention (RtI). Some learners require additional instructional methods in order to experience increased levels of engagement necessary to increase their learning (Basye, 2014). Studies have shown that most experienced teachers employ evidence-based instructional practices in an effort to close student learning gaps (Spooner, Knight, Browder, Jimenez, & DiBiase, 2011). Evidence-based practices are instructional means that are supported

by a body of literature as having demonstrated effectiveness in student learning (Qdom et al., 2005). Educators are encouraged to find and implement effective instruction that will maximize student learning for all learners (Monsen, Ewing, & Kwoka, 2013).

Response to Intervention (RtI) is a set of instructional strategies based on the theory that many students struggle academically simply because they have not had sufficient opportunities for appropriate learning (Vellutino & Fletcher, 2005). The RtI program is a systematic approach to learning that gives students multiple chances to practice the specific skills they are lacking in order to show mastery of a given task (Lipson, Chomsky-Higgins, & Kanfer, 2011). RtI is also listed as a national support system under the Individuals with Disabilities Education Act (IDEA) (RtI Network, 2014). When students are identified as having a specific skill gap, a series of research-based intervention strategies are applied by a teacher to help the student learn the missing skill (Fletcher & Vaughn, 2009). This study seeks to examine an instructional means that will be applicable for a group of mixed ability fifth grade learners and that will support the objective of filling educational gaps as recommended by RtI (RtI Network, 2014).

Cross-curricular approach. Teachers who implement literacy strategies like improved vocabulary can maximize student learning in every subject area as the students learn both the content they need and the necessary reading skills to increase learning in other subject areas (Marzano et al., 2001). This multi-content area approach to instruction is referred to as cross-curricular. A cross-curricular approach to teaching and learning is beneficial to both students and teachers across all content areas. For instance, while vocabulary is often strongly linked to reading instruction, it affects much more than a student's ability to read and comprehend text in language arts related subject areas only. Extending Sweller's (1994) work on word learning, Baker, Simmons, and Kameenui (1995) also tied vocabulary knowledge to overall student

academic performance. O'Reilly and McNamara (2007) furthered the idea of increasing students' academic vocabularies. The researchers found that when teachers help students increase their academic vocabulary, not only does students' understanding increase but they also produced significant gains in their overall performance in other subject areas (O'Reilly & McNamara, 2007). A correlation between literacy skills and science knowledge exists (Byrd & Rasberry, 2011). This correlation is supported by the fact that strong science instruction is aided by content literacy (Grillo & Dieker, 2013). Content literacy is the ability to apply reading and writing skills in order to acquire new learning in any subject area (Fang, 2012). The National Board Certified Teachers (2016) expanded on the connection between content literacy and other subject areas in their recommendations for improving teaching and learning through teacher professional development programs. These programs illustrate a cross-curricular approach to instruction, highlighting the benefits of content literacy in other subject areas like science and math (National Board Certified Teachers, 2016). A boost in vocabulary acquisition will increase elementary student performance in other content areas including science (Lenski, 2011).

Science

The Common Core State Standards Initiative (CCSS), is increasing the inclusion of science content area instructional standards to the curriculum in K-12 classrooms (Common Core State Standards, 2015). Currently, the Common Core State Standards include a national push for all states in the U.S. to provide the same high-quality academic learning goals for each grade using one common scope and sequence curriculum to prepare students for today's career and college demands (Crockett, 2015; U.S. Department of Education, 2014a). The pressure to increase science content standards in the K-12 curriculum is in response to a corporate demand for a specific learner profile with explicit workforce skills (National Research Council, 2013;

Science Coalition, 2016). This section will focus on the elements that support strong science instruction in the elementary setting and the importance of teaching science vocabulary to students.

Science in elementary. Research regarding science content area learning for elementary learners is limited (Yoon, Dyehouse, Lucietto, Diefes-Dux, & Capobianco, 2014) despite the myriad of literature demonstrating the benefits of science content area learning for secondary and post-secondary learners (Aronin & Haynes-Smith, 2013). Nationwide initiatives like STEM and the Science Coalition are promoting that science learning begin in the elementary classrooms (Science Coalition, 2016; STEM Education Coalition, 2016). Recommendations from Next Generation Science Standards (NGSS) has reiterated that science content areas need to be taught at the elementary school level in order to strengthen the students' content knowledge (National Research Council, 2013). NGSS further states that teaching science related content areas in the elementary setting will also increase the students' overall level of interest in STEM fields as student learners and continuing to adulthood (National Research Council, 2013). Early and ongoing effective teaching practices could potentially be a key to eliminating achievement gaps in science education (Klieger & Yakobovitch, 2011; Wieman, 2012).

Science vocabulary. Although vocabulary is learned through oral language and reading (Moats, 2004), science textbooks pose a difficult challenge for student learning due to their overload of technical vocabulary terms (Fang, 2012). The challenging terms in science are especially difficult because they are unfamiliar, not a part of a student's everyday speaking vocabulary, and tend to have multiple meanings (Aronin & Haynes-Smith, 2013). Words like electromagnetic waves and the Coriolis Effect are terms that are not part of the average fifth graders' speaking vernacular. Further, words like fair and mild are seemingly simple words but

have multiple meanings when using them in the context of science. Fair may mean equal shares amongst friends but in weather, fair means cool and dry. Likewise, for many students, mild describes the level of spiciness in food. However, in weather terms, mild means humid and warm. Students who learn science vocabulary can better understand bigger science concepts (Fang, 2012). Although researchers have shown the positive impact science vocabulary has on learning in middle school and high school age students, adequate science vocabulary instruction is not being effectively integrated into the average elementary classroom setting (Carrier, 2013; Grillo & Dieker, 2013).

Economic Pressure

Pressure to push students into science and math academic fields of study has been trickling down from the White House (U.S. Department of Education, 2014a). Former President Barack Obama expressed his concern that the position of the U.S. as a global leader is being threatened by the lack of students interested in STEM fields and the limited number of teachers qualified to reinforce student endeavors. To support the STEM initiative, the government earmarked nearly 300 million dollars for STEM programs and initiatives in the 2015 fiscal budget (U.S. Department of Education, 2014b). The push for STEM educational opportunities is demonstrating increased student learning in science content areas for both STEM majors and non-STEM majors (Jin & Bierma, 2013; National Science Board, 2010). The former President's Council of Advisors on Science and Technology recommended a 33% increase in the number of STEM bachelor's degrees each year and adoption of research-based instructional strategies and best practices for teachers in an effort to help students achieve the increased educational goal (National Academy of Sciences, 2014). The following section of this chapter will explain the economic pressures of increasing and improving science content area instruction in order to

address the global competition of the workforce with other countries and the desired skillset needed to fulfill corporate job openings.

Competing globally. The need for STEM field professionals is growing at a rapid rate in an effort to remain in step with the high demands of a technologically savvy global economy (DeJarnette, 2011; Sinnema & Aitken, 2013). The current national debate about the economy and the fear of not being able to fulfill the demands of future occupations has many companies admitting they have a difficult time finding U.S. workers with the desired science and math based skill set (Furchtgott-Roth, 2013). Unfortunately, American education has delayed preparing both teachers and students to successfully function in an increasingly globalized world (Doppen & An, 2014). Even with economic growth, economists project the U.S. will continue to have a shortage of workers qualified STEM field positions (National Science Board, 2010). Providing early exposure of effective science content instruction to young learners may be a key to establishing long-term educational success in America (National Science Board, 2010).

Corporate skillset. In addition to the demands of experienced STEM content area learners, 21st century learners are expected to also be well versed in the following areas: collaboration, communication, creativity, and critical thinking (DeJarnette, 2011). Collaboration includes sharing of ideas and working with others in an effort to complete a task and works best when learning tasks replicate real world work scenarios and include people working together toward a common goal (DeJarnette, 2011). Communication skills are necessary in nearly every facet of work, including interacting with others in the same work environment, speaking with customers, and delegating tasks (Selber & Faris, 2013). An enriched and extensive vocabulary makes communication easier and more effective (Newton, 2013). Students who think critically are great problem solvers and can quickly detect inconsistencies, thus, creating prepared citizens

ready for working relationships (Dewey, 1905). In order to keep up with the rapidly changing pace, the country is in need of innovative thinkers who are visionaries and critical thinkers (Dovemark & Beach, 2014). While special interest in student accountability in the educational community continues, the local and global markets are increasingly interested in student performance, specifically a 21st century learner who is self-motivated, creative, flexible, and collaborative (Helfrich, 2014). Technology offers endless real-world opportunities in which to collaborate with others (Burgerová, 2013).

Technology

The benefits of technology, when used appropriately and integrated with sound purpose and fidelity, could potentially afford teachers an opportunity to gain a higher level of engagement from students (Agosto, Copeland, & Zach, 2013; Burgerová, 2013). Little research has been done with science vocabulary instruction using the application of technology (Aronin & Haynes-Smith, 2013; Grillo & Dieker, 2013). The lack of technology coupled with science vocabulary instruction is a surprising discovery considering the multitude of research studies that show the powerful and positive effect technology can have on learning (Cervenanská, 2013; Chuang, 2014; Finke, McNaughton, & Drager, 2009; Johnson et al., 2010). However, a few progressive studies have demonstrated positive learning outcomes using technology as a catalyst to specifically increase student working memory in vocabulary acquisition (Aronin & Haynes-Smith, 2013; Grillo & Dieker, 2013; Marshall & Taylor, 2013; Rositas-Martínez & Mendoza-Gómez, 2015). Key ideas, even those that are considered extremely abstract, can be learned if taught in an engaging way (Rata, 2016). Technology tools that help students gain a better understanding of abstract concepts, like science vocabulary terms, would be beneficial to the field of education. For clarification, technology is a broad term that encompasses all forms of

digital media in the field of computer science and technology tools is the term referring to a specific device or program that is being used to electronically deliver information students are learning (Hagge, 2017).

Researchers have documented challenges and negative side effects of using various technology tools in the classroom (Deubel, 2007; Fedynich, 2014). Spitzer (2014) showed adverse results of including technology in learning because the constant typing impaired students' reading and writing. Spitzer's (2014) research demonstrated that a lack of reading and writing by students led to memory impairment. Spence (2001) wrote about trepidations with instructional technology in that teaching involves human participants and the addition of technology actually became a substitute for human interaction. Further, a meta-analysis concerning iPads® and higher learning concluded with varying views from the students and faculty. The students reported enhanced learning experiences although the iPad® use generally did not translate into increased learning outcomes (Nguyen, Barton, & Nguyen, 2015). The faculty reported iPads® helped the faculty members disseminate information and provided professional development support (Nguyen, Barton, & Nguyen, 2015). While benefits for using the iPads® exist, there appears to be a deficit in deciding how to best align and integrate the iPad® with learning.

Researchers have shown some negative and inconclusive results regarding technology and student learning outcomes; however, the overall consensus of research concerning technology and learning is the use of technology is predominantly promising (Marino, Israel, Beecher, & Basham, 2013). Choosing an appropriate and effective technology tool to maintain student level of engagement without compromising the integrity of the lesson is vital for positive learning results (Griffin, 2014; Ross, 2015). The chosen technology tool also needs to be easily

accessible and user-friendly for both teachers and students (Miller, 2014). This section will expand on the effectiveness technology can play in student learning by reviewing literature on choosing effective instructional technology tools, the use of technology to increase student engagement, and the importance of ensuring teacher and student accessibility to and usability of a given technology tool.

Technology and instruction. When a technology tool is matched to the appropriate audience, an increased level of student engagement can occur as well as an increase in the effectiveness of instruction (Clark, 2009). With numerous technology devices and program choices, teachers may have difficulty choosing the most appropriate instructional vehicle. When choosing the best delivery method, teachers should first consider their audience (Serim, 2012). Many digitally experienced students are craving diverse methods of instruction delivery (Perry, Cunningham, & Gamage, 2012). With access to desktops, laptops, iPads®, smartphones, and more, young digital era citizens are surrounded by technology devices. Current students yearn for instruction that is collaborative and includes the regular use of technology tools that are a natural part of their daily lives (Oblinger, 2013).

Research regarding interactive technology tools has shown positive results concerning enhancing teacher instruction and increasing student engagement and motivation. The National Council for Accreditation of Teacher Education (NCATE) supports technology in the classroom for instructional purposes as it states that a requirement for an appropriate teacher education program must include the integration of technology that enhances student learning (National Council for the Accreditation of Teacher Education, 2017). According to Brecka and Cervenanská (2015), technology tools like interactive white boards have demonstrated mostly positive results for enhancing teacher instruction. In their study, 269 children were provided

various minutes of exposure to interactive whiteboards over a 14-week period of instruction. The treatment group averaged viewing sessions of 15-18 minutes of viewing time with the control group being denied access to the viewing sessions. The researchers determined that interactive whiteboards can significantly increase student learning and positively influence their level of motivation. While Brecka and Cervenanská's study was done in a pre-school setting, the results may be applicable to elementary learners with similar technology tool and exposure to technology. Likewise, in a mixed methods study with quantitative evaluations using a pre- and post-tests, Fonseca et al. (2014) showed that supplementing traditional instruction with augmented reality technology enhanced the student's academic skills and also resulted in an increase in student motivation. While the students in Fonseca et al.'s (2014) study were in secondary education, one can wonder about whether results using a similar technology tool and a younger audience would be comparable.

Engagement. In terms of student motivation and level of engagement, a student's interest level is extremely important in student performance (Davis & Hardin, 2013; Lederman, Lederman, & Antink, 2013). Greenwood (1991) revealed that student engagement is also an important indicator of academic success. The effect of student engagement and learning is not a new concept—in 1693 Locke wrote that the goal of education is to help children to be actively engaged in learning versus requiring students to participate in the mundane rote memorization of facts.

A deeper examination of student engagement by gender may reveal why American students are not performing up to par comparatively with other countries. One study examining students' attitudes toward STEM subject areas found that male students showed more interest in STEM programs over female students (Mahoney, 2010). While the statistics show the numbers

of females learning and working in science-related fields are slowly increasing, both science and math fields are still populated predominantly by males (Shore et al., 2015). Abell (2007) revealed that minority students and female students begin losing an interest in science during the upper elementary grades in an examination of student attitudes toward science. Female students losing interest in science at such an early age is cause for further examination of elementary instruction that will maintain or improve a student's level of engagement using a technology tool (Capobianco, Diefes-Dux, Mena, & Weller, 2011; Mahoney, 2010).

Accessibility. Any technology tool used to teach students should be easily replicable, accessible, and managed, while still addressing learning standards (Johnson et al., 2010). Accessibility refers to the ease with which something is obtained or used (Cruz, Emmel, Manzini, & Braga-Mendes, 2016). One of the many advantages to implementing technology in the classroom includes offering various choices and providing more information with greater ease (Archambault & Crippen, 2009; Kemp et al., 2014; National Council for the Accreditation of Teacher Education, 2017).

A vast knowledge of various technology tools requiring expert skills in electronics is not necessary for implementing instructional technology in the classroom (Borup, West, & Thomas, 2015). Student engagement can be achieved through relatively low-intensity technological applications like video integration technologies (Aronin & Floyd, 2013; Borup et al., 2015). Video integration technology tools generally consist of mobile technologies that have the ability to display videos or vodcasts or that contain video conferencing applications like Skype™ (Alwehaibi, 2015). The integration of video technology tools into instruction may help students better connect with the material, which can contribute to increased higher-order thinking skills

(Flanigan, Becker, & Stewardson, 2012) and overall heightened sense of motivation in students (Ossi, Hietanoro, & Ruismäki, 2011).

Vodcasts

Vodcasts are a type of technology tool consisting of short video clips with corresponding audio that can be accessed and shared using computers or other portable technology devices (Hill & Nelson, 2011). Vodcasts are used for video integration and are becoming increasingly popular for supplementing student instruction (Schnackenberg, Vega, & Relation, 2009; Pettit, Kinney, & McCoy, 2017). Vodcasts are a favorite technology tool among teachers for engaging students in a way that can extend student learning (Shankar-Brown & Brown, 2014). Vodcasts offer an increased level of engagement, beyond that provided by teacher lectures, note taking, or printed texts (Walker, Cotner, & Beermann, 2011).

Vodcasts can be downloaded from the internet for free. Study Jams™ is a website that offers free access to a variety of science and math videos appropriate for upper elementary learners (Scholastic, 2017). Other websites, like BrainPOP® and BrainPOP Jr® are subscription-based programs that offer multiple academic levels of vodcasts in the content areas of science, social studies, English, math, arts, health, and technology in multiple languages (BrainPOP, 2017). Vodcasts can also be made by teachers or students for free and have emerged as a respectable video integration contender for classroom instruction due to their user-friendly format that is affordable and simple to use (Educational Technology Network, 2009; Schnackenberg et al., 2009). Vodcasts are a great choice for novice users of video integration applications as they generally already exist on the technology in most classrooms and their availability in American homes is increasing, as well (Jung Won & Suhyun, 2012).

Affordability and accessibility coupled with supporting research demonstrate that vodcasts can increase student learning, especially for large groups of students (Walker et al., 2011).

Vodcast viewing does provide some limitations. Low bandwidth of internet speed could pose problems with being able to show a vodcast (Wahab & Ghafoor, 2013). The strength of the internet signal or the age of the device could affect the quality of the vodcast being displayed whether the vodcast be from a teacher/student made source or if streaming from a subscription-based service. If one is downloading vodcasts from the internet or if teachers and students are making their own vodcasts, then the file must be stored on some type of technology like a computer or mobile technology device. Depending on the volume of users per device and the storage capabilities of the device on which the vodcast has been stored, hard drive space availability may pose a problem (Wahab & Ghafoor, 2013). This section of the chapter will disclose what researchers note concerning the use of vodcasts to support vocabulary learning and vocabulary acquisition. A review of what the literature says about the culminating approach of combining science, vocabulary, and vodcast technology for instructional purposes will also be included.

Vocabulary support. Vocabulary learning increases when students use video integrated tools like vodcasts (Jung Won & Suhyun, 2012). Research concerning vodcasts as a tool to supplement vocabulary instruction in elementary students, particularly fifth graders, is sparse. However, a study of vocabulary acquisition in fourth and sixth grade students of native English speakers showed that students who received the treatment of viewing vocabulary laden vodcasts as part of their instruction made significant gains in the retention of vocabulary terms compared to students in the control group (Lowman, 2014). The 48 students were randomly assigned to the treatment and control groups and the data were analyzed using an independent samples T-test

with equal variances. The treatment of vodcasts contained instruction for nine difficult and unknown vocabulary words over a three day period with viewing sessions lasting approximately six minutes each day (Lowman, 2014). The treatment group scored an average of 44% higher than the control group as measured by a pre- and post-test vocabulary quiz (Lowman, 2014). This study helps provide supporting evidence that short, repeated exposure to specific vocabulary terms using vodcasts is an effective instructional tool for increasing student vocabulary acquisition.

Science, vocabulary, and technology. When presenting information that is difficult and abstract, keeping students engaged may be difficult. Science vocabulary terms are notably challenging for students to learning (Aronin & Haynes-Smith, 2013). When supplementing science instruction with technology, science websites often include animation and music (Wieman, 2012). In addition to catching the attention on the viewer, animation helps to clarify concepts while allowing participants to hear the pronunciation of difficult vocabulary (Boles, 2011). Boles (2011) found that a textbook generally offers a single illustration or diagram to explain information while a website offers multiple presentations of the topic being addressed. Combining graphics, sound, and video is promising for vocabulary instruction using vodcasts by affording students an opportunity to make a connection between what they know and the new learning (Chambers, Cheung, Madden, Slavin, & Gifford, 2006).

English Language Learners (ELLs), individuals who speak English as a second language, have an even bigger challenge of learning new vocabulary (Carrier, 2013). In a study of 22 third and fourth grade ELL students, science vocabulary was taught to half of the students with the aid of daily vodcasts (Jung Won & Suhyun, 2012). The daily vodcasts included a three to five minute review of the daily lesson that was then posted online for home access. Via the internet,

a 20-question vocabulary pre-test and post-test was given to participants based on the lessons along with a student survey that gauged the students' perception of the effectiveness of the technology in vocabulary improvement (Jung Won & Suhyun, 2012). The findings showed that the students' post-test scores increased on average by 36 points, as compared to the control group, which pointed to the meaningfulness of the technology tool (Jung Won & Suhyun, 2012).

Vodcasts were also found to increase student performance in science in higher education students. A more science content-based examination of vodcasts in a study of pharmacy school students using an analysis of variance (ANOVA) research design showed significant increases in student grade point average (GPA) for students who previewed a series of vodcasts before attending class compared to those students who were not provided access to the vodcasts (Bossaer, Panus, Stewart, Hagemeyer, & George, 2016). While the results are promising for vodcast learning, the study is limited in that the vodcast viewing sessions took place over the course of four semesters and were with graduate students whose developmental learning skills are different from those of fifth graders.

Little research has been reported concerning science vocabulary acquisition and the use of vodcasts in elementary learners (Ozdamli, & Asiksoy, 2016). However, a study that included middle school students and science vocabulary using vodcasts showed positive results (Aronin & Haynes-Smith, 2013). Students in the treatment group demonstrated heightened student interest levels and made significant gains in their science vocabulary acquisition compared to the control group who did not receive vodcast instruction (Aronin & Haynes-Smith, 2013).

Limited research exists regarding studies using vodcasts for science vocabulary instruction in fifth grade learners. However, a study using podcasts and science vocabulary in fifth grade learners was noted. Podcasts are similar to vodcasts but are for listening only, similar

to a lecture type format, as video is not included. Putman and Kingsley (2009) reported significant gains in student science vocabulary instruction using podcast listening sessions. The sample of 58 fifth grade students from a suburban school was randomly divided into a treatment group and a control group with access to a home computer or similar digital media device capable of playing podcasts (Putman & Kingsley, 2009). The treatment group received podcast instruction that supported the assigned vocabulary in addition to traditional classroom science instruction. The control group was provided traditional science instruction for seven consecutive weeks. A pre-test and post-test analysis of covariance (ANCOVA) indicated a statistically significant increase in vocabulary post-test scores among the treatment group when compared to the control group (Putman & Kingsley, 2009). A survey given to the students about their experience with the podcasts revealed positive views toward the use of podcasts as a supplement to their science vocabulary instruction with 76% of the students reporting that they either agreed or strongly agreed that the novelty of the podcasts motivated them to learn through increased interest level and the repeated exposure to the terminology resulted in learning science vocabulary (Putman & Kingsley, 2009). Perhaps the results from the aforementioned podcast study could be applicable to that of vodcasts since the technology tools are similar in nature.

Another study using a technology tool similar to vodcasts includes Stoner, Beck, Dennis, and Parette-Howard's (2011) examination of science vocabulary using a video integration technology tool called animation technology. Animation technology is the opposite of podcasts; a podcast is audio only and animation technology is video only. These researchers reported that a group of children of varying socio-economic statuses were administered a science vocabulary pre-test followed by science instruction. A treatment group received science instruction that included animation technology; a control group received instruction that did not include the

animated instruction (Stoner et al., 2011). The at-risk students who were provided animation technology in the treatment group had the same scores as more affluent students on the post-test examination that were in the control group (Stoner et al., 2011). The research demonstrated that animated technology is an effective science instructional tool for lower socio-economic and other at-risk students.

Summary

The typical fifth grade classroom is filled with varying academic ability levels as well as a myriad of experiences and exposures that both benefit and restrict learning. Still, teachers are expected to provide equal access to the same curriculum to all students within the confines of a single classroom. Thus, teachers need a successful way in which to provide instructional means that delivers the most effective learning impact to such a diverse group of learners.

Finding a way to increase a student's vocabulary may result in many benefits. According to CLT, increasing student vocabulary stamina will help students increase learning not only in a specific content area but also in other subjects (Sweller, 1994; Van Merriënboer & Sweller, 2005). Improving student vocabulary acquisition will increase student working memory and an increase in student working memory will lead to long-term learning (Sweller 1994; Sweller, 2010). Researchers suggest that vocabulary instruction is most effective when the student receives repeated exposure to specific vocabulary words that are presented in a manner that is motivating to the student (Sweller, 2010).

Educators are constantly seeking ways to integrate technologies into instruction in an effort to reach a new generation of tech savvy learners (Gagliolo & Nansen, 2008). Zabala (2014) supported teachers using vodcasts as an instructional means to increase vocabulary, especially in the science content area. Using vodcasts as a supplemental instructional means in

the elementary setting could have a significant impact on learning by helping students better understand essential science vocabulary, thus having a better understanding of more complex science concepts (Agosto, Copeland, & Zach, 2013; Burgerová, 2013). Video integration technology tools, like vodcasts, may potentially play a significant role in developing the skills needed in order to be effective in modern academics as diverse learners (Black, 2009). The study of effective instructional means will also add to the body of literature concerning student achievement. Through the support of previous research, this study seeks to address the current gap of research concerning effective science vocabulary instruction using vodcasts in fifth grade learners (Ciarrochi, Heaven, & Davies, 2007; Kersaint et al., 2014; Minner et al., 2012).

CHAPTER THREE: METHODS

Overview

The purpose of this research is to examine science vocabulary acquisition when using an application of the instructional means, vodcasts, in fifth grade students as compared to those students who were not provided the additional instructional means. Included in this chapter is a discussion of the research design, research question with hypothesis, definition of the variables, and a description of the participants and setting. An explanation of the instrumentation, research procedures, and data analysis is also included.

Design

A nonequivalent control-group design was used for this study to determine if there was a statistically significant difference among the achievement scores of fifth grade students receiving supplemental science vocabulary vodcast instruction and students receiving traditional science vocabulary instruction only, while controlling for pre-test science achievement scores. The nonequivalent control-group design is a structured pre-/post-test randomized experiment without random assignment of groups that are intact but believed to be similar in both the treatment and control groups (Warner, 2013). The independent variable (vodcasts) is generally defined as a treatment demonstrating a cause (Gall, Gall, & Borg, 2007). In this study, the independent variable is identified as supplemental science vocabulary instruction via the use of vodcast lessons in addition to traditional classroom instruction. A nonequivalent control-group design is the most appropriate research design as the independent variable of supplemental science vocabulary instruction using vodcasts will be manipulated while monitoring a control group (Gall et al., 2007). The dependent variable is generally defined as the effect resulting in the application of the independent variable (Warner, 2013). In this study, the dependent variable,

science achievement scores, is identified as the 2015 released version of the North Carolina READY Science End-of-Grade Assessment (NCRSEOGA) (Department of Public Instruction North Carolina, 2015). The nonequivalent control-group design is most appropriate when there is an inability to conduct randomization for the sample population (Gall et al., 2007; Rovai, Baker, & Ponton, 2013; Warner, 2013). Currently, the students belong to intact classrooms that was established prior to the study, by school administration; therefore, the students cannot be randomized as individual participants. The intact classrooms were established at the beginning of each school year by school administration in an effort to heterogeneously group the students based on ethnicity and academic ability. Because the sample of participants could not be randomized, a cluster randomization of the students in the control and treatment groups were assigned using cluster sampling (Gall et al., 2007). A covariate is used to control for differences between two groups (Warner, 2013). The covariate is identified as the pre-test using the same North Carolina READY Science End-of-Grade Assessment (NCRSEOGA) as the post-test (Department of Public Instruction North Carolina, 2015). The nonequivalent control-group design ensures that threats to internal validity will be statistically controlled (Campbell & Stanley, 1963; Gall et al., 2007; Warner, 2013).

Research Question

The research question for this study is as follows:

RQ1: When used as a supplement to traditional instruction, can content-specific vodcasts increase science achievement scores in fifth grade students?

Hypothesis

The null hypothesis for this study is as follows:

H₀1: There is no statistically significant difference among North Carolina READY Science End of Grade Assessment (Department of Public Instruction North Carolina, 2015) achievement scores between fifth grade students receiving supplemental science vocabulary vodcast viewing instruction and students receiving traditional science vocabulary instruction only, while controlling for pre-test science achievement scores.

Participants and Setting

The participants for this study were fifth grade students from Bailey Elementary, a pseudonym, located in the Piedmont region of North Carolina during the fall of the 2017-2018 school year. The school is a K-5 elementary school located in a small rural town consisting of 3,383 residents representing the following race categories: 73% Caucasian, 21% African American, 4% Hispanic, and 0% Asian with a median age of 37 years (United States Census Bureau, 2016).

Students

Bailey Elementary (pseudonym) is a Title I school meaning at least 40% of its student population comes from low-income families who qualify for the public school lunch assistance program (Department of Public Instruction North Carolina, 2016). Currently, 43% of the fifth grade students at Bailey Elementary qualify for free lunch and 6% are offered lunch at a reduced rate (National Center for Educational Statistics, 2016) which is comparable to the collective district rate of 44% (Department of Public Instruction North Carolina, 2017).

The school has 757 students enrolled with 175 of the students in the fifth grade (National Center for Educational Statistics, 2016). Both the treatment and control groups are comprised of students with diverse ethnicities: 19% African American, 14% Hispanic, .9% Asian, and 67% Caucasian (Department of Public Instruction North Carolina, 2017). The students in this

research study have a male/female ratio of 54% male and 46% female (Department of Public Instruction North Carolina, 2017). District demographics are provided in the Setting section.

According to Gall et al. (2007, p. 144), a minimum of 166 participants yields a medium effect size for appropriate statistical analysis in non-equivalent control group designs. For this study, a sample size of $N = 169$ ($n = 85$ control group and $n = 84$ treatment group) was used with a statistical significance level of $\alpha = .05$, a medium effect size, and a statistical power of .80 (Gall et al., 2007). Randomization of the sample is considered too disruptive due to the students currently belonging to six previously established classrooms. Therefore, the students will be randomly placed into the control and treatment groups as intact classrooms.

Teachers

After IRB approval was granted, school district and school administration approval was procured. The researcher will then began soliciting fifth grade teachers to participate in the study. As expected, 100% of the fifth grade teachers participated in the study as this research did not interrupt or inhibit their regular instruction. The six teachers are all Caucasian females who range from seven to 13 years of teaching experience. Each teacher holds a K-6 Bachelor of Science degree in Elementary Education with approved teaching licensure for the State of North Carolina (Department of Public Instruction North Carolina, 2014). No initial licensure teachers participated in this research. Further demographic information is included at the conclusion of the study.

Setting

Bailey Elementary, a pseudonym, is located in a small rural town in the Piedmont region of North Carolina and is governed by the local school district and its Board of Education. Bailey Elementary is one of 17 elementary schools in the district and is currently ranked 792 out of

1492, 47th percentile, of elementary schools in North Carolina (National Center for Educational Statistics, 2016). Bailey Elementary is located on the southern end of a large-sized school district. The school district serves nearly 21,000 students with 10% enrolled in Exceptional Children's Education (EC) programs, 12% English Language Learners (ELL), and 9% Academically or Intellectually Gifted (AIG) (Department of Public Instruction North Carolina, 2017). The district's student demographics are: Caucasian 67%, African American 14%, Hispanic 12%, Asian 3%, and other 4% (Department of Public Instruction North Carolina, 2017). The district is ranked among the top 25% of school districts in the state of North Carolina in student performance (National Center for Educational Statistics, 2016) and ranks above the state average in standardized test scores (Department of Public Instruction North Carolina, 2017).

The classrooms used in this study are all fifth grade, regular education classrooms. Each fifth grade classroom teacher has equal access to the same technology provided by the school—Wi-Fi, Apple iPad®, Apple iPad Mini™, Apple TV®, tablets, teacher laptop, desktop computers, projector, and SMART Board®. The fifth grade students in both groups also have equal access to the same technology as the teachers with the exception of a teacher laptop. All teacher instruction for both the treatment and control groups was aligned to the Common Core State Standards on the topic of weather for fifth grade students in the State of North Carolina (Common Core State Standards Initiative, 2015; Department of Public Instruction North Carolina, 2016) and according to the district's pacing guide. The instruction took place in each student's regular education classroom. The fifth grade teachers at Bailey Elementary are required by administration to follow common lesson plans that are provided to the entire grade level electronically, by the grade level chair. To ensure equivalency across the groups, the

researcher provided the common lesson plans for the weather unit to secure that every student in the fifth grade was afforded the same learning opportunity in addition to holding the teachers accountable for the content of the curriculum.

The Control Group

The control group consisted of 85 students currently in the fifth grade. The average age of each student is 11 years old with a gender ratio of 52 males and 33 females. The ethnicity of the students in the control group consisted of 58 Caucasian, 16 African American, 9 Hispanic, and 2 Asian.

The Treatment Group

The treatment group consisted of 84 students currently in the fifth grade. The average age of each student is 11 years old with a gender ratio of 50 males and 34 females. The ethnicity of the students in the treatment group consisted of 46 Caucasian, 19 African American, 18 Hispanic, and one Asian.

Instrumentation

The measurable instrument administered in this study for both the pre- and post-tests was the North Carolina READY Science End-of-Grade Assessment (NCRSEOGA) (Department of Public Instruction North Carolina, 2015). The NCRSEOGA (Department of Public Instruction North Carolina, 2015) is a widely accepted instrument for measuring science achievement in fifth grade students (Department of Public Instruction North Carolina, 2014) and was used in this study to measure science vocabulary acquisition. The NCRSEOGA (Department of Public Instruction North Carolina, 2015) is a standardized test that is required of all fifth grade students in North Carolina as supporting evidence of acquired basic skills and knowledge as mandated by General Statute 115 C 174.10 (Department of Public Instruction North Carolina, 2014).

Additionally, the NCRESOGA (Department of Public Instruction North Carolina, 2015) contributes to the cumulative measurement of student academic growth, is used to ensure teacher accountability, and is often examined when determining school funding (Department of Public Instruction North Carolina, 2009a; Department of Public Instruction North Carolina, 2014). Specifically, North Carolina standardized tests have been used in multiple studies to support findings concerning student academic ability and growth (Benfield, 2012; Bowles, 2014; Meluso, Zheng, Spires, & Lester, 2012; Newnam, 2014). Permission to use the 2015 released NCRSEOGA (Department of Public Instruction North Carolina, 2015) for both the pre- and post-tests in this study has been granted (see Appendix E).

The North Carolina Statewide Testing Program personnel found that the NCRSEOGA (Department of Public Instruction North Carolina, 2015) meets/exceeds expectations for reliability norms by calculating the reliability statistics using Cronbach's alpha (Department of Public Instruction North Carolina, 2014). The Cronbach's alpha reliability values include alpha values of .90 for Forms A, B, C, N, and O; Cronbach's alpha value for Form M was .91 (Department of Public Instruction North Carolina, 2014) (see Table 3.1).

Table 3.1

Reliability Statistics for North Carolina READY Science End-of-Grade Assessment

Science	Form A	Form B	Form C	Form M	Form N	Form O
Grade 5	0.90	0.90	0.90	0.91	0.90	0.90

While there are six different forms of the NCRSEOGA (Department of Public Instruction North Carolina, 2015), each of them equivocally represents the Common Core State Standards for fifth grade science (Department of Public Instruction North Carolina, 2016). This study will focus on material covered under the subscales of Matter, Energy, and Earth Systems as a full unit

study of weather. Collectively, the three subscales will contribute to 41% of the pre- and post-test questions. The following table shows all subscales included on the NCRSEOGA (Department of Public Instruction North Carolina, 2015) and their coordinating weight distribution (see Table 3.2). The NCRSEOGA was validated in its entirety, thus, will be given to the students as a full assessment to protect the validity of the instrument.

Table 3.2

Subscales and Distribution for North Carolina READY Science End-of-Grade Assessment

Area	Matter	Energy	Evolution	Ecosystems	Living Organisms	Earth Systems	Force Motion
Weight	12-14%	11-13%	13-15%	14-16%	14-16%	15-17%	13-15%

The pre- and post-tests in this study will not coincide with the regularly scheduled standardized testing for students required by the state of North Carolina. The school's assessments are administered in the last 10 days of the students' fifth grade year and will consist of a different version of the assessment used in this study (Department of Public Instruction North Carolina, 2015). The assessments used in this study were administered prior to the school's scheduled state testing window during the 2017-2018 school year and used the 2015 released version of the NCREOGA (Department of Public Instruction North Carolina, 2015). Although the NCRSEOGA (Department of Public Instruction North Carolina, 2015) is released online, the students and parents did not know which version of the assessment was being used prior to the study, in order to mitigate the possibility of access to the instrument.

Pre-test

The pre-test consisted of the 2015 released version of the NCRSEOGA (Department of Public Instruction North Carolina, 2015) which is a 58 question, multiple choice science assessment. In this study, the scores from the pre-test science assessment were reported using a

scale ranging from 0-100 percent. The focus of this study was not whether the attained scores were considered passing but, instead, more closely examined the differences between the pre-test and post-test science assessment scores. The pre-test, as an equivalent form to the post-test, was administered to both groups one day prior to the treatment group starting the first vodcast viewing session. The pre-test took no more than 90 minutes to complete.

Post-test

The post-test also used the 2015 released version of the NCRSEOGA (Department of Public Instruction North Carolina, 2015) which is a 58 question, multiple choice science assessment. In this study, the scores from the post-test science assessment were reported using a scale ranging from 0-100 percent. The focus is not whether the attained scores are considered passing but instead, more closely examined the differences between the pre-test and post-test scores. The post-test was administered to both groups one day following the treatment group's final vodcast viewing session. The post-test took no more than 90 minutes to complete.

Procedures

Upon receiving Institutional Review Board (IRB) from Liberty University, district approval to conduct research was sought. The researcher met with the district's Deputy Superintendent of Curriculum and Instruction to discuss the significance of the study and to gain written consent to contact the school administration for research purposes (see Appendix B). Once written permission was granted from the district, the researcher scheduled a meeting with the school administration to discuss the research plan and to seek written consent (see Appendix C) to conduct research on the premises.

In order to establish validity of the treatment, the researcher proceeded to develop a panel of science curriculum experts to perform an expert review of the vodcasts used in this study. The

expert review panel consisted of five experts from the district's Science Curriculum Review team each possessing a terminal degree in education with a minimum of 10 years' teaching experience.

Through the use of Survey Monkey®, a link to a 28-question survey was provided to each of the experts. Questions 1-2 asked each expert to list their highest level of education and years of teaching experience. Question 3 asked a general question about the experts' level of knowledge concerning common weather terms. Questions 4-28 each provided a corresponding link to one of the vodcasts used in this study. The experts were asked to rate how well the vodcast described specific weather terms using a 5-point Likert type scale (with 1 indicating "very poor" and 5 indicating "very good"). Additionally, the expert reviewers were asked to provide a brief comment regarding their level of agreement for each of the science vocabulary specific questions. Reviewers were required to answer each of the 28 questions. The survey was concluded and the responses were analyzed as a whole using the Survey Monkey® results analyzation program. The expert panel unanimously agreed that each of the provided vodcasts satisfactorily covered the science content vocabulary terms related to this study (see Appendix I). A satisfactory reply was designated as a 3, 4, or 5 ("average", "good", or "very good" respectively) on the Likert type scale.

After the school's administration affirmed written approval, the researcher recruited teacher participants approximately four weeks prior to the study. The recruitment took place during a required fifth grade teachers' meeting to discuss the expectations of the study, gain written consent from the participating teachers, and to disclose the research protocol concerning this study (see Appendix D). During this time, the researcher also trained the participating teachers on the viewing of the vodcasts, the collection of the parent written consent forms, and

the administration and collection procedures of the pre- and post-tests. Explicit directions, common plans, and a script (see Appendix F) was provided for each teacher. The researcher used the previous year's lesson plans to create a five week long weather unit. The lesson plans along with the vodcast viewing schedule (see Appendix J) were presented to the appropriate fifth grade teachers. Having common lesson plans kept the instruction for both groups constant and helped control for construct validity, which will ensure the fidelity of the treatment and is an administrative directive at this school. Additionally, the five week instructional pace will allow sufficient time to pass between the administration of the pre- and post-tests (Lodico, Spaulding, & Voegtle, 2010) off-setting the possibility of false growth measures due to the students' ability to recall pre-test items, referred to as test-retest. For precaution, the test-retest reliability will be calculated using Pearson Correlation Coefficient (Gall et al., 2007; Warner, 2013).

As noted in the instrumentation section, this study used the 2015 released version of the NCRSEOGA (Department of Public Instruction North Carolina, 2015) as both the pre- and post-test. The researcher used the NCRSEOGA (Department of Public Instruction North Carolina, 2015) as the pre- and post-tests for both groups because there is no standardized testing in science in previous grades and no NCRSEOGA (Department of Public Instruction North Carolina, 2015) or equivalent assessment exists for fourth grade students allowing a year to year comparison to be made. Additionally, there are no standardized fifth grade beginning-of-grade science assessments available from the North Carolina Department of Public Instruction so that a beginning of year and end of year comparison could have been made (Department of Public Instruction North Carolina, 2014).

Three weeks before the study, the researcher visited each fifth grade homeroom for approximately five minutes to give the students an overview of the study. The students were

advised about the importance of refraining from discussing anything about the study to other students and teachers in order to protect the integrity of the study. Student assent was attained during the overview session by the researcher. The students who gave written assent to use their scores in this study received a parental written consent form to take home (see Appendix L). The students were given one week to return the signed parental consent form. The researcher provided a phone message, sent by the school's group phone messaging service, urging all fifth grade parents to please sign and return the consent form by the given date. For those students who did not return the signed parent consent form, an additional form was sent home. A small incentive of a mechanical pencil was offered to each student who returned a signed form. Students returning signed forms declining permission to use student data were still eligible for the incentive. Assessment scores from those students whose parents declined the use of their child's data being included in the study and those students who did not return a parental written consent form was discarded and was not used in any area of this study.

One week before the application of the treatment, the school's data manager provided a master list of the district assigned student identification numbers, race, and gender for each participating student. From the list, the teacher removed all names and returned it to the researcher. While the classroom teacher had access to both the student identification numbers and the names of the students, the researcher did not. No attempt to match the student identification number with the student's name was made by the researcher. All collected data was kept in a separate locked storage cabinet. All digital data is stored on a password protected laptop computer. Pseudonyms and codes were used to protect the school, teachers, students, and other involved stakeholders.

The vodcasts featured weather unit related science vocabulary terms and will be shown to the treatment group for five weeks for a total of 15 sessions. Prior to the study, the collection of vodcasts were reviewed and validated by an expert review panel using Survey Monkey (see Appendix I). The researcher reviewed the results of the expert review panel to determine the level of consensus. Permission to use the vodcasts for research purposes has been granted (see Appendix K). The treatment group's vodcast viewing was provided immediately following the morning announcements on viewing days as determined by the viewing schedule. The vodcasts were played from the teacher's school laptop computer and projected onto the classroom screen. The viewing sessions were less than five minutes long. Regularly scheduled classroom instruction for the weather unit began for both the treatment and the control groups as outlined in the common lesson plans that were provided for the teachers. The participating teachers were reminded of the importance of confidentiality concerning the treatment and control groups among the teachers and also with the students in order to protect the integrity and control the validity of the research study.

The pre- and post-tests were given to the teachers one day prior to administration. The vodcast viewing schedule with provided links was given to the treatment group prior to the study and also provided for the control group teachers at the conclusion of the study so that both groups had equal exposure to the treatment. The classroom teachers administered and collected the pre-tests and returned them to the researcher. After the treatment group finished the 15 vodcast viewing sessions over the duration of five week study, the post-test was administered to both groups. The classroom teachers administered and collected the post-tests and returned them to the researcher. The researcher then scored the post-tests. Once the pre- and post-tests were

collected and scored by the researcher, the data was transferred to a spreadsheet and further analyzed through an application of IBM SPSS® software.

Data Analysis

Data collected in this study was used to determine if there was a statistically significant difference among achievement scores of fifth grade students between students receiving supplemental science vocabulary vodcast instruction and students receiving traditional science vocabulary instruction only, while controlling for pre-test science achievement scores. A one-way analysis of covariance (ANCOVA) was used in this statistical analysis. The ANCOVA is the most appropriate statistical procedure when the control and treatment groups are not equal (Tabchnick & Fidell, 2007; Rovai et al., 2013; Warner, 2013), and when the pre-test and post-test are the same measure (Warner, 2013). In this study, the independent variable is supplemental vodcasts. The dependent variable is science achievement post-test scores. The controlling variable is science achievement pre-test scores. IBM SPSS® software was used by the researcher for descriptive statistical analysis.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this quantitative study is to examine the effect of vodcast viewing in fifth grade science assessment scores at Bailey Elementary School, a pseudonym, representing an area in the piedmont region of North Carolina. This study builds on the body of knowledge concerning students learning science vocabulary using a given technology tool. The 169 participants in this study were drawn from a sample population of 175 fifth grade students enrolled in Bailey Elementary during the 2017-2018 school year. This chapter presents the results of data collected for this research study as it pertains to the proposed research question and hypothesis discussed in previous chapters. This chapter will conclude with a summary of the results.

Descriptive Statistics

The sample population was drawn from intact classes. Intact classes were assigned to a control or treatment group prior to the study intervention. The participants in the control group received traditional science instruction only, while those in the treatment group received traditional science instruction in addition to supplemental science vocabulary vodcast viewing sessions. The study consisted of 102 males and 67 females. The number of participants by race included 61.5% Caucasian, 20.7% African American, and 17.8% Hispanic and Asian (combined) participants. The study consisted of 169 participants ($N = 169$). Table 4.1 further shows the demographics of the study participants by gender, race, and participant group.

Table 4.1

Gender, Race, and Participant Group Descriptive Statistics

Variable	Category	<i>N</i>	Percent
Gender	Male	102	60.4
	Female	67	39.6
Race*	Caucasian	104	61.5
	African American	35	20.7
	Hispanic and Asian	30	17.8
	(combined)		
Participant Group	Treatment	84	49.7
	Control	85	50.3

Note. Race category “Hispanic and Asian” includes 27 Hispanic and 3 Asian participants.

The descriptive statistics for the pre- and post-test scores are as follows: A total of 84 participants in the pre-test score treatment group, which assessed the student’s pre-existing knowledge before treatment, yielded a mean of 35.8 ($SD = 10.5$); 84 post-test scores yielded a mean of 59.8 ($SD = 13.2$). A total of 85 participants in the pre-test score control group, which assessed the student’s pre-existing knowledge, yielded a mean of 32.6 ($SD = 8.5$); 85 post-test scores yielded a mean of 49.7 ($SD = 11.1$). Skewness and kurtosis show, numerically, how normal and symmetrical the distribution is in a histogram (Warner, 2013). An assumption of a normal distribution is usually met when the mean and median are similar and skewness and kurtosis are 0. The mean and median for the treatment group were similar, as were the mean and median of the control group. Table 4.2 shows descriptive statistics for the pre-test and post-test scores.

Table 4.2

Pre-test and Post-test Score Descriptive Statistics

Variable	Group	<i>N</i>	Mean	Std. Dev.
Pre-test Score	Treatment	84	35.8	10.5
	Control	85	32.6	8.5
Post-test Score	Treatment	84	59.8	13.2
	Control	85	49.7	11.1

Results**Null Hypothesis**

The null hypothesis for the study stated there is no statistically significant difference among North Carolina READY Science End-of-Grade Assessment (Department of Public Instruction North Carolina, 2015) achievement scores between fifth grade students receiving supplemental science vocabulary vodcast viewing instruction and students receiving traditional science vocabulary instruction only, while controlling for pre-test science achievement scores.

Assumption Testing

Prior to analysis, the researcher screened the data to ensure there were no violations of assumptions before the use of ANCOVA to test the hypothesis (Gall et al., 2007). Assumption testing determined whether the following assumptions were tenable: no extreme outliers, normality, linearity, bivariate normal distribution, homogeneity of slopes, and equal variances. The assumption testing used in this study is explained further below.

Outliers. Extreme outliers were tested for through the generation of a box and whisker plot for each group (see Figure 4.1). Examination of the box and whisker plots indicated an outlier in the control group (participant 105). This outlier was removed resulting in a final

sample size of 84 cases in the treatment group and 84 cases in the control group. The total sample size for all further analyses was $N = 168$.

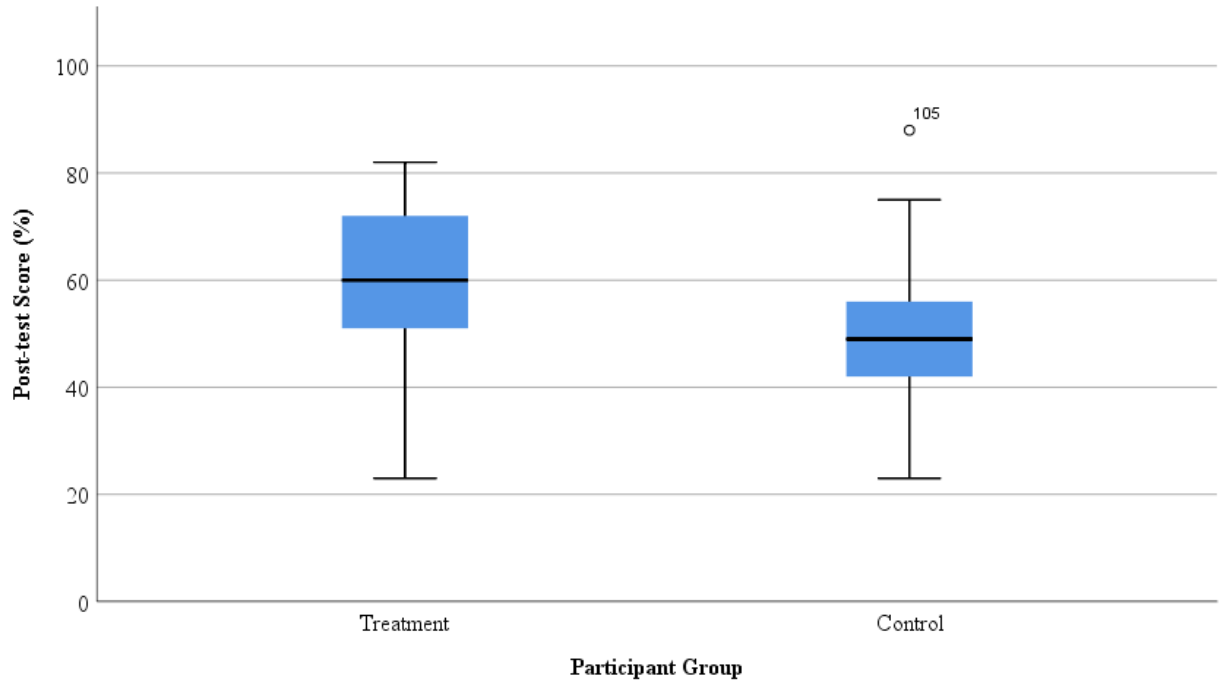


Figure 4.1. Box and whisker plot of the post-test score by participant group.

Normality. The assumption of normality was assessed using histograms (see Figures 4.2 and 4.3) and Kolmogorov-Smirnov (see Table 4.4) due to the sample size being greater than 50 (Gall et al., 2007). Kolmogorov-Smirnov yielded non-significant results at the $\alpha = .05$ level therefore, normality was assumed (Rovai et al., 2013).

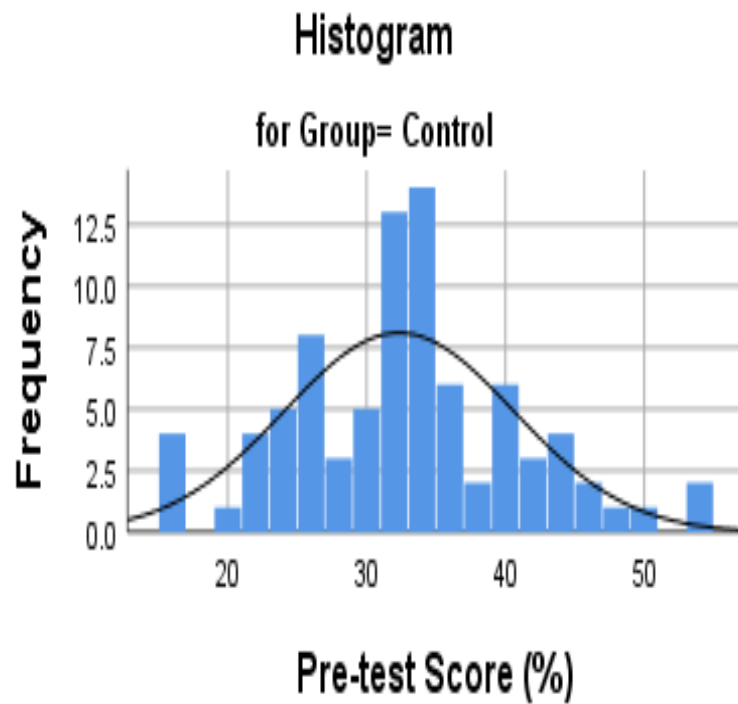
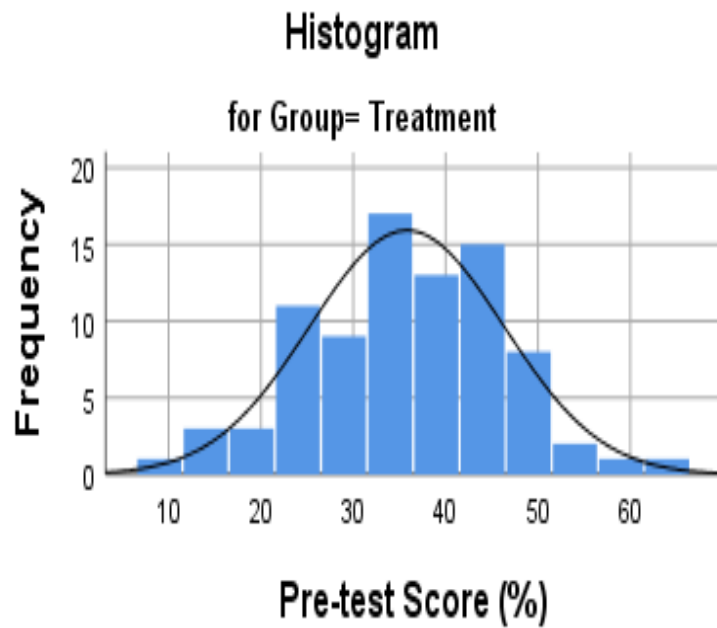


Figure 4.2. Histograms for the pre-test score.

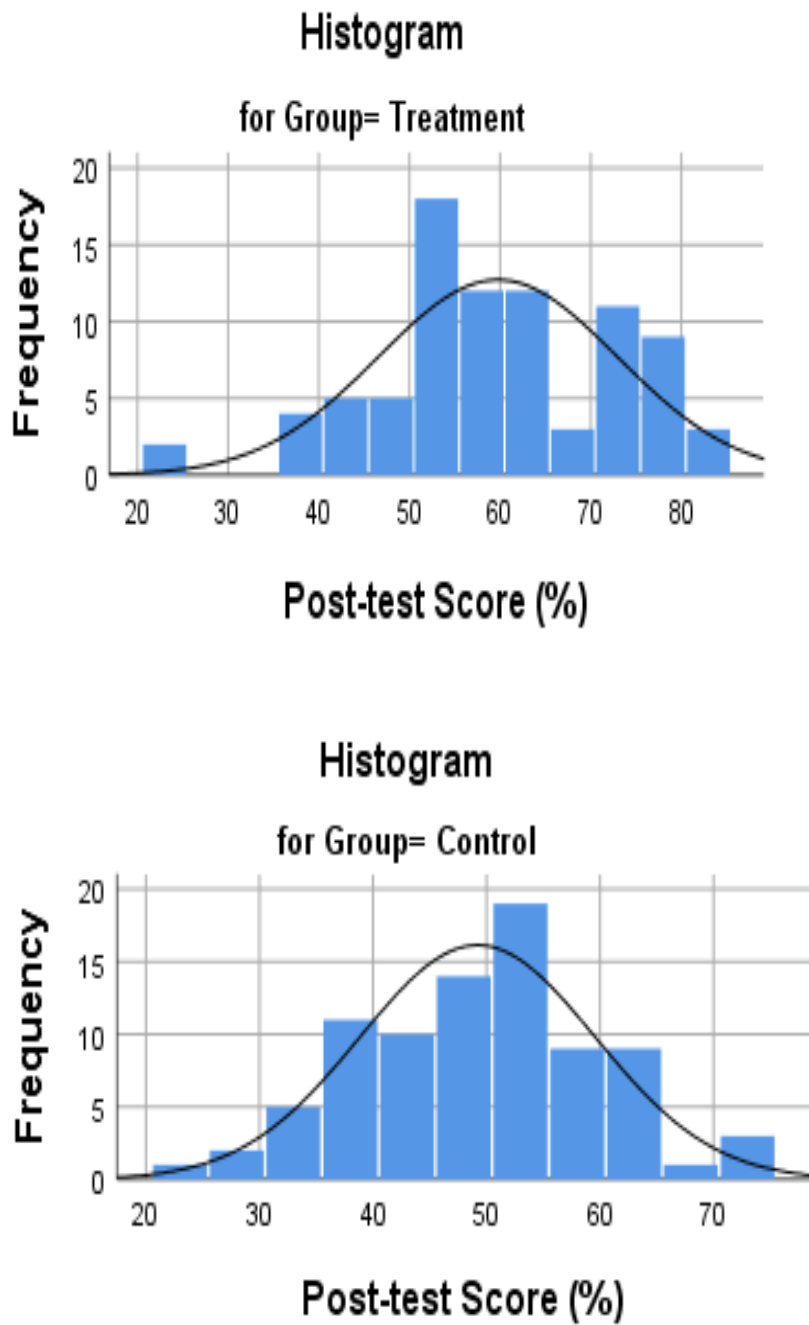


Figure 4.3. Histograms for the post-test score.

Table 4.3

Kolmogorov-Smirnov (KS) Normality Test Results

Variable	Group	N	KS Sig.
Pre-test Score	Treatment	84	.20
	Control	84	.00
Post-test Score	Treatment	84	.05
	Control	84	.06

The assumption of normality was further examined using normal quartile-quartile plots (Q-Q plots). Normal Q-Q plots are used to determine if the data sets come from populations with a common distribution (Rovai et al., 2013). The normal Q-Q plots indicated normal distribution for both the treatment and control group for the pre-test scores (see Figure 4.4) as well as the post-test scores (see Figure 4.5). The assumption of normality was met for both the pre- and post-test scores.

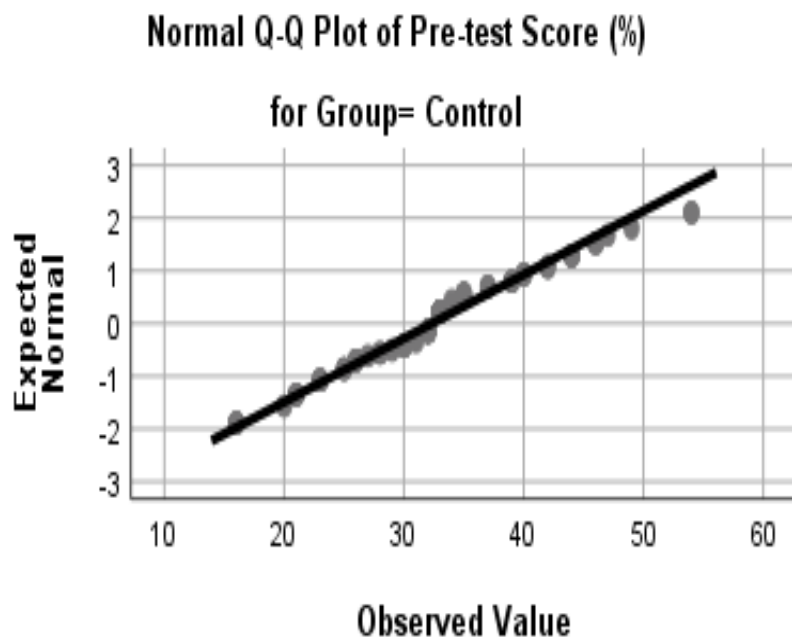
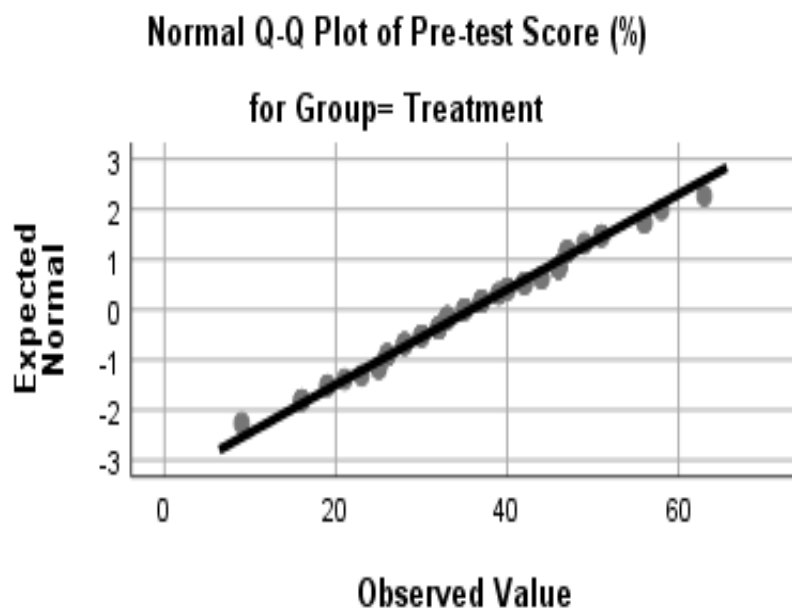


Figure 4.4. Normal Q-Q plots for the pre-test score.

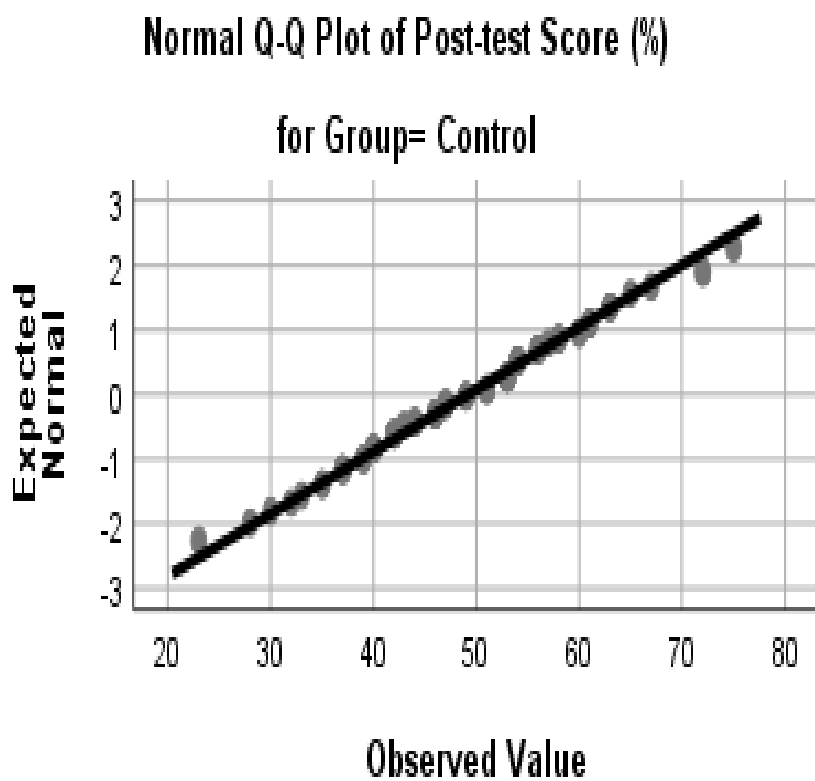
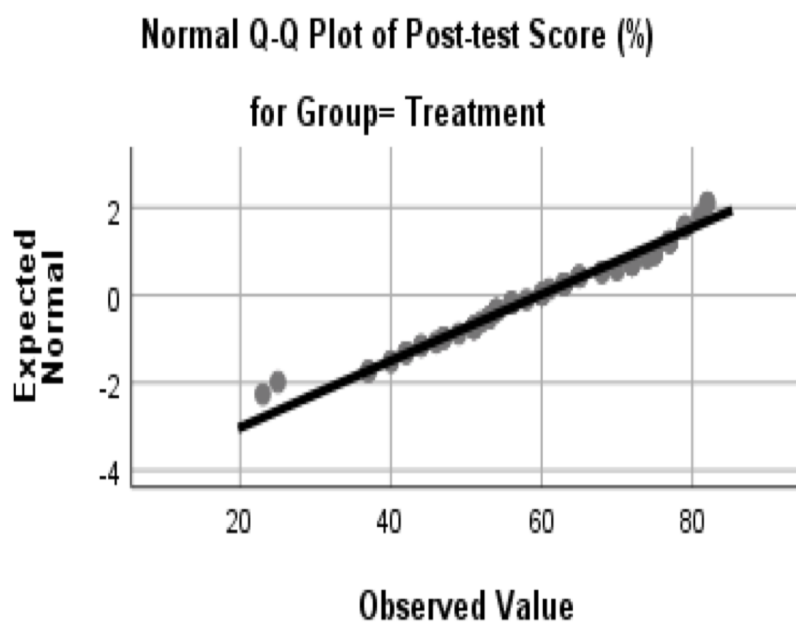


Figure 4.5. Normal Q-Q plots for the post-test score.

Linearity. The assumption of linearity was checked by calculating the Pearson's linear correlation coefficient (r) between the pre- and post-test science achievement scores and by also producing a scatterplot between the two measures. The linear correlation measure was $r = 0.676$ ($p < .001$), which is a strong positive correlation (Gall et al., 2007). Further, the correlations by treatment and control groups were 0.73, 0.58 respectively. The scatterplot in Figure 4.6 showed a strong positive linear relationship between the pre-test and post-test scores. The Pearson correlation coefficient, $r(168) = .68, p < .001$, supported the plot results. Both indicate the assumption of linearity was met.

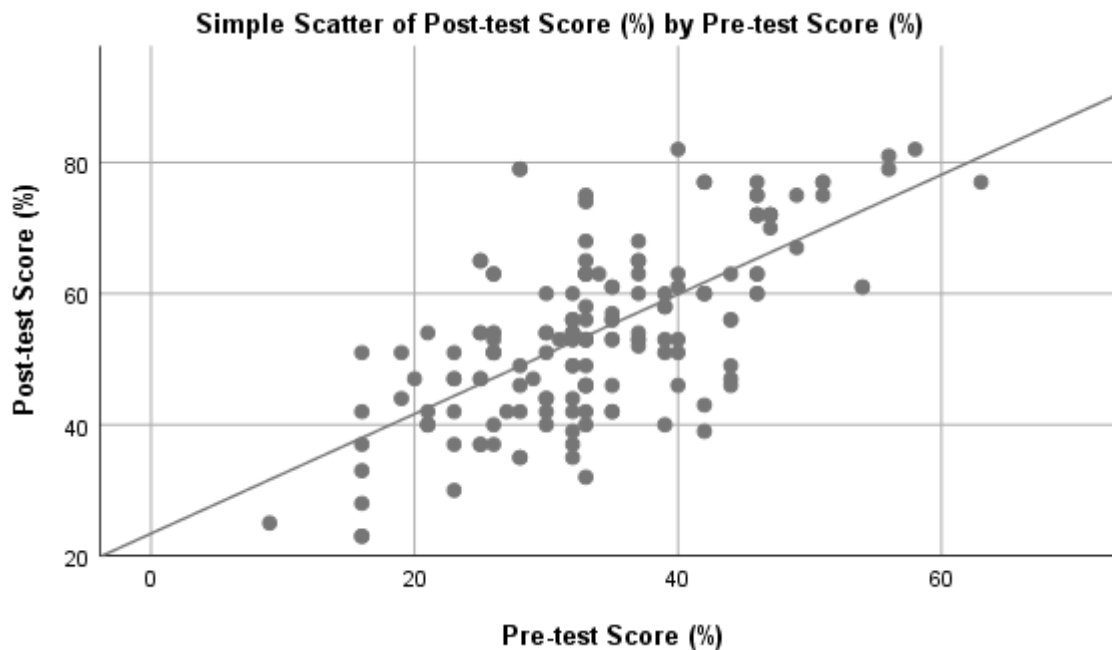


Figure 4.6. Simple scatterplot of post-test score by pre-test score.

Bivariate normal distribution. Bivariate normal distribution was assessed by creating a series of scatter plots between the covariate and the dependent variable scores for each group (see above Figure 4.6). Examination of the scatter plots indicated mostly linear association; therefore, the assumptions were met (Gall et al., 2007).

Homogeneity of slopes. The homogeneity of regression slopes was tested by conducting a two-way between-groups ANOVA to determine the significance of the pre- and post-test score interaction (see Table 4.4). The ANOVA results showed that the interaction was not significant ($F(1,164) = 1.49, p = 0.22$); therefore, there was not enough evidence to reject the null hypothesis of equal slopes. Thus, the homogeneity of regression slopes assumption was met.

Table 4.4

Tests of Between Subjects Effects

Dependent Variable: Post-test Score (%)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	15293.741 ^a	3	5097.914	65.644	.000
Intercept	8063.935	1	8063.935	103.837	.000
Group	6.836	1	6.836	.088	.767
Pretest	9406.395	1	9406.395	121.123	.000
Group * Pretest	115.780	1	115.780	1.491	.224
Error	12736.206	164	77.660		
Total	526705.000	168			
Corrected Total	28029.946	167			

Equal variances. The assumption of equal group variances of the post-test scores between the participant groups and to ensure the covariate was confounded with the treatment was tested using Levene's test (Tabachnick & Fidell, 2007; Rovai, Baker, & Ponton, 2013; Warner, 2013). The Levene's test was not significant, $F(1,166) = .02, p = .886$. Therefore, the assumption was met.

Reliability

The reliability of the internal consistency between the pre- and post-test science achievement scores was determined by calculating Cronbach's alpha. For this study, Cronbach's alpha = 0.79 indicated an acceptable to good measure of internal consistency between the two items (Tabachnick & Fidell, 2013; Warner, 2013). Therefore, after testing, all assumptions were met and the ANCOVA was conducted. This study's sample size of 169 (n = 84 for control group and n = 85 for treatment group) was sufficient to achieve a medium effect size, a significance level of $\alpha = .05$, and a statistical power of .80 (Gall et al., 2007; Warner, 2013). Cronbach's alpha was used to calculate the internal consistency. A 95% significance level, or confidence interval, was maintained and an alpha level ($p < 0.05$) determined if the null hypothesis was rejected or failed to be rejected (Campbell & Stanley, 1963; Gall et al., 2007; Rovai et al., 2013). Partial eta squared (η^2) reported the strength and magnitude of the effect size (Gall et al., 2007; Warner, 2013).

Analysis Results

An ANCOVA was conducted to see if the participant group main effect was significant and if it could explain any differences in the treatment and control post-test means, after controlling for pre-test scores. The ANCOVA results showed the covariate, pre-test score, was significantly related to the dependent variable, post-test score, $F(1, 165) = 134.74, p < .001$, partial $\eta^2 = .45$, which is considered a medium effect size (Cohen, 1988), with an observed power of approximately 1.00. After adjusting for the pre-test scores, there was a statistically significant difference between the participant groups at an $\alpha = .01$ level, $F(1, 165) = 30.53, p < .001$, partial $\eta^2 = .16$, which is considered a small effect size, with an observed power of approximately 1.00. For the overall model, the total $\eta^2 = .54$, which is considered a medium to

large effect size. The observed power (1.00) was larger than the desired power of .80, reducing the likelihood of a Type I error (Rovai et al., 2013). The results are listed in Table 4.5 below.

Table 4.5

ANCOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	15,177.96	2	7,588.98	97.43	.000	.541
Intercept	7,979.68	1	7,979.68	102.45	.000	.383
Pre-test	1,049.81	1	10,494.81	134.74	.000	.450
Group	2,377.78	1	2,377.78	30.53	.000	.156
Error	12,851.99	165	77.89			
Total	52,6705	168				
Corrected Total	28,029.95	167				

Note. a. R Squared = .541 (adjusted R Squared = .536)

Summary

ANCOVA was used to control for the effect of the pre-test score covariate, so that the true impact of the supplemented vodcast viewing sessions as a treatment on the post-test science achievement scores could be more accurately determined. After ensuring that all assumptions were met, the ANCOVA was done and showed the participant group main effect was significant at the $p < .001$ level, after controlling for the pre-test covariate. Therefore, the null hypothesis of no difference in post-test means after controlling for the covariate was rejected. The conclusion was that, after controlling for pre-test scores, the treatment group post-test mean was significantly different from the control group post-test mean, with indications that the post-test mean scores for those participants receiving traditional science instruction plus the supplemental

vodcast viewing sessions were higher than the post-test mean scores for those only receiving traditional instruction with no vodcast viewing sessions.

CHAPTER FIVE: CONCLUSIONS

Overview

This chapter summarizes and discusses the findings of the study. A discussion of the results, implications, and limitations regarding this study's research question will be communicated further in this chapter. Lastly, a conclusion and recommendations for future research will also be included.

Discussion

The purpose of this quantitative study was to examine the effect viewing content related vodcasts had on fifth grade students learning science as determined by post-test science achievement scores. The sample population consisted 175 fifth grade students enrolled at Bailey Elementary School during the second semester. The participants were both male and female fifth grade students who identified their race as one of the following categories: Caucasian, African American, Hispanic, or Asian. The instrument used for the study was the North Carolina READY Science End of Grade Assessment for Fifth Grade (NCRSEOGA) (Department of Public Instruction North Carolina, 2015). The instrument in this study served as both the pre-test and the post-test. The instrument was kept intact and given to each participant as a whole assessment. The NCRSEOGA (Department of Public Instruction North Carolina, 2015) is a 58-question science assessment in multiple choice format. The NCRSEOGA (Department of Public Instruction North Carolina, 2015) covers seven separate content areas in fifth grade science. These seven units include: matter, energy, evolution, ecosystems, living organisms, earth systems, and force and motion (Department of Public Instruction North Carolina, 2015). For clarification, the matter unit includes the basic changes of the states of matter, specifically relevant to the water cycle. The unit of energy consists of thermal energy and heat transfer under the umbrella of conduction, convection, and radiation. As a reminder, convection is the rising

and falling of warm and cool air which is the basis of the water cycle and initiates weather patterns. Lastly, the earth systems unit is a full unit on weather, and is also the focal unit of this study. Clearly, these three separate units of study overlap. For example, the process of convection is included under the curriculum standards for matter, energy, and earth systems. However, because these three learning strands overlap, choosing NCRSEOGA (Department of Public Instruction North Carolina, 2015) assessment questions that conform to only one specific category or unit of study would be difficult and debatable. A decision was made to keep the instrument intact to avoid possible inaccuracy of confining specific questions that could, potentially, lead to misrepresented data. Additionally, having to set apart specific questions would lead to a low test question bank, which could result in inappropriate representation of student knowledge concerning the content area of weather, which is being examined in this study.

Another reason why the choice was made to keep the instrument in its entirety includes protecting the instrument's validity. The NCRSEOGA (Department of Public Instruction North Carolina, 2015), in its entirety, meets/exceeds expectations for reliability norms by calculating the reliability statistics using Cronbach's alpha (Department of Public Instruction North Carolina, 2014). The Cronbach's alpha reliability values include alpha values are $\geq .90$ (Department of Public Instruction North Carolina, 2014) yielding appropriate internal consistency reliability (Warner, 2013). Departmentalizing the questions may lower the instrument's reliability probability. This reason, coupled with the difficulty in segregating specific questions, lend support to the researcher's choice to use the state validated instrument as a collective set.

Previous studies support the learning benefits of vodcast viewing sessions and have identified several factors contributing to the vodcast learning success. One study contributing to the increase in vocabulary word acquisition in students using vodcast viewing sessions attributes the impact to elevated levels of student engagement (Lowman, 2014). Another study stated that vodcasts, as an instructional means, were effective in meeting the needs of the various learning styles of today's student (Bayerlein, 2015) even within crowded classrooms (Van Oordt & Mulder, 2016). While the current study did not examine level of student engagement or specific learning styles, the findings of previous studies support the current study's examination of the use of vodcasts for increasing science vocabulary acquisition is warranted.

While the bulk of research using vodcast viewing sessions is supportive, in contrast, many of the studies use varying age groups and differing areas of content as was provided in this study (Anastasiadou, Folkvord, & Lupiañez-Villanueva, 2018). Research viewing sessions for college aged learners seems to be the most prevalent with the (Pettit et al., 2017). Further, the content area of learners using vodcasts is rampant in health profession classes where large amounts of vocabulary terms are typically given (Hew & Lo, 2018). Although the studies concerning vodcast viewing sessions in prior research is predominantly dominated by older students and other fields of study outside of science, there is, however, an overwhelming collection of data that supports the use of vodcast viewing session to increase learning (Hoover, Dinndorf-Hogenson, Tollefson, Berndt, & Laudenschach, 2018). The current study is further supported by previous research of vodcasts being an effective instructional means, although limited research exists for this study's age group and subject matter collectively. For instance, as stated earlier, research concerning vodcasts and science leans heavily toward upper grade students of middle/high school ages as well as higher education with few studies sampling upper

elementary grades. Previous findings have demonstrated positive results for increasing student learning in a variety of subjects, namely language arts; however, the connection between vocabulary and science is a lesser represented area. It is important to include the current study's examination of vodcasts and vocabulary in the content area of science in upper elementary students as it pieces together previous areas that have been researched as separate entities and examines them collectively.

Research Question

The research question guiding this study is as follows: Is there a statistically significant difference among North Carolina READY Science End-of-Grade Assessment (Department of Public Instruction North Carolina, 2015) achievement scores of fifth grade students between students receiving supplemental science vocabulary vodcast instruction and students receiving traditional science vocabulary instruction only, while controlling for pre-test science achievement scores? Analysis of the pre- and post-test scores showed that there was a statistically significant difference in the science achievement scores of those students who received the treatment of supplemental vodcast viewing sessions compared to those students who did not receive the treatment. Both groups were provided the same traditional science instruction, provided by the teacher, as outlined by a common set of lesson plans as well as a pacing schedule which was provided for each fifth grade teacher.

Conclusion

The purpose of this study was to examine fifth grade science achievement scores to see if watching science based vodcasts would have an impact on student post-test scores. The vodcasts used in this study focused on understanding specific science vocabulary terms pertinent to learning major science concepts for the topic of weather. Students in the treatment group

watched brief vodcasts of less than five minutes on a common science topic. After controlling for the pre-test, the treatment of supplemental vodcast viewing sessions had a statistically significant impact on the treatment group. Based on the results of this study, vodcast viewing sessions were found to have produced an increase in the science achievement scores of the treatment group compared to the scores of the students who did not receive vodcast viewing sessions. More specifically, the results suggest that supplemental vodcast viewing sessions, consisting of topic applicable science vocabulary terms, positively influences student learning.

Research concerning vodcasts and similar illustrated text formats are important due to the growing use of video content as a learning resource in educational arenas (Leton, Molanes-Lopez, Luque, & Conejo, 2017). Vodcasts are becoming increasingly popular for supplementing student instruction (Pettit et al., 2017) and are also quickly becoming a favorite technology tool among teachers for engaging students in a way that can extend student learning by offering increased levels of engagement as compared to lectures, note taking, or printed texts (Shankar-Brown & Brown, 2014). Research shows that associating words and pictures together is an effective way of helping students learn (Vygotsky, 1962). Further, teachers must incorporate strategies that help students make better sense of what they see and read (Mestre & Ross, 2015). In today's 21st century classroom, technology is considerably more prevalent and with the nation's push for STEM content areas instruction in the classroom, vodcasts can bridge science vocabulary instruction and technology (Bossaer et al., 2016).

Previous research studies demonstrate conflicting results concerning vodcasts as a learning resource in both the educational and non-educational settings (Leton et al., 2017). Likewise, some studies state that there is simply not enough research to neither support nor refute the effectiveness of using vodcasts to increase student learning (Hargett, 2018). Further,

research examining vodcasts, science, and elementary learners is considerably sparse (Ozdamli & Asiksoy, 2016). Multiple studies do support the findings of this study's research concerning the effectiveness of using vodcasts to increase student learning in the content area of science (Aronin & Haynes-Smith, 2013; Ozdamli & Asiksoy, 2016); however, most studies concerning vodcasts and science instruction, neglect to include data concerning elementary-age learners (Bossaer et al., 2016). The results of this study add to the current body of knowledge concerning vodcasts, the content area of science, and elementary learners collectively.

While the data in this study demonstrates an increase in science achievement scores in a treatment group of vodcast viewers, the study does not reveal specifically how vodcasts increase student learning. For instance, some of the variables could include student viewing time and duration. Further research is recommended examine specific variables and criteria that best contribute to student learning. Additionally, the research in this study indicated that the increase in student learning was relatively equivalent among both gender groups as well as having virtually equivalent positive results among various race groups. Having an instructional means that can increase student learning across all subgroups, is certainly valuable. The recommendations for future research will be discussed at length later in this chapter.

Implications

Today's typical classroom hosts students of various backgrounds, abilities, and nationalities. Finding an instructional means that yields positive learning results for such diverse learners would be paramount to the field of education. Further, implementing a technology tool that is both economical and user-friendly would be especially beneficial to today's classroom. According to the results in this study, vodcast viewing sessions have the potential to increase student science achievement scores in fifth grade students. These results support

classroom teachers wanting to implement vodcasts as an instructional means while meeting the needs of a differing population of learners.

With the nation's push for an increase in science education coupled with the state of North Carolina's mandated standardized testing for science, an instructional means that could assist in satisfying the needs of all involved parties is highly recommended. A surge in STEM content areas for workforce preparedness further supports the classroom teacher's need to adopt instructional practices that can meet the needs of most learners. Lastly, massive cuts in educational funding on both the state and local level lends to the difficult task of finding effective research based instructional means via a fiscally savvy instrument, should increase interest in vodcast viewing. A single computer with internet access are the minimum components necessary for vodcast viewing. While there are a multitude of subscription based vodcast viewing programs and websites, there are also several quality services that are free of charge. The vodcasts used in this study were free of charge with no subscription needed.

Additionally, the user-friendly level of vodcast viewing requires novice technology skills. The ease of use can be beneficial to both teachers and students. Easy access and compatibility of vodcast viewing allows the viewing sessions to be done whole group with the teacher facilitating or as small groups and even as an individual student working alone. The cost effective and feasible format coupled with the results of being a compelling instructional means, makes using vodcast viewing sessions a valid addition to supplement teacher instruction in science elementary learners.

Limitations

Internal validity in a study is achieved when the conditions of an effect lead to a conclusion (Warner, 2013). Assigning intact classes to a treatment or control group, as a whole,

could pose a threat to internal validity and may be a limitation to this study. The participants in this study were not able to be randomized due to the fact that they belonged to previously established classes. The inability to randomly assign the students may lead to a threat of internal validity (Rovai et al., 2013); therefore, a pre-test was used to control for the possible difference between the two groups (Campbell & Stanley, 1963).

The history of each student could be a limitation of the study creating a threat to validity as the students were not sorted according to academic ability. Students with superior academic skills or accelerated vocabulary could perform better on the science assessment than those students with less academic ability. Likewise, students with a stronger background or prior knowledge on a given topic or area of interest may also be a limitation. In this study, the differences in the history of the students was controlled through the pre-test/post-test using a nonequivalent control-group design (Gall et al., 2007).

External validity is the degree to which the results of a study can be applied when generalizing a population (Warner, 2013). An external threat to validity and potential limitation in this study could include the student's awareness of their group placement. Students knowingly belonging to the treatment group may inadvertently perform differently due to their perceived response to group placement known as the Hawthorne effect (Rovai et al., 2013). Since the students had to attend an informational session concerning the treatment of the study as well as attain written parental consent, the participants in this study were aware of the treatment and the dates of implementation. The novelty of receiving the treatment could have impacted the post-test science assessment scores.

Another limitation includes the sample size. The sample size used in the data set for this study contained 168 participants. However, true representation is reported using data from large

populations in quantitative research (Campbell & Stanley, 1963; Warner, 2013). Therefore, future quantitative studies should include various sample sizes to more accurately depict the population.

In this study, the participants were fifth graders attending a large, rural Title I school located in the piedmont area of North Carolina. An external threat of validity was introduced since the population was not indicative of all elementary schools in North Carolina. Additionally, this study applied a treatment using a single method of supplemental vocabulary instruction (vodcasts) resulting in an additional potential limitation of the study. Alternate methods of vocabulary instruction may determine differences in the treatment of an instructional supplementation while also considering a non-rural community of learners.

The length of the treatment used in this study may be a limitation. Each vodcast viewing session was less than five minutes. The length of the time used in this study cannot be generalized to include vodcast viewing for longer lengths of time. Examining the effectiveness of vodcasts for different increments of time is recommended for future research as the success rate could be determined by the length of time students were exposed to the vodcasts.

The instrument used in this study was the NCRSEOGA, a standardized test. Using only a standardized test to measure the differences in pre- and post-scores could be a limitation in this study. Further studies measuring student score differences using various methods other than a standardized assessment could be beneficial. Validated instruments measuring student made projects, teacher made tests, or other formative assessments could be used to determine differences in the treatment of vodcasts.

Recommendations for Future Research

Generalization of results allow researchers to make inferences concerning extensive populations (Warner, 2013). Generalizability would need to be determined through replicated studies as an extension of the research findings. While numerous studies exist on the effectiveness of technology and learners, recommendations for future research in the specific areas of randomized groups, student demographics, and length of treatment are explained below.

Random assignment of participants to groups will best ensure group equivalence (Warner, 2013). The sample population in this study was drawn from intact classes and assigned in its entirety to a control or treatment group prior to the intervention. Since the participants in this study were not able to be randomized due to belonging to previously established classes that were unable to be changed, future research is recommended to replicate this study using participants who can be randomly assigned to a control or treatment group versus assigning whole groups of students as intact classrooms.

Another suggestion for further studies includes student demographics. In this study, the participants were fifth grade students attending a large, rural Title I school located in the piedmont area of North Carolina. According to Rovai et al. (2013), the results must apply to general population in order to be considered truly representative. In this study, the population of student participants is not indicative of all students in North Carolina. Previous studies reveal positive results concerning science vocabulary instruction in middle school and high school setting; however, adequate science vocabulary instruction is not being effectively integrated into the average elementary classroom setting (Carrier, 2013; Grillo & Dieker, 2013). Further, research concerning science vocabulary acquisition and the use of vodcasts in elementary

learners is quite limited (Ozdamli & Asiksoy, 2016). Future studies including elementary age students is recommended.

The location of the school used in this study is rurally located with a Title I socio-economic status (SES) which means the school in this study contains a large percentage of students who financially qualify for free or reduced-price breakfast and lunch rates. Further studies should consider the SES of the students to see if the treatment noted in this study is equally applicable. As stated earlier the school in this study belongs to a rural community. A rural setting is also not indicative of the entire population of fifth grade students. Thus, future research should also examine the replication of this study using participants attending non-rurally located schools.

The final recommendation for future research concerns the length and frequency of the treatment. Much has been represented in this study in terms of the effectiveness of vodcasts for increasing student learning. However, a deeper examination of the treatment distribution is suggested as the frequency and the duration of the vodcast viewing sessions may be an indicator of its success. Researchers should consider specific time restraints for vodcast exposure in learning (Pettit et al., 2017). Therefore, studying the optimal viewing time necessary for achieving positive results could prove valuable. In this study, the intervention of 15 vodcast viewing sessions were presented to the treatment group in increments lasting five minutes or less. Examining the effectiveness of vodcasts using segments of time greater than five minutes will help generalize the results of the study concerning vodcast exposure time. Additionally, the vodcast viewing sessions took place daily over a span of five weeks. Future research exploring the repetition and extent of the vodcast viewing sessions could also be beneficial. Investigations

regarding the frequency and duration of the vodcast viewing sessions are recommended for further studies.

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APPENDICES**Appendix A: Liberty IRB Approval**

April 18, 2018

Debra Lester

IRB Approval 3198.041818: Science Vocabulary Acquisition: A Nonequivalent Control-Group Examination of Vodcasts and Fifth Grade Students

Dear Debra Lester,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research
The Graduate School
Liberty University | Training Champions for Christ since 1971

APPENDIX B: District Assent Form

April 19, 2018

XXX

XXX

XXX

Dear XX,

I am a doctoral candidate at Liberty University. As part of the requirements in pursuit of an Educational Doctorate, I am conducting research on science vocabulary acquisition. The title of my research project is:

Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts
and Fifth Grade Students

The purpose of this study is to analyze the effect of vodcasts as an instructional means for learning science vocabulary in fifth grade students at Bailey Elementary School. This study will add to the body of research in finding an instructional means via vodcasts, as a technology tool that will service students with varying academic abilities. In addition, the study hopes to contribute to research concerning increasing achievement levels in science (Kersaint et al., 2014) by using supplemental science vocabulary instruction to address the gap in education concerning student learning in STEM content areas (Ciarrochi et al., 2007; Minner et al., 2012). Additionally, this study should be of great interest to the district as many of the schools currently have paid subscriptions to various vodcast type programs and websites. Hopefully, this study will help reveal if this is a wise investment choice.

I am requesting your permission to conduct research at Bailey Elementary School involving the fifth grade teachers and students in the general education setting. An instructional means of vodcasts will be administered each morning in addition to the typical instruction provided by the classroom teacher. A different vodcast will be shown five times a week for a total of five weeks. The 24 vodcast viewing sessions will last no more than five minutes per session. No personal or identifying information will be reported and all university confidentiality procedures will be strictly adhered. A more detailed summary of the study is included in the attachment. Thank you for your time and careful consideration.

Sincerely,

Debra Bailey Lester

Educator/Graduate Student

Study Overview

Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts and Fifth Grade Students

Debra B. Lester, Doctoral Candidate
Liberty University
School of Education

The fifth grade teachers at Bailey Elementary School are being recruited to assist in a university research study that is examining the effect of an instructional means of video podcasts (vodcasts) and science vocabulary in fifth grade students. Since the study involves an instructional that has previously been provided to the students and is considered a part of science instruction, parental written consent will be for the use of their child's assessment data in the study. Participation in this research study is voluntary and the teachers may choose to withdraw at any time without penalty. The decision to participate or to not participate will in no way affect the relationship with the researcher, other teachers, administration, or Liberty University. This form further indicates the procedures and implications of this research study. Please read the following agenda then sign and return this document if you agree to assist in this research study. Please feel free to ask any questions.

Debra Bailey Lester, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to see if vodcasts will help fifth grade students increase their science vocabulary knowledge.

Procedures: The teachers in this study may be asked to do the following:

1. Sign a written consent form.
2. Attend an informational meeting which will take approximately 40 minutes during grade level planning on an agreed upon day. During this meeting, the teachers will receive training that pertains to their specific role and responsibilities in this study.
3. The teachers will collect parent written consent forms and will mark the students who have not been granted permission or have not returned the consent form. The teachers will remove the names of all students so that the researcher will only be able to identify students according to student identification number only.
4. The teachers will have students complete a pre-test in class. The pre-test will be the released version of the North Carolina READY Science End-of-Grade Assessment for fifth grade (Department of Public Instruction North Carolina, 2014). The estimated time to complete the pre-test is 90 minutes. The teachers will score the assessments and return them to the researcher.
5. Some teachers will administer the vodcast viewing sessions according to the provided viewing schedule. The vodcasts will feature explanations and examples of key

vocabulary terms and concepts from the fifth grade science curriculum. Common regular classroom instruction will continue for all students. At the conclusion of the study, the remaining classes will be given access to the vodcasts.

6. After the final vodcast viewing session, the teachers will have students complete a post-test in class. The post-test will be the released version of the North Carolina READY Science End-of-Grade Assessment for fifth grade (Department of Public Instruction North Carolina, 2014). The estimated time to complete the post-test is 90 minutes. The teachers will score the assessments and return them to the researcher.

Risks and Benefits of being in the Study: There are minimal risks to all parties in this study as the names of all student participants will be identified by an identification number, the teachers will be identified by a code, and the name of the school/district will be given a pseudo name. The pre-/post-tests will be completed on paper so there is no risk of digital hacking and will be stored in a locked filing cabinet for the duration of three years. At the three year mark, the data will be shredded and discarded.

The benefits of participation are that students and teachers may discover a method of teaching that increases student learning in the content area of science.

Compensation: The teachers will receive gratis for assisting in the study in the form of a restaurant gift card.

Confidentiality: The records of this study will be kept private. In any type of report I might publish, I will not include any information that will make it possible to identify the students. Research records will be stored securely and only the researcher will have access to the records. Each student's data will be represented by a code keeping the scores on the pre-/ post-tests completely anonymous. All precautions will be taken to protect the identity of each student, teacher, school and district. The name of each student, teacher, and also the name of the school will not be divulged in the results or in any of the study's written representation. However, the overall results of the study will be used for the purpose of publication using pseudonyms.

Voluntary Nature of the Study: Assistance in this study is voluntary. The teachers' decision to assist or not assist will not affect any current or future relations with the individuals at Baiely Elementary or Liberty University. They may withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If they choose to withdraw from the study, they should contact the researcher at the email address included in the next paragraph.

Contacts and Questions: The researcher conducting this study is Debra Baiely Lester. You may ask any questions you have now. If you have questions later, you are encouraged to contact me at dlester4@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Jillian Wendt at jarnett@liberty.edu

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Carter 134, Lynchburg, VA 24515 or email at irb@liberty.edu.

I grant permission for research study called Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts and Fifth Grade Students at Baiely Elementary. I have read the aforementioned consent form and agree to the teachers' duties and responsibilities that were disclosed. I understand that a copy of this consent form, teacher training, and any necessary materials will be provided.

Superintendent's Signature _____

Date _____

APPENDIX C: Administration Consent Form

April 19, 2018

XXX

XXX

XXX

Dear XX,

I am a doctoral candidate at Liberty University. As part of the requirements in pursuit of an Educational Doctorate, I am conducting research on science vocabulary acquisition. The title of my research project is:

Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts and Fifth Grade Students

The purpose of this study is to analyze the effect of vodcasts as an instructional means for learning science vocabulary in fifth grade students at Baiely Elementary School. This study will add to the body of research in finding an instructional means via vodcasts, as a technology tool that will service students with varying academic abilities. In addition, the study hopes to contribute to research concerning increasing achievement levels in science (Kersaint et al., 2014) by using supplemental science vocabulary instruction to address the gap in education concerning student learning in STEM content areas (Ciarrochi et al., 2007; Minner et al., 2012). Additionally, this study should be of great interest to you as the school currently pays for several vodcast type programs and website memberships. Perhaps this study may help confirm or deny the effectiveness of this learning format.

I am writing to request your permission to conduct research at Baiely Elementary School involving the fifth grade teachers and students in the general education setting. An instructional means of vodcasts will be administered each morning in addition to the typical instruction provided by the classroom teacher. A different vodcast will be shown five times a week for a total of five weeks. The 24 vodcast viewing sessions will last no more than five minutes per session. No personal or identifying information will be reported and all university confidentiality procedures will be strictly adhered. A more detailed summary of the study is included in the attachment. Thank you for your time and careful consideration.

Sincerely,

Debra Bailey Lester

Educator/Graduate Student

Study Overview

Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts and Fifth Grade Students

Debra Bailey Lester, Doctoral Candidate
Liberty University
School of Education

The fifth grade teachers at Baiely Elementary School are being recruited to assist in a university research study that is examining the effect of an instructional means of video podcasts (vodcasts) and science vocabulary in fifth grade students. Since the study involves an instructional that has previously been provided to the students and is considered a part of science instruction, parental written consent will be for the use of their child's assessment data in the study. Participation in this research study is voluntary and the teachers may choose to withdraw at any time without penalty. The decision to participate or to not participate will in no way affect the relationship with the researcher, other teachers, administration, or Liberty University. This form further indicates the procedures and implications of this research study. Please read the following agenda then sign and return this document if you agree to assist in this research study. Please feel free to ask any questions.

Debra B. Lester, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to see if vodcasts will help fifth grade students increase their science vocabulary knowledge.

Procedures: The teachers in this study may be asked to do the following:

1. Sign a written consent form.
2. Attend an informational meeting which will take approximately 40 minutes during grade level planning on an agreed upon day. During this meeting, the teachers will receive training that pertains to their specific role and responsibilities in this study.
3. The teachers will collect parent written consent forms and will mark the students who have not been granted permission or have not returned the consent form. The teachers will remove the names of all students so that the researcher will only be able to identify students according to student identification number only.
4. The teachers will have students complete a pre-test in class. The pre-test will be the released version of the North Carolina READY Science End-of-Grade Assessment for fifth grade (Department of Public Instruction North Carolina, 2014). The estimated time to complete the pre-test is 90 minutes. The teachers will score the assessments and return them to the researcher.
5. Some teachers will administer the vodcast viewing sessions according to the provided viewing schedule. The vodcasts will feature explanations and examples of key vocabulary terms and concepts from the fifth grade science curriculum. Common regular

classroom instruction will continue for all students. At the conclusion of the study, the remaining classes will be given access to the vodcasts.

6. After the final vodcast viewing session, the teachers will have students complete a post-test in class. The post-test will be the released version of the North Carolina READY Science End-of-Grade Assessment for fifth grade (Department of Public Instruction North Carolina, 2014). The estimated time to complete the post-test is 90 minutes. The teachers will score the assessments and return them to the researcher.

Risks and Benefits of being in the Study: There are minimal risks to all parties in this study as the names of all student participants will be identified by an identification number, the teachers will be identified by a code, and the name of the school/district will be given a pseudo name. The pre-/post-tests will be completed on paper so there is no risk of digital hacking and will be stored in a locked filing cabinet for the duration of three years. At the three year mark, the data will be shredded and discarded.

The benefits of participation are that students and teachers may discover a method of teaching that increases student learning in the content area of science.

Compensation: The teachers will receive gratis for assisting in the study in the form of a restaurant gift card.

Confidentiality: The records of this study will be kept private. In any type of report I might publish, I will not include any information that will make it possible to identify the students. Research records will be stored securely and only the researcher will have access to the records. Each student's data will be represented by a code keeping the scores on the pre-/ post-tests completely anonymous. All precautions will be taken to protect the identity of each student, teacher, school and district. The name of each student, teacher, and also the name of the school will not be divulged in the results or in any of the study's written representation. However, the overall results of the study will be used for the purpose of publication using pseudonyms.

Voluntary Nature of the Study: Assistance in this study is voluntary. The teachers' decision to assist or not assist will not affect any current or future relations with the individuals at Bailey Elementary or Liberty University. They may withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, you should contact the researcher at the email address included in the next paragraph.

Contacts and Questions: The researcher conducting this study is Debra Bailey Lester. You may ask any questions you have now. If you have questions later, you are encouraged to contact me at dlester4@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Jillian Wendt at jarnett@liberty.edu

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Carter 134, Lynchburg, VA 24515 or email at irb@liberty.edu.

I grant permission for research study called Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts and Fifth Grade Students at Bailey Elementary. I have read the aforementioned consent form and agree to allow Debra B. Lester permission to recruit fifth grade teachers and conduct research for this study on the school premises according to the information that was disclosed. I understand that a copy of this consent form, teacher training, and any necessary materials will be provided.

Administration Signature _____

Date _____

APPENDIX D: Teacher Consent Form

April 19, 2018

XXX

XXX

XXX

Dear XX,

I am a doctoral candidate at Liberty University. As part of the requirements in pursuit of an Educational Doctorate, I am conducting research on science vocabulary acquisition. The title of my research project is:

Science Vocabulary Acquisition: A Non-Equivalent Control Group Examination of Vodcasts and Fifth Grade Students

The purpose of this study is to analyze the effect of vodcasts as an instructional means for learning science vocabulary in fifth grade students at Bailey Elementary School. This study will add to the body of research in finding an instructional means via vodcasts, as a technology tool that will service students with varying academic abilities. In addition, the study hopes to contribute to research concerning increasing achievement levels in science (Kersaint et al., 2014) by using supplemental science vocabulary instruction to address the gap in education concerning student learning in STEM content areas (Ciarrochi et al., 2007; Minner et al., 2012). Additionally, this study should be of great interest to the district as many of the schools currently have paid subscriptions to various vodcast type programs and websites.

I am writing to recruit you to assist in the aforementioned research study. You may be asked to show a provided vodcast to your students each morning in addition to the typical instruction that you provide. The vodcast viewing schedule will be five times per week for a duration of five weeks. Each viewing session will last no longer than five minutes per session. Additionally, you will be asked to give your students a pre-and post-test (North Carolina READY Science End-of-Grade Assessment). A gratuity in the form of a restaurant gift card will be provided for your participation. No personal or identifying information will be reported and all university confidentiality procedures will be strictly adhered. Students will be identified by their student identification numbers and teachers will be identified by a code. More details about the study is provided as an attachment.

Thank you for your time and careful consideration.

Sincerely,

Debra Bailey Lester,

Educator/Graduate Student

Study Overview

Science Vocabulary Acquisition: A Non-Equivalent Control Examination of Vodcasts and Fifth Grade Students

Debra Bailey Lester, Doctoral Candidate
Liberty University
School of Education

The fifth grade teachers at Bailey Elementary School are being recruited to assist in a university research study that is examining the effect of an instructional means of video podcasts (vodcasts) and science vocabulary in fifth grade students. Since the study involves an instructional that has previously been provided to the students and is considered a part of science instruction, parental written consent will be for the use of their child's assessment data in the study. Participation in this research study is voluntary and the teachers may choose to withdraw at any time without penalty. The decision to participate or to not participate will in no way affect the relationship with the researcher, other teachers, administration, or Liberty University. This form further indicates the procedures and implications of this research study. Please read the following agenda then sign and return this document if you agree to assist in this research study. Please feel free to ask any questions.

Debra Bailey Lester, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to see if vodcasts will help fifth grade students increase their science vocabulary knowledge.

Procedures: The teachers in this study may be asked to do the following:

1. Sign a written consent form.
2. Attend an informational meeting which will take approximately 40 minutes during grade level planning on an agreed upon day. During this meeting, the teachers will receive training that pertains to their specific role and responsibilities in this study.
3. The teachers will collect parent written consent forms and will mark the students who have not been granted permission or have not returned the consent form. The teachers will remove the names of all students so that the researcher will only be able to identify students according to student identification number only.
4. The teachers will have students complete a pre-test in class. The pre-test will be the released version of the North Carolina READY Science End-of-Grade Assessment for fifth grade (Department of Public Instruction North Carolina, 2014). The estimated time to complete the pre-test is 90 minutes. The teachers will score the assessments and return them to the researcher.
5. Some teachers will administer the vodcast viewing sessions according to the provided viewing schedule. The vodcasts will feature explanations and examples of key vocabulary terms and concepts from the fifth grade science curriculum. Common regular

classroom instruction will continue for all students. At the conclusion of the study, the remaining classes will be given access to the vodcasts.

6. After the final vodcast viewing session, the teachers will have students complete a post-test in class. The post-test will be the released version of the North Carolina READY Science End-of-Grade Assessment for fifth grade (Department of Public Instruction North Carolina, 2014). The estimated time to complete the post-test is 90 minutes. The teachers will score the assessments and return them to the researcher.

Risks and Benefits of being in the Study: There are minimal risks to all parties in this study as the names of all student participants will be identified by an identification number, the teachers will be identified by a code, and the name of the school/district will be given a pseudo name. The pre-/post-tests will be completed on paper so there is no risk of digital hacking and will be stored in a locked filing cabinet for the duration of five years. At the five year mark, the data will be shredded and discarded.

The benefits of participation are that students and teachers may discover a method of teaching that increases student learning in the content area of science.

Compensation: The teachers will receive gratis for assisting in the study in the form of a restaurant gift card.

Confidentiality: The records of this study will be kept private. In any type of report I might publish, I will not include any information that will make it possible to identify the students. Research records will be stored securely and only the researcher will have access to the records. Each student's data will be represented by a code keeping the scores on the pre-/ post-tests completely anonymous. All precautions will be taken to protect the identity of each student, teacher, school and district. The name of each student, teacher, and also the name of the school will not be divulged in the results or in any of the study's written representation. However, the overall results of the study will be used for the purpose of publication using pseudonyms.

Voluntary Nature of the Study: Assistance in this study is voluntary. The teachers' decision to assist or not assist will not affect any current or future relations with the individuals at Bailey Elementary or Liberty University. They may withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If they choose to withdraw from the study, they should contact the researcher at the email address included in the next paragraph.

Contacts and Questions: The researcher conducting this study is Debra B. Lester. You may ask any questions you have now. If you have questions later, you are encouraged to contact me at dlester4@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Jillian Wendt at jarnett@liberty.edu

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Carter 134, Lynchburg, VA 24515 or email at irb@liberty.edu.

I grant permission for research study called Science Vocabulary Acquisition: A Non-Equivalent Control Examination of Vodcasts and Fifth Grade Students at XX Elementary. I have read the aforementioned consent form and agree to the teachers' duties and responsibilities that were disclosed. I understand that a copy of this consent form, teacher training, and any necessary materials will be provided.

Teacher's Signature _____

Date _____

Sincerely,
Debra Bailey Lester
Educator/Graduate Student

APPENDIX E: Permission to Use North Carolina READY Science
End-of-Grade Assessment Fifth Grade

On Wed, Jul 29, 2015 at 11:31 AM, David Bryant <David.Bryant@dpi.nc.gov> wrote:
Ms. Lester,

Thank you for the inquiry. We generally approve the use of released test items for educational purposes with the understanding that no momentary gain on your part is in question. In that the items are available on our website, you may use the items for educational purposes (your dissertation). We would also encourage you to [pay attention to the copyright information that is on the site](#).

Regards,

David Bryant
Parent Liaison/Education Consultant
Accountability Services Division
NC Department of Public Instruction
6314 Mail Service Center
Raleigh, NC 27699-6314
Phone: [\(919\) 807-3775](tel:(919)807-3775)
Fax: [\(919\) 807-3699](tel:(919)807-3699)
www.ncpublicschools.org

APPENDIX F: Teacher Instructions

Teacher Instructions

Pre-/post-test

The pre-test is a 58-item science assessment, which is a pencil and paper version of the online North Carolina READY Science End-of-Grade Assessment. The science assessment is numbered to 60 but there will be no questions or answer choices available for #37 and #38. These questions were originally presented in a drag and drop digital format which is not available in the released multiple choice version provided by the state. The pre-test should take no longer than 90 minutes. The pre-tests will be coded according to the student's identification number provided by the district. Please hand out the pre-tests to the students and read the instructions at the top of the page out loud. Be sure that each student receives the correct test as they will be identified by their student identification number only. Please follow standard testing protocol in that there is no talking during the test besides questions by the students and the giving of directions per the teacher script. No content assistance can be provided and the students must read the questions and the answer choices themselves. Students should be encouraged to do their best as there may be items on the test that they have not yet learned. As the students finish, have them place the pre-test in the provided envelope. You will return the assessments to me. I am available for any questions.

Vodcasts

If you are one of the teachers chosen to administer the treatment, you will be showing a vodcast five mornings each week for the duration of five weeks beginning on the start date. A link to each vodcast will be listed in the vodcast viewing schedule. You can show the vodcasts on the technology tool of your choice that will connect to a projector and speakers that work. Each vodcast lasts less than five minutes and will review key vocabulary related to the science topics of weather and water cycle.

I am available for any questions.

Debra B. Lester
email XXX@XXX
cell XXX-XXX-XXXX
work XXX-XXX-XXXX

APPENDIX G: Pre-/Post-Test Teacher's Script

Today you will take a multiple choice test that asks questions about fifth grade science. Do not worry if some of the questions on the test ask you about something that you have not yet learned. Choose the *best* answer for each question. You cannot receive any help with the questions; just do your best. If you have any questions, please raise your hand and I will help you. (Teacher hands out survey to each student). At the top right side of the page, you should see your student identification (student I.D.) number. Make sure that this is your student identification number. If it is not, please raise your hand. When you are finished, please place your test in this envelope. Are there any questions? (Answer questions). You may begin.

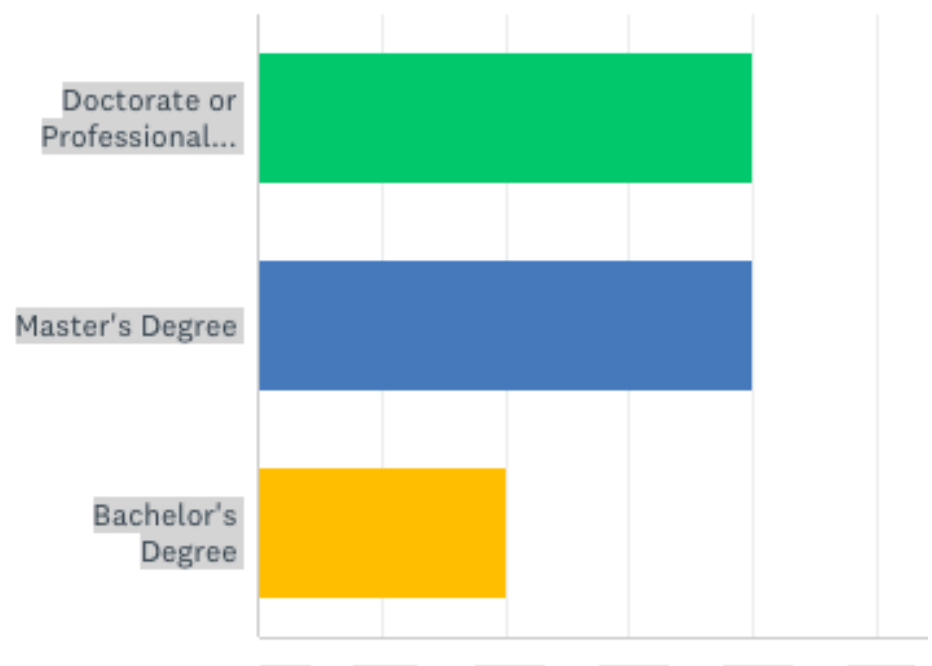
APPENDIX H: Expert Review of the Vodcasts

	VERY POOR-	POOR-	AVERAGE-	GOOD-	VERY GOOD-	TOTAL	WEIGHTED AVERAGE-
– Explain how the sun's energy impacts the processes of the water cycle.	0.00% 0	0.00% 0	0.00% 0	20.00% 1	80.00% 4	5	4.80
– Explain the effects of the transfer of heat (either by direct contact or by at a distance) that occurs between objects at different temperatures.	0.00% 0	0.00% 0	20.00% 1	20.00% 1	60.00% 3	5	4.40
– Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.	0.00% 0	0.00% 0	20.00% 1	80.00% 4	0.00% 0	5	3.80
–							

Compare daily and seasonal changes in weather conditions and patterns.	0.00%	0.00%	0.00%	60.00%	40.00%	5	4.40
	0	0	0	3	2		
–	0.00%	0.00%	40.00%	60.00%	0.00%		
Predict upcoming weather data collected through observation and measurements.	0	0	2	3	0	5	4.20

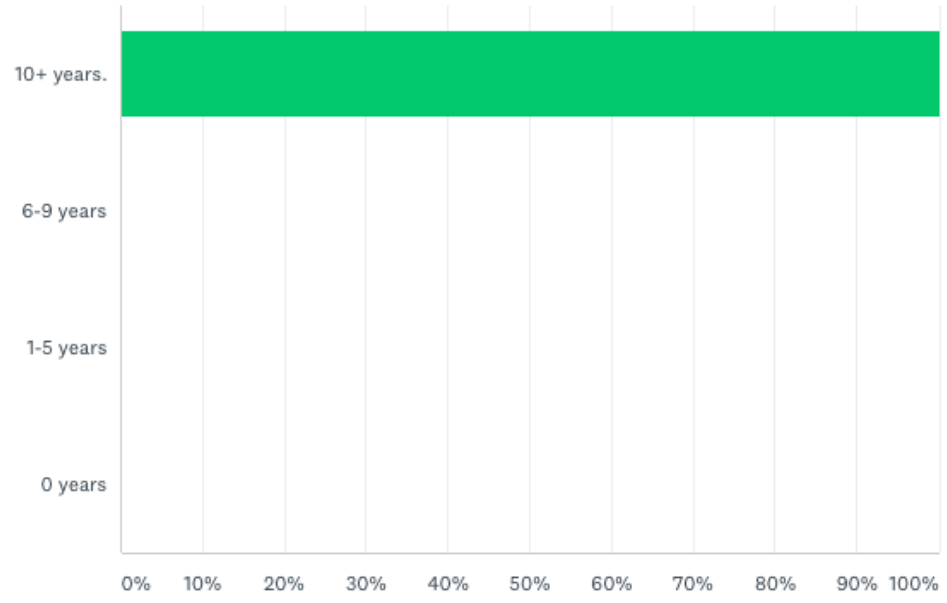
What is your current level of education?

Answered: 5 Skipped: 0



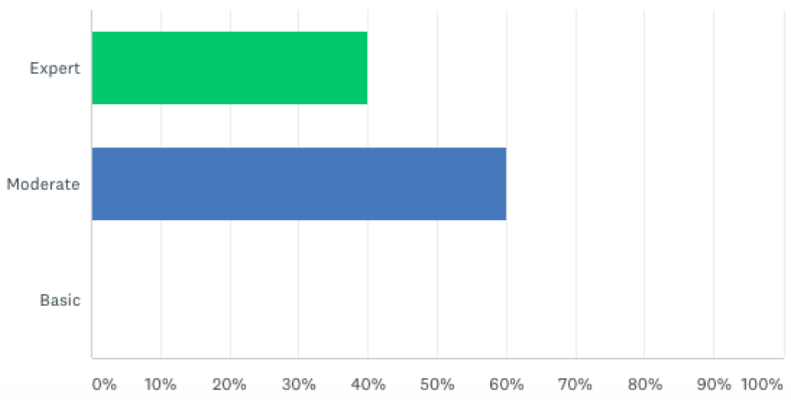
How many years of teaching experience (elementary/middle/secondary/higher education) do you have?

Answered: 5 Skipped: 0



When watching the weather channel or other source of weather news, which of the following best describes your working knowledge of weather terms used in these programs?

Answered: 5 Skipped: 0



* Data taken from Expert Validation Survey issued via Survey Monkey™

APPENDIX I: Vodcast Viewing Schedule

Science Essential Standard	Essential Vocabulary	Vodcast(s)
<p>*5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle.</p>	<p>*Water cycle, evaporation, condensation, precipitation, runoff, transpiration, convection cell</p>	<p>1. <i>The Water Cycle</i> http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/water-cycle.htm by Scholastic Inc.© 2. <i>Water Cycle</i> https://jr.brainpop.com/science/weather/watercycle/ by Brain POP Jr.© 3. <i>Water Cycle</i> https://www.brainpop.com/science/earthsystem/watercycle/ by Brain POP©</p>
<p>*5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures.</p> <p>*5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.</p>	<p>*Conduction, convection, radiation, electromagnetic waves, conductor,</p>	<p>4. <i>Heat</i> http://studyjams.scholastic.com/studyjams/jams/science/energy-light-sound/heat.htm by Scholastic Inc.© 5. <i>Heat</i> https://jr.brainpop.com/science/energy/heat/ by Brain POP Jr.© 6. <i>Solids, Liquids, and Gases</i> http://studyjams.scholastic.com/studyjams/jams/science/matter/solids-liquids-gases.htm by Scholastic Inc.©</p>
<p>*5.E.1.1 Compare daily and seasonal changes in weather conditions and patterns.</p>	<p>*Wind speed, wind direction, air pressure, temperature, precipitation</p>	<p>7. <i>Weather and Climate</i> http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/weather-and-climate.htm by Scholastic Inc.© 8. <i>Weather Instruments</i> http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/weather-instruments.htm by Scholastic Inc.© 9. <i>Air Pressure and Wind</i> http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/air-pressure-and-wind.htm by Scholastic Inc.©</p>

		<p>10. <i>Wind</i> https://www.brainpop.com/science/weather/wind/ by Brain POP©</p>
<p>*5.E.1.2 Predict upcoming weather events from weather data collected through observation and measurements.</p>	<p>*Pressure systems, fronts, stratus cloud, cirrus cloud, cumulous cloud,</p>	<p>11. <i>Fronts and Air Masses</i> http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/air-masses-and-fronts.htm by Scholastic Inc.©</p> <p>12. <i>Waves and Currents</i> http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/waves-and-currents.htm by Scholastic Inc.©</p> <p>13. <i>Clouds and Precipitation</i> http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/clouds-and-precipitation.htm by Scholastic Inc.©</p> <p>14. <i>Weather</i> https://www.brainpop.com/science/weather/weather/ by Brain POP©</p> <p>15. <i>Clouds</i> https://www.brainpop.com/science/weather/clouds/ by Brain POP©</p>

*Department of Public Instruction North Carolina. (2014). Unpacked content grade 5. Retrieved from <http://snces.ncdpi.wikispaces.net/file/view/5.pdf/449657522/5.pdf>

APPENDIX J: Permission to Use Vodcasts

Your submissions:

Name
Debra Lester
Email
dlester4@liberty.edu
Telephone Number
XXX-XXX-XXXX
Organization
Doctoral Candidate seeking permission to use videos
Message
<p>Hi. I'm Debra Lester, a doctoral candidate for Liberty University. I also am a teacher with a subscription to Brainpop. I am looking to study the effect of vodcasts on science vocabulary in elementary students. It is university etiquette that I ask permission from all parties whose information may be used in my study. Therefore, I am asking permission to show Brainpop and/or Brainpop Jr. videos to my treatment group and list it as a "vodcast" with appropriate citation. As a reminder, this is not a program review as vodcasts from other organizations will also be included in the treatment. Should you have any questions, or would like to read my proposal, please contact me at XXX-XXX-XXXX or dlester4@liberty.edu</p> <p>Thank you for your time, Debra Lester</p>

Thu 11/17, 12:35 PM

Lester, Debra

Thank you for contacting us! We will get in touch with you shortly.

Voicemail

AP

Antonio Perez <antoniop@brainpop.com>

Reply all

Thu 12/1, 5:17 PM

Lester, Debra

Inbox

Hi Deborah,

If you purchased a subscription you can use that subscription to show the videos for your group. I will also provide a link to our terms of use: https://www.brainpop.com/about/terms_of_use/

Thanks!

--

Antonio T. Perez

Coordinator, BrainPOP Educators

antoniop@brainpop.com • www.brainpop.com • [@ToneAndMoby](https://twitter.com/ToneAndMoby)

t. 212.574.6054 • f. 212.447.5179

71 West 23rd Street, 17th Floor • New York, NY 10010

Permission to use Study Jams for treatment group

Lester, Debra

Thu 12/1, 1:19 PM

Ms. Sandhorst,

Hi. I'm Debra Lester and I am a doctoral candidate asking permission to show the Study Jams videos to a group of students to see if showing videos will increase science vocabulary in elementary students. Although you offer a free program on the internet, it is university etiquette to ask permission for use. Thank you for your time.

Sincerely,
Debra Lester



Scholastic Inc. 557 Broadway, New York, NY 10012-3999, (212) 343-6100
www.scholastic.com

December 13, 2016

Ms. Debra Lester
Liberty University

Dear Ms. Lester:

Scholastic is pleased to grant you permission to use the STUDY JAMS videos in a student treatment group for research use for your dissertation as described in your letter/phone call.

Kindly give credit to Scholastic Inc. as the original source of the videos.

Sincerely yours,

APPENDIX K: Parent/Guardian Consent

The Liberty University Institutional
Review Board has approved
this document for use from
4/18/2018 to 4/17/2019
Protocol # 3198.041818

PARENT/GUARDIAN CONSENT FORM

Science Vocabulary Acquisition: A Nonequivalent Control-Group Examination of Vodcasts and
Fifth Grade Students
Debra Bailey Lester
Liberty University
School of Education

Your child is invited to be in a research study of vodcasts (short video clips) and science vocabulary learning. He/she was selected as a possible participant because he/she is in the fifth grade and has to take a Science End-of-Grade Assessment at the end of the school year. Please read this form and ask any questions you may have before agreeing to allow him/her to be in the study.

Debra Bailey Lester, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to see if students watching science vodcasts learn more science. Specifically, will fifth grade students who watched science vocabulary rich vodcasts perform better on a given science assessment than those students who were not provided vodcasts? Students will be randomly chosen to participate in the vodcast viewing sessions. However, those students who are not chosen to participate in the vodcast viewing sessions will be given the opportunity to watch them at the conclusion of the study. The vodcasts and the testing will not interrupt the academic school day as all vodcasts and testing will take place during the required science block instructional time.

Procedures: If you agree to allow your child to be in this study, I would ask him or her to do the following things:

1. Take a science pre-test in class during science class. The pre-test will take no more than 90 minutes.
2. Watch a science related vodcast each day. The vodcast viewing sessions will take less than 5 minutes each day for five weeks and will be shown during the required science block of instruction. Again, some students will watch the vodcasts now as part of the research study, and others will watch them after the study has concluded.

The Liberty University Institutional

Review Board has approved
this document for use from
4/18/2018 to 4/17/2019
Protocol # 3198.041818

3. Take a science post-test in class during science class. The post-test will take no longer than 90 minutes to complete.

Risks: The risks involved in this study are minimal, which means they are equal to the risks your student would encounter in everyday life.

Benefits: Participants in this research study may receive a direct benefit in the form of improved knowledge and scores.

Benefits to society include college and workforce readiness for students and more appropriate budget allotments for vodcast programs in schools.

Compensation: Your child will be given a free mechanical pencil for returning this signed Parent/Guardian Consent Form.

Confidentiality: The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely and only the researcher will have access to the records. The identity of your child and their scores will be protected at all times.

Your child will be identified only by a numerical code making your child's pre-/post-test scores anonymous. Although the teacher will retain a list linking your child's numerical code to their name, the researcher will not have access to the list and will remain unable to identify students. Digital data (spreadsheet of test scores) will be stored on a password locked computer; after three years, the data will be deleted. The data will be stored in a locked filing cabinet for three years. At the end of the third year, all data will be shred and discarded. Data will not be used in any constraints outside the use of this research.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect his/her current or future relations with Liberty University or Bailey Elementary. If you decide to allow your child to participate, he/she is free to not answer any question or withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If your child chooses to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should your child choose to withdraw, any data collected will be destroyed immediately and will not be included in this study.

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4/18/2018 to 4/17/2019

Protocol # 3198.041818

Contacts and Questions: The researcher conducting this study is Debra Bailey Lester. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at dlester4@liberty.edu or XXX-XXX-XXXX. You may also contact the researcher's faculty advisor, Dr. Jillian Wendt at jarnett@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Green Hall 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to allow my child to participate in the study.

(NOTE: DO NOT AGREE TO ALLOW YOUR CHILD TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

Signature of Parent Date

Signature of Investigator Date

APPENDIX L: Child Assent

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ASSENT OF CHILD TO PARTICIPATE IN A RESEARCH STUDY

What is the name of the study and who is doing the study?

Science Vocabulary Acquisition: A Nonequivalent Control-Group Examination of Vodcasts and Fifth Grade Students.

Why are we doing this study?

We are interested in studying vodcasts (short video clips) and science vocabulary learning.

Why are we asking you to be in this study?

You are being asked to be in this research study because you are in the fifth grade and have to take a Science End-of-Grade Assessment at the end of the school year.

If you agree, what will happen?

If you are in this study, you will take a pre-test to see what science you know and a post-test to show how much you learned. Some students will watch some science videos as part of their science instruction and other students will receive teacher instruction without watching any science videos.

Do you have to be in this study?

No, you do not have to be in this study. If you want to be in this study, then tell the researcher. If you don't want to, it's OK to say no. The researcher will not be angry. You can say yes now and change your mind later. It's up to you.

Do you have any questions?

You can ask questions any time. You can ask now. You can ask later. You can talk to the researcher. If you do not understand something, please ask the researcher to explain it to you again.

Signing your name below means that you want to be in the study.

Signature of Child

Date

Researcher contact information:
Debra Lester

Faculty Advisor:
Dr. Jillian Wendt
The Liberty University Institutional

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dlester4@liberty.edu
XXX-XXX-XXXX

jarnett@liberty.edu

Liberty University Institutional Review Board,
1971 University Blvd, Green Hall 1887, Lynchburg, VA 24515
or email at irb@liberty.edu.

Fifth Grade Students
Bailey Elementary
XXX
XXX, NC XXXXX

Dear Fifth Grade Students,

As a graduate student in the School of Education at Liberty University, I am conducting a research study to compare the pre- and post-test scores of fifth grade students who watched science video clips and those who did not view the clips. I am writing to invite you to participate in my study.

If you are a fifth-grade student at Bailey Elementary and you are taking a science end of grade assessment at the end of the school year, you qualify for this study. If you are willing to participate, you may or may not be asked to watch science video clips in addition to your typical science instruction. The video clips will be shown five times per week for five weeks. Each video clip will last no longer than five minutes. Additionally, you will be asked to take a pre- and post-test. It should take no longer than 90 minutes to complete each test. Your participation will be completely anonymous, and no personal or identifying information will be collected.

To participate, please take the parent/guardian consent form home, ask your parents to sign it, and return it to your teacher. You will also need to sign the child assent form and return it to your teacher. Both forms contain additional information about my research. Please return them by April 23, 2018 in order to participate in this study. Students who return both forms signed will be given a free mechanical pencil.

Sincerely,

Debra Bailey Lester
Doctoral Candidate