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Teachers' Perceptions of an Integrated Curriculum: An Action Research Study

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Teachers' Perceptions of an Integrated Curriculum: An Action Research Study

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Abstract

This action research study examined the experiences of six fourth-grade teachers at a school in southern South Carolina regarding the integration of literacy and science. The analysis of data provided evidence that the teachers' experiences during the study transformed their thinking concerning instructional strategies. The participants actively engaged in Stringer's (2014) cyclical action research model: Look, Think, Act. Using this cyclical approach, they contributed to the five actions that took place during this study. They implemented a planned intervention that integrated literacy and science. The participants realized that using an integrated approach was a successful instructional strategy and began adding additional information to the intervention. The teachers discovered that integration enabled them to address more state standards effectively and efficiently. In addition, the participants embraced integration and began adding mathematics and social studies content to the intervention. The principal observed the fourth-grade teachers transform to using an interdisciplinary approach. Because of their success, the principal encouraged the fifth-grade teachers to engage in a similar project. As the participants viewed instruction through a new lens, they decided to develop and implement integrated plans for science and literacy for the remainder of the school year. This study demonstrated that transforming instruction from teaching in isolation to using an integrated approach can lead to efficient and effective use of instructional time for meeting additional state standards, and increased student learning in both English language arts and science, and successful preparation for mandated state assessments.

Keywords: integration, instructional strategies, intervention, transformation

Dedication

This dissertation is dedicated to my husband, A. B. You encouraged me to pursue my dream of earning a doctorate. During my journey, you spent countless hours revising and editing submissions for my coursework. You even took time to edit while at Boy Scout camp and during our vacations. You spent many nights sleeping in the recliner so I would not be alone while I worked on schoolwork. When I needed help, you woke up to assist me. Your continued support was the catalyst that helped me to persevere through this process. Without you by my side, I would not have accomplished my goal. I am eternally grateful that you were and will always be my number one advocate and supporter.

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Chapter 1: Introduction

Introduction to the Problem

In the United States, education is driven by high-stakes state accountability measures. Most states focus primarily on student performance in English language arts (ELA) and mathematics (Brassell, 2007; Kogan, Lavertu, & Peskowitz, 2016). This narrowed focus leads to administrators to mandate that teachers concentrate on the tested areas (Brassell, 2007; Kogan et al., 2016). After the enactment of No Child Left Behind (NCLB), schools and school districts were labeled as either having met or not met standards based on federal annual yearly progress requirements determined by state assessment evaluations. Administrators were pressured to ensure their schools improved and excelled because, under NCLB, school performance was disseminated to all stakeholders through a publicized school report card (Judson, 2013; Kogan et al., 2016).

The NCLB Act was replaced in 2015 with Every Child Succeeds Act (ESSA), which gave states the flexibility to identify what benchmarks constitute acceptable student achievement (Darrow, 2016). The relationship between high-stakes testing and classroom instruction has been transformed from the use of effective teaching strategies to specific content-driven instruction primarily in ELA and mathematics (Darrow, 2016; Diamond, 2007; Judson, 2013). Because of states' accountability formulas, less time is often allotted during the school day for science and social studies than for ELA and math (Cox-Petersen & Spencer, 2006; Judson, 2013; Lapp, Grant, Moss, & Johnson, 2013; McEwan, 2012; Romance & Vitale, 2012; Wills, 2009). In South Carolina, for example, science constitutes 20% of the curriculum in Grades 3 through 5 and 25% in Grades 6 through 8 (Diamond, 2007; Judson, 2013). Teachers implement a prescribed

curriculum that results in uniform instruction to meet the state standards (Cox-Petersen & Spencer, 2006; Judson, 2013; McEwan, 2012; Lapp et al., 2013; Romance & Vitale, 2012; Wills, 2009). Skills and knowledge in science tend to be taught in isolation (Girod & Twyman, 2009; Romance & Vitale, 2012; Van Meeteren & Escalada, 2010). Students have limited exposure to content-area reading, a practice that limits the natural connections between content areas such as science and literacy.

In this action research study, I addressed the existing concerns regarding high stakes achievement testing and time constraints and recommended a solution. Teachers' experiences were the catalyst for the study, which focused on curriculum integration as a means of conserving time while promoting student achievement.

Background, Context, History, and Conceptual Framework for the Problem

The paradigm that drove this action research study was the constructivist theory of learning. Constructivism, a psychological theory, stems from the work of Piaget in the field of cognitive science prior to his death in 1980 (Ackermann, 2001; Fosnot & Perry, 1996). Psychologists recognize constructivism as a powerful framework for how adults learn and construct their own knowledge (Creswell, 2013; Danielson, 2007; Ravitch, 2016; Rebore, 2015; Richardson, 2003). Constructivism is based on the premise that adult learners construct knowledge structures in their mind in a nonlinear fashion. Through hands-on explorations, participants develop deep conceptual understandings. Knowledge is created through interactions with the world, people, and things (Ackermann, 2001; Fosnot & Perry, 1996).

This study addressed the integration of science and literacy to improve achievement scores. The constructivist learning theory suggests learning is contextual. Individuals do not

learn based on isolated facts. Instead, individuals learn in relationship to what is already known, that is, prior knowledge (Hein, 1991; Richardson, 2003). Within a constructivist framework, the work group comprised of fourth-grade teacher participants who worked collaboratively to develop an effective way to achieve a solution for the study.

Statement of the Problem

The problem this study addressed was the lack of knowledge about the experiences of fourth-grade teachers at an intermediate school located in the southern United States regarding the use of integration of science and literacy to improve achievement in both content areas. The factor that contributed to the problem is teachers' poor understanding of integration. In elementary schools, content areas are usually taught in isolation and with workbooks (Bryce, 2011; Plummer & Kuhlman, 2008; Zhai & Tan, 2015). This method might prohibit the transfer of reading skills into all content areas (Bryce, 2011; Plummer & Kuhlman, 2008; Zhai & Tan, 2015). Providing continued support and professional development opportunities for teachers will be the catalyst to help them understand the craft of integration (Cervetti & Pearson, 2012; Fuhui Tong, Irby, Lara-Alecio, & Koch, 2014; Greenleaf et al., 2011; Lapp et al., 2013; Mantzicopoulos & Patrick, 2011; Odegaard, Haug, Mork, & Sorvik, 2014; Plummer & Kuhlman, 2008; Schmidt, 1999).

Purpose of the Study

The purpose of this qualitative action research study was to gain an understanding about the experiences of six fourth-grade teachers at an intermediate school located in the southern United States regarding the benefits of implementing an integrated approach to literacy and

science instruction. At this stage of research, the integration of literacy and science is defined as two content areas taught together to benefit learning in both subjects.

Research Questions

This action research study was guided by three questions.

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

Rationale, Relevance, and Significance of the Study

Although science educators are charged with preparing students to be successful in a technological society, administrators and teachers feel pressured to prepare students in areas that carry more weight on state achievement tests—that is, reading and mathematics rather than science and social studies. The significance of this action research study was to move classroom practices toward an integrated approach where science and literacy complement each other. Through the cross-pollination of content areas, instructional time was utilized more efficiently while achievement in each area was improved.

Definition of Terms

For the purposes of this study, the following definitions are provided:

High-stakes testing: High-stakes testing refers to the state achievement tests used to determine school accountability (Brassell, 2007; Kogan et al., 2016).

Integration: Integration is an instructional strategy wherein content areas are taught simultaneously (McQuitty, 2016).

Action research: Action research is a collaborative approach to inquiry that provides the researcher and participants with a means for developing a systematic action or intervention that results in resolving an identified problem that challenges people in their everyday work lives (Herr & Anderson, 2015; Stringer, 2014). The approach to action research is cyclical in nature. Through continuous cycles of investigation, effective solutions to identified problems can increase the effectiveness and efficiency of the participants' work. (Stringer, 2014).

Action research enables teachers to become creative investigators. Stringer's (2014) framework for action research consists of three phases: Look, Think, Act. The participants continually cycle through each stage of the model. (Stringer, 2014). During the *Look* phase, data is gathered to define and describe the problem. Throughout the *Think* phase, exploration, analysis, and interpretation become the focus. This phase explains how or why things are as they are. In the *Act* phase, a course of action is defined based on the analysis of the situation. During this stage, specific actions are implemented and evaluated for effectiveness. Then the cycle starts over. (Stringer, 2014). When each cycle begins again, Stringer (2014) refers to this as a spiral.

Engaging in action research enables the participants to build knowledge that persistently enhances their professional practices. "Action research is not a neat, orderly activity that allows participants to proceed step by step to the end of the process" (Stringer, 2014, pp. 9-10). Continually reviewing, reflecting, and reacting leads to practices that will increase the well-being of the people involved because the participants are constantly reviewing, reflecting, and reacting (Stringer, 2014). Figure 1 is representative of Stringer's (2014) model.

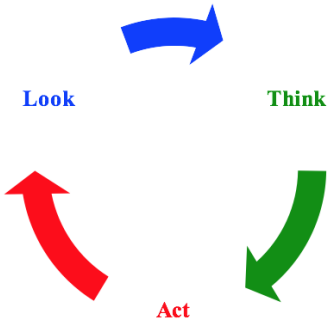

Figure 1. Stringer's (2014) model of Look, Think, Act cycle

Assumptions, Delimitations, and Limitations

Assumptions

Assumptions refer to aspects of a study beyond the researcher's control (Simon, 2011). I purposefully invited six fourth-grade teachers to participate in the study. Although the teachers were offered no incentives to participate, I assumed they would accept the invitation for the learning experience.

This purposeful sampling was representative of the population that I planned to make inferences about (Simon, 2011). The participating teachers were interviewed to determine their experiences with integration. I expected that the teachers would answer the interview questions honestly. Anonymity and confidentiality were preserved to encourage openness and honesty. In addition, the participants were permitted to withdraw from the study at any time (Simon, 2011).

Delimitations

Delimitations, which define the boundaries in a research study, include the problem, sampling, instrumentation, member checking, and reflexivity (Herr & Anderson, 2015; Simon, 2011; Stringer, 2014). As indicated by the purpose statement, this qualitative action research study was designed to better understand the experiences of six fourth grade teachers at an

intermediate school located in southern South Carolina regarding the benefits of implementing an integrated approach to literacy and science instruction. Purposeful sampling was used to select participants from the fourth grade at the school because I had previously established rapport and connections with the teachers in this setting (Herr & Anderson, 2015; Stringer, 2014). To provide process validity and triangulate the results, the study included interviews, observations, pre- and posttests, and reflections (Herr & Anderson, 2015; Stake, 2010; Stringer, 2014). Member checking provided participants with opportunities to review the analysis of data for accuracy. Participants were able to verify that the documented evidence was representative of their thoughts, perspectives, and experiences (Herr & Anderson, 2015; Stake, 2010; Stringer, 2014). Reflexivity was an essential concept associated with increasing the validity of the study. This process involves a researcher's reflection or self-evaluation of how the findings were collected, summarized, and communicated (Harding, 2013). Throughout the process, I kept a research journal in which I recorded each step of the research process (Harding, 2013; Stake, 2010; Stringer, 2014).

Limitations

The outside limitations that might not be controllable in this action research study included time constraints, the setting, prolonged engagement, transferability, the pre- and posttests, and being a participant-observer as indicated by Willis (2009), administrators require that specific time limits be allocated for each content area. Under the constraints of time, teachers might limit science instruction to provide more time for literacy (Plummer & Kuhlman, 2008). During this 7-consecutive week study, participating teachers' schedules adhered to the

state's time allotment for both literacy and science. For this reason, the study provided a snapshot of the participants' experiences under the given conditions (Simon, 2011).

The setting is another limitation. Because I conducted an action research study, I selected the site for convenience (Herr & Anderson, 2015). I expected the participants to trust the integrity of the research process. Even though the study was site specific, the results of this rich, descriptive study can help readers determine how the findings might be beneficial to their settings (Stake, 2010).

The assessment used for both the pre- and posttests might be a limitation. The questions were not pilot tested. The pretest was also the posttest. When administered as the posttest, it was not altered. In addition, students might have remembered items and answers from the pretest. Even though I trusted the teachers to adhere to the guidelines for the assessment, they might have "taught to" the test. Finally, being both a participant and observer during the study was a limitation. Assuming both roles as difficult because I did not want my ideas or biases to influence the study.

Summary

In Chapter 1, I introduced the problem of the teachers' lack of experiences with and lack of understanding of integration. I defined and explained action research and how it would be used in this study. In this action research study, I investigated and supported professional needs to help teachers understand the art of integration as they cycle through Stringer's (2014) Look, Think, Act model. Possible assumptions, delimitations, and limitations of this study were also included.

In Chapter 2, I reviewed the literature related to the topic of integration. I also discussed the theoretical framework, constructivism, that drove this study. In Chapter 3, I described details of the research design, context of the study, ethical protection of the participants, role of the researcher, participant selection, data collection and analysis, validity, and reliability. In Chapter 4, I analyzed the findings. Finally, in Chapter 5, I provided conclusions and recommendations.

Chapter 2: Literature Review

Introduction

Living in a science-based technological society, students need to be adept at integrating both literacy and science. For this reason, the study focused on the seamless integration of literacy strategies with science conceptual understandings to determine whether this approach can increase elementary school students' comprehension and achievement in both content areas. This literature review begins with a discussion of the conceptual framework, followed by an examination of school accountability in South Carolina, where the science achievement test constitutes 20% of each school's annual report card grade. Next, time constraints are discussed as being a limiting factor for science instruction in elementary classes. Then, the natural integration of reading and literacy strategies with science was addressed. The review ended with a discussion of the benefits of integrated literacy and science in elementary classrooms.

Conceptual Framework

The paradigm that drove this study was the constructivism theory of learning. Constructivism, a psychological theory, stems from the work of Jean Piaget in cognitive science (Ackermann, 2001; Fosnot & Perry, 1996). Psychologists have recognized constructivism as a powerful framework for how adults learn and construct their own knowledge (Creswell, 2013; Danielson, 2007; Ravitch, 2016; Rebore, 2015; Richardson, 2003). According to constructivist theory, adult learners, much like children, construct knowledge structures in their mind in a nonlinear fashion. Through opportunities for hands-on explorations, learners develop conceptual understandings. Knowledge is created through interactions with the world, people, and things (Ackermann, 2001; Fosnot & Perry, 1996). Put another way, knowledge is actively constructed

and reconstructed through personal experiences (Ackermann, 2001; Hein, 1991; Richardson, 2003).

Instead of providing answers to questions, instructors in a constructivist model facilitate the learning process to enable students to build personal knowledge. Constructivist pedagogy is characterized by a student-centered approach to learning and an engagement in dialogue, which leads to knowledge creation about a topic. If necessary, direct instruction is offered. Direct instruction is a strategy in which the teacher and/or researcher guides the participants in how to participate in effective dialogue and active learning to help them become comfortable with the constructivist process. In contemporary times, constructivist learning can involve reference to informational texts, exploring websites, and structured opportunities for students to challenge, change, or add to previous knowledge and develop their critical thinking (Richardson, 2003).

This study was designed to address the integration of science and literacy to improve achievement scores. The constructivist learning theory was used to organize and guide the research. The constructivist theory supports integrated contextual learning. That is, individuals do not learn based on isolated facts; instead, individuals learn in relationship to what is already known (Hein, 1991; Richardson, 2003). The theory of constructivism also recognizes that learning is a social activity, and that interactions with peers are an integral element of learning (Ackermann, 2001; Hein, 1991; Richardson, 2003).

Action Research

Six fourth-grade teacher participants constituted the group that worked collaboratively to develop an effective way to achieve a successful solution for the study. During meetings, the participants assimilated new knowledge as they communicated with each other. New information

was added to their existing knowledge structures (Barrett & Long, 2012; Danielson, 2007). These meetings enabled the participants to share experiences from their personal classrooms as they sought to understand their individual classroom settings (Creswell, 2013; Stake, 2010).

Stringer (2014) defined three phases of action research: *Look, Think,* and *Act*. In the first phase, *Look*, information was elicited from the participants to determine their perceptions and ideas. Based on the constructivist approach, individuals will understand a given situation differently because of their firsthand experiences, knowledge, and cognitive structures at that time. Different experiences lead to a greater depth of understanding for both the participants and researcher (Danielson, 2007). To gather data, interviews were conducted with both individually and in group sessions. Carefully crafted, open-ended questions encouraged participants to express their thoughts and experiences regarding the research problem. Through audio recordings of the interviews and the transcriptions of the recordings using Rev.com, I was able to interpret and understand the perspectives of each participant (Creswell, 2013; Stringer, 2014). Throughout the duration of the spiraling action research study, questions were continually used to collect information (Herr & Anderson, 2015; Stringer, 2014).

During the *Think* phase (Stringer, 2014), the analysis of information gathered through interviews and observations was used to formulate the intervention (Stringer, 2014). Action research is a "collaborative approach to inquiry or investigation that provides people with the means to take systemic action to resolve specific problems" (Stringer, 2014, p. 8). The participants discussed current lesson plans and how to modify them to address the problem of limited integration as an instructional strategy. To engage in this task in a constructivist manner, the teachers needed to develop their own understanding of how the intervention would look.

They had to be able to uncover patterns and derive relationships in the planned intervention (Danielson, 2007).

Based on the constructivist theory, as participants collaborate they learn through connections with new information and prior knowledge. As they plan, implement, and evaluate, they learn through the process of inquiry (Lara-Alecio et al., 2012). Constructivism focuses on activities, processes, and social interaction among adults. To enhance the thinking phase, participants need to engage in collaborative professional development. Teachers who share the same practices, ideas, and language increase their knowledge (Ravitch, 2016; Rebore, 2015). Constructivist theorists indicate that learning is an active process that requires changes in mindset (Danielson, 2007; Riehle, 2012). Constructivists do not follow a traditional curriculum. Participants in the study engaged in active discourse as they planned and evaluated the intervention. It also encouraged teachers to avoid working in isolation. Professional learning team (PLT) meetings and common planning time allowed participants to discuss ideas, experiences, strategies, and support each other (Blumenfeld, Krajcik, Marx, & Soloway, 1994).

The planned intervention was implemented during the last phase, *Act* (Stringer, 2014). According to the constructivist theory, teachers need to be willing to take risks as they implement new methodologies and practices. Through active learning, the primary purpose of the research will be accomplished. I anticipated that students would understand concepts and develop cognitive skills through the integration of literacy and science (Blumenfeld et al., 1994; Danielson, 2007). Following the implementation of the treatment, the participants reflected individually in journals (Blumenfeld et al., 1994; Herr & Anderson, 2015; Stringer, 2014). Learning takes time. During the *Act* phase, the participants implemented the planned

intervention. Following the execution of activities, participants reflected on what worked or did not work and what was learned (Hein, 1991). Action research is cyclical. Following reflection upon what was learned based on the analysis of instructional strategies and amending the initial intervention, the cycle started over.

Blumenfeld et al. (1994) worked with teachers participating in models of interactive cycles of collaboration, enactment, and reflection. This strategy predated the process for action research described by Herr and Anderson (2015) and Stinger (2014). The mindsets of both the Blumenfeld and his colleagues and teachers gradually changed as they developed new instructional strategies, improved implementation of learning strategies, and began using new pedagogical approaches to learning. However, as the teachers began to comprehend the process, they began adopting the theoretical premises of the constructivist theory (Blumenfeld et al., 1994).

This study was based on the action research format. The participants cycled through each phase to develop a practical solution for the problem of lack of integration of science and literacy during classroom instruction (Herr & Anderson, 2015; Stringer, 2014). As they spiraled continually through the *Look, Think, Act* phases, the participants' instructional strategies transformed.

Review of Research Literature and Methodological Literature

Search Strategy

The literature search focused on the effects of integrating science and literacy strategies in an elementary classroom on outcomes in student achievement. In addition, the search focused on how to effectively implement an integrated curriculum, how to support teachers during the

transition, and past research showing a positive impact after moving from teaching in isolation to an integrated approach. I conducted the search using ProQuest, ERIC, JSTOR, Wiley Online Library, and Science Direct databases, as well as Google Scholar. Keywords included *accountability, elementary, science, integration, literacy, reading, comprehension, writing, science literacy, high-stakes testing, time constraints, pedagogy, professional development, constructivism, classroom instruction, achievement, interdisciplinary, inquiry,* and *methodology*.

Accountability

Over the past 2 decades, the adoption of state accountability systems requiring that school performance be disseminated to all stakeholders has resulted in a transformation of public education (Kogan et al., 2016). High-stakes achievement testing is the predominant form of accountability, particularly since the implementation of No Child Left Behind (NCLB) in 2002. Schools and school districts are labeled as having "met" or "not met" standards based on federal annual yearly progress requirements as determined by state achievement tests.

To adhere to the new expectations, states began to modify standardized testing to align with the new regulations and improve student achievement (Kogan et al., 2016). To determine school and district annual yearly progress, states analyzed reading and mathematics scores and proficiency rates (Kogan et al., 2016), which has led to a narrowed curriculum. Time spent on other subjects, including science and social studies, has decreased. This is especially true for elementary classrooms (Judson, 2013).

The NCLB Act was replaced in 2015 when President Barack Obama signed the Every Student Succeeds Act (ESSA). However, like NCLB, ESSA requires that all students in third through eighth grades be tested annually in mathematics and reading. Unlike NCLB, ESSA gives

states the right to determine their own definition of student progress and acceptable achievement (Darrow, 2016). In South Carolina, science constitutes 20% of the accountability formula in Grades 3 through 5 and 25% in Grades 6 through 8 (Judson, 2013).

Diamond (2007) explored the relationship between high-stakes testing policies and classroom instruction and found that teachers tend to focus instruction on content that will be tested rather than effective pedagogical strategies. As a result, teachers often neglect certain content areas in response to high-stakes achievement tests.

Time Constraints

Teachers and administrators feel the pressures of time constraints and tend to believe that spending more time on specific content areas such as reading and mathematics leads to higher achievement scores (Cox-Petersen & Spencer, 2006; Lapp et al., 2013; McEwan, 2012; Romance & Vitale, 2012). As such, many teachers believe they have insufficient time to engage students in science investigations or integrate math instruction with science instruction (Judson, 2013; McEwan, 2012).

To secure positive report card ratings, administrators and school districts are increasingly moving toward a prescribed curriculum as a means of increasing student performance on state achievement tests (Wills, 2009). The result is uniform instruction and required time in each content area (Wills, 2009). Time devoted to science instruction at the elementary level creates a barrier to providing effective instruction in all content areas (Romance & Vitale, 2012).

Elementary students seldom engage in content-area reading; instead, skills are taught in isolation. This practice prevents the development of the natural connections between everyday language and science discourse (Romance & Vitale, 2012). Romance and Vitale (2012) argued

that limiting instructional time hinders the development of both comprehension and conceptual understandings. Conversely, when science and literacy instruction is integrated, teachers can effectively address standards in both disciplines while maximizing efficiency during the school day (Royce, 2005).

Science and Literacy Integration

The most compelling reason to engage in the interdisciplinary instruction of science and language arts is the cognitive parallels between the two content areas (Nixon & Akerson, 2004; Sorvik, Blikstad-Balas, & Odegarrd, 2015). The National Assessment of Educational Progress data have indicated that states using an integrated approach to science show higher student achievement (Judson, 2013). The National Research Council (2012) has emphasized that being literate in science requires the ability to read, understand, and communicate orally and in writing. Others have noted that reading, writing, speaking, and listening are important tools for learning science (Nixon & Akerson, 2004; Plummer & Kuhlman, 2008; Sorvik et al., 2015). In science, students are provided with opportunities to write factual information or claims and support their thinking with evidence (National Research Council, 2012; Sorvik et al., 2015). Conceptual understandings in science are represented through words, diagrams, charts, graphs, images, symbols, and mathematics. Therefore, reading and the ability to interpret informational text is a fundamental science practice (Lapp et al., 2013; National Research Council, 2012, pp. 74-77).

The Next Generation Science Standards (NGSS) and the Common Core State Standards (CCSS) revisited how science intersects with literacy. Common Core State Standards were created to help students use informational text or nonfiction text, a genre that has been typically overlooked in elementary classrooms. Reading informational texts during the early grades builds

the foundation for success in subsequent grades (Lapp et al., 2013; Madden et al., 2014). Reading scientific texts during language arts provides students with opportunities to develop critical thinking and comprehension skills. McQuitty (2016) referred to the integration of science and literacy as "partners because engaging in one means engaging in the other" (p. 2). Scientists use writing and visual images to share their findings with others in the field (Slough & McTigue, 2010; Sorvik et al., 2015).

The NGSS and the CCSS encouraged teachers to integrate science and literacy in classroom practices. Indeed, science has become a focal point for teaching literacy skills (Wallace & Coffey, 2016). The focus of the NGSS is the inclusion of informational text. The crosscutting concepts are used to help students connect ideas within and across the different science disciplines. The focus of NCSS is connecting students' background knowledge to facilitate real-world meaning and application (Lapp et al., 2013; Madden, Peel, & Watson, 2014).

To support learning in science, teachers need to use strategies that engage students in reading so the passages are more meaningful (Bryce, 2011). Students are expected to read and understand textbooks as a single source without being provided opportunities to read a variety of informational texts. Textbooks tend to present conceptual understandings and content in unorganized and uninteresting styles (Bryce, 2011; Plummer & Kuhlman, 2008), yet teachers continue to rely on them.

Science activities provide opportunities for students to develop background knowledge, make observations, and communicate their observations to others. Being scientifically literate requires students to have the skills and ability to comprehend, interpret, analyze, and evaluate

texts. Evidenced-based explanations to support claims are an essential part of science (Barrow et al., 1984; Washburn & Cavagnetto, 2013). Students who raise questions about their observations may be motivated to read in their quest to locate answers (Barrow, Kristo, & Andrew, 1984; Washburn & Cavagnetto, 2013). During an integrated science and literacy experience, students collaboratively participate in investigations (Barrow et al., 1984; McDonald et al., 2012; Odegaard et al., 2014). While working in teams, they engage in dialogue to communicate ideas, read and write about their experiences and observations, draw and label diagrams, and, depending on age, either dictate or write information (Barrow et al., 1984).

Opportunities for students to synthesize information through literary strategies including reading, writing, debating, and visually organization enhance student learning from science investigations (Slough & McTigue, 2010, p. 207). These combined processes develop science understandings while increasing students' reading abilities, vocabulary, and comprehension (Barrow et al., 1984, p. 189). Schmidt (1999) worked with teachers at two different schools to develop a framework of instruction using science inquiry and literacy. The teachers discovered that in an inquiry-based classroom, literacy skills are developed as students formulate questions, read informational texts, record and analyze data, and report findings. During assessments, the teachers were expecting specific answers identified from the units of study. Instead, their answers included higher order thinking that went beyond the curriculum's requirements (Schmidt, 1999).

Novak et al. (2016) identified five components of literacy that are fundamental to the integration with science instruction. These are connecting new ideas to prior knowledge and experiences, using questioning to facilitate meaningful learning, integrating text and visual

representations, allowing students to use science ideas in context, and engaging the students in scientific dialogue. To be successful and productive citizens, students need to be skilled at both oral and written communications. With the implementation of the Common Core State Standards, students are expected to engage in argument where they support claims with evidence (Novak et al., 2016). Students should be confident when discussing and explaining phenomena in the natural world.

At the elementary level, at least half of the school day comprises English language arts instruction. With limited time for science instruction (Dickinson & Young, 1998), an integrated curriculum blends the two disciplines. Dickinson and Young (1998) argued that when teachers develop interdisciplinary units they should include meaningful themes, balance instruction between science and literacy, help students make connections, and include experiences that will help students meet goals and objectives in both areas. Elementary teachers can use their strengths in English language arts to improve their science instruction. In sum, interdisciplinary instruction is effective for student learning because this approach will help students make gains in both content areas.

Classroom Practices

Elementary teachers primarily use whole group instruction during science instruction, tending to dominate classroom discourse when orchestrating science instruction (Zhai & Tan, 2015). In a teacher-directed learning environment, students become passive recipients of knowledge where static knowledge is valued instead of building their understandings through engaging activities. Teachers assume the role of dispenser of knowledge, advisor of learning, the sheriff of student activities—much like an authoritative figure, and thus limiting opportunities

for students to be actively engaged (Zhai & Tan, 2015). They seldom have a chance to engage in content area reading that would enable them to make connections between everyday language and the language of science (Hall & Williams, 2015; Romance & Vitale, 2012; Zhai & Tan, 2015).

In the face of high-stakes testing, elementary teachers must teach children science processes and argument while preparing them with knowledge of science facts, vocabulary, and conceptual understandings (Nowicki, Sullivan-Watts, Shim, Young, & Pockalny, 2013). Nowicki et al. (2013) found that some elementary teachers lack adequate science background to teach science accurately.

As noted earlier, textbooks present information in an unorganized and uninteresting style, yet they are used as the essential resource for science instruction (Bryce, 2011). Elementary teachers are more likely to find ways to integrate science into the curriculum if they can envision it as a content area with information texts that drives learning in literacy as well as other content areas (Connor et al., 2010; Howes & Campos, 2009, McDonald et al., 2012).

Professional Development

Providing support for teachers is necessary to help them move toward the integration of science and literacy (Cervetti & Pearson, 2012; Fuhui Tong et al., 2014; Greenleaf et al., 2011; Lapp et al., 2013; Mantzicopoulos & Patrick, 2011; Odegaard et al., 2014; Plummer & Kuhlman, 2008; Schmidt, 1999). Teachers need professional development in content area literacy strategies, language support strategies, and discourse strategies (Okhee & Buxton, 2013). Once they understand the content knowledge, they can engage their students in scientific inquiry by helping students plan investigations, gather data from a variety of sources, construct

explanations, develop arguments based on evidence, and communicate their findings in order to defend their conclusions (Cervetti & Pearson, 2012; Fang & Wei, 2010; Okhee & Buxton, 2013). Continued professional development opportunities provide a toolbox for teachers to effectively integrate science and literacy and help students read independently, develop conceptual understandings, and establish personal goals in literacy (Cervetti & Pearson, 2012; Greenleaf et al., 2011).

Although educators are pressured by time constraints, with proper training they can learn new, efficient ways to develop student learning through integrating subject areas. Their tacit beliefs about time, curriculum, and what content area should take priority might be holding them captive to pre-established practices and methodology (McEwan, 2012). For some teachers, integration makes sense. For others, integration takes away valuable time for ensuring that standards are met in each content area (Royce, 2005). During professional development, teachers can learn to construct effective strategies for integrating literacy practices with inquiry-based science (Howes & Campos, 2009).

According to the National Science Standards, students must learn to read scientific information and develop scientific thinking skills as they acquire and analyze new information. Through professional development, teachers can learn to build on the common ground that exists across content areas and maximize time management during the school day (Royce, 2005).

In one rural Ohio district, teachers overcame the demands on their time by integrating language arts and science. White et al. (2014) described an interdisciplinary professional development opportunity in reading and science and its effect on student achievement in Grades 5 through 8. Participating educators engaged in a 4-day training session that addressed content

and pedagogy and how to teach reading through the use of informational text in the science curriculum. Teachers also received on-site support through academic coaching sessions (White et al., 2014). To determine the impact of the professional development, the researchers compared student achievement scores in both reading and science and found that student proficiency with reading and understanding informational texts improved (White et al., 2014). Student achievement was shown to have improved on scores on the state achievement tests in reading and science (White et al., 2014). This study also provides evidence that providing professional development to support teachers with the process of integration results in positive teacher change and classroom methodologies (Cervetti & Pearson, 2012; Fuhui Tong et al., 2014; Greenleaf et al., 2011; Lapp et al., 2013; Mantzicopoulos & Patrick, 2011; Odegaard et al., 2014; Plummer & Kuhlman, 2008; Schmidt, 1999; White et al., 2014).

Benefits of Integration

Research indicates that integrating literacy and science is beneficial for improving achievement in both content areas. In a 10-year study, Pearson, Knight, Cannady, Henderson, and McNeill (2015), developers of a curriculum called "Seeds of Science," combined reading, writing, and language arts with science instruction. They used the literacy tools to enhance knowledge, inquiry skills, and critical thinking in science. Through the cross-pollination of literacy and science, students read informational texts and completed inquiry-based projects to master conceptual understandings. Throughout the process, Pearson et al. (2015) used pre- and posttests to indicate growth. At the end of the year, they were able to document significant gains in both subjects. Odegaard et al. (2014) provided professional development for participating teachers in the Seeds of Science curriculum to enhance their comprehension of integration. The

researchers discovered that the student participants in the treatment group made significantly more gains in science understandings, vocabulary, and writing than the students who did not receive the intervention.

Romance and Vitale (2012) focused on the implementation of an interdisciplinary instructional model called Search Information about Science IDEAS (Science IDEAS). The goal was to provide a reform initiative where content areas would be integrated and complement each other. Participants included teachers and students in third through fifth grades. The research focus addressed five areas of concern: time constraints, implications from not conceptually linking science and literacy, how interdisciplinary instruction supports reading comprehension, how an integrated approach will be a beneficial instructional model, and how integration increases time allocated to both content areas (Romance & Vitale, 2012). Data analysis of interviews, observations, and student achievement information indicated a strong correlation between the integration of science and literacy instruction. The researchers argued that an interdisciplinary strategy to learning increases time for both content areas and provides a strong foundation in both areas (Romance & Vitale, 2012).

Hall and Williams (2015) concluded that through the integration of informational text into content areas, third grade students can become more engaged with learning and comprehension. The authors used pre- and posttests, field notes, interviews, and surveys. After the data analysis, three themes emerged: achievement in content areas increased, as did students' reading levels and their awareness of college. The student surveys indicated that they were better readers because they knew content area vocabulary and they enjoyed reading (Hall & Williams, 2015).

When informational text and science instruction are integrated, students experience using scientific language while working as scientists. As students make connections with the text, they are constructing meaning. These experiences help students comprehend how scientists work and build claims and evidence from data. When they make claims regarding an investigation, teachers are able to formatively assess their thinking, reasoning, and understanding (Enfield, 2014; Washburn & Cavagnetto, 2013). In addition, connecting science with literacy motivates students to read and write (Cervetti, Barber, Dorph, & Goldschidt, 2012; Cervetti & Pearson, 2012). The interdisciplinary instructional approach engages students in thinking writing, reading, drawing, talking, and acting like scientists. In primary classrooms, science centers invite students to work and act like scientists while engaging in science activities. This process encourages the students to ask questions and develop inquiry skills (Girod & Twyman, 2009; Van Meeteren & Escalada, 2010).

Fuhui Tong et al. (2014) researched the effects of integrating literacy and science instruction as an intervention for fifth grade English language learners (ELL). All lessons included were aligned to the state standards. Fifty-eight students participated in the intervention for 23 weeks. The researchers indicated that inquiry-based science lends itself well to an approach where literacy and science are intertwined. Data were collected with classroom observations, benchmark tests, and the end-of-the-year sate achievement tests. After the analysis of data was complete, the researchers concluded that the integrated instructional model enabled the ELL students to outperform their English reading peers in both reading and science. In addition, they discovered that fifth grade students who participated in an integrated approach from kindergarten to third grade made greater gains.

According to Siebert et al. (2016), when literacy practices are integrated with content area studies, students are provided with strategies to understand experiences and to engage in self-expression. Reading teachers may be skeptical about providing assistance to content area teachers with the integration of reading strategies into their instruction. However, this process will promote positive interactions and collaboration between all teachers as they strive to meet the needs of all students (Siebert et al., 2016). Washburn and Cavagnetto (2013) reached similar conclusions in their research. They discovered that literacy is essential for students to understand conceptual understandings in science. Documentation from this study indicated that students used argument-based writings to support their claims with evidence.

In classrooms where an integrated curriculum of science and literacy were implemented, pre- and posttests indicated the students achieved higher achievement in both content areas. Students showed growth in science conceptual understandings, vocabulary, and reading skills. Reading informational texts increased comprehension while developing science literacy. Thus, as many researchers have concluded, that science and literacy are not mutually exclusive (Brassell, 2007; Connor et al., 2010; Enfield, 2014; Fang & Wei, 2010; Hall & Williams, 2015; Mantzicopoulos & Patrick, 2011; McDonald et al., 2012; Plummer & Kuhlman, 2008).

Cervetti et al. (2012) examined the effects of a planned intervention on fourth grade student achievement on standardized tests in both reading and science. Students who participated in the treatment plan were taught through a curriculum model about light and energy that engaged them in reading text, writing notes and reports, conducting investigations, frequent collaboration, and dialogue with peers about science concepts. The remaining fourth graders were taught the same concepts using the curriculum and materials provided by their school

district. Even though both groups made gains in science and reading comprehension, the treatment group achieved higher gains in science understanding, vocabulary, and writing. Cervetti et al. (2012) concluded that their work validates the notion that integrating science inquiry and literacy is reciprocally beneficial.

Review of Methodological Issues

Because action research is cyclical, data collection will be ongoing during the investigation (Herr & Anderson, 2015; Stringer, 2014). The primary data in action research is collected during interviews with the participants. Through carefully crafted questions, participants will be able to express their thoughts and experiences regarding the research study both individually and in focus groups (Creswell, 2013; Stringer, 2014).

Interviews and focus groups are commonly used in qualitative studies (Bryce, 2011; Sorvik et al., 2015; Hall & Williams, 2015; Howes & Campos, 2009; Lara-Alecio et al., 2012). Observations, videos, and field notes are also commonly used methodologies in qualitative research (Enfield, 2014; Fuhui Tong et al., 2014; Hall & Williams, 2015; Nixon & Akerson, 2004; Slough & McTigue, 2010; Sorvik et al., 2015; Wills, 2009). Diamond (2007) used focus groups and interviews to determine the influences that affect teachers during instructional planning and used field notes and coding methods to determine the impact of assessment policies. For their qualitative study, Sorvik et al. (2015) formed a focus group and interviewed participants separately and as a group. The data were analyzed and coded into common themes regarding the integration of literacy and science. Sorvik et al. also used observation and videos as a source of data collection. Four common practices of the integration process were revealed. To determine themes in their perspective studies (Fuhui Tong et al., 2014; Hall & Williams, 2015;

Slough & McTigue, 2010; Sorvik et al., 2015) also recorded field notes during interviews, observations, and videos. Enfield (2014) and Nixon and Akerson (2004) collected data through classroom observations and videos and field notes, which they analyzed and coded to determine commonalities. Wills's (2009) methodology included regular observations and videotaping of classroom lessons, and field notes were taken during teacher interviews.

Artifacts are also used in conjunction with these methodologies. Zwiep, Straits, Stone, Beltran, and Furtado (2011) explored the blended science and literacy approach with the development of the English language. The researchers analyzed lesson plans, observed classroom practices, and interviewed the teachers. Interviews were recorded and transcribed verbatim. All information was coded to identify recurring themes. Student notebooks and other student documents provide evidence that integrating science and literacy increases achievement in both areas (Barrow et al., 1984; Dickinson & Young, 1998; Madden et al., 2014; Plummer & Kuhlman, 2008; Pearson et al., 2015).

Caponera, Sestito, and Russo (2016) used pre- and posttests to provide evidence of student growth following an interdisciplinary unit. After analyzing the data, the researchers discovered a strong correlation between reading, science, and mathematics scores. Girod and Twyman (2009) used the Seeds of Science literacy based program as an intervention in their study. Both pre- and posttests were administered to determine growth in reading, writing, and science conceptual understandings. The analysis of data indicated that using the Seeds of Science intervention in both science and literacy improved student achievement in each area.

A number of these cited researchers used multiple source of data collection, a process called triangulation (Enfield, 2014; Fuhui Tong et al., 2014; Hall & Williams, 2015; Nixon &

Akerson, 2004; Slough & McTigue, 2010; Sorvik et al., 2015; Wills, 2009). When the researchers code the information to locate themes from a variety of sources, they are triangulating information that provides validity and credibility to their findings (Creswell, 2013; Stake, 2010; Stringer, 2014). Triangulation is a strength because it provides quality evidence that establishes credibility (Creswell, 2013; Stake, 2010;).

Although using multiple approaches for gathering data provides trustworthiness for studies, weaknesses are associated the methods. When conducting interviews, either individually or in focus groups, participants may deceive the interviewer. Formal interviews can limit personal connections between the researcher and the participants (Creswell, 2013; Hatch, 2002; Herr & Anderson, 2015; Stringer, 2014). Even though observations enable the researcher to observe a phenomenon in the actual setting, they can be problematic. First is intrusiveness. Although the goal of both observations and videos are to capture normal classroom activity, the presence of an unknown visitor might influence the participants' behavior. In addition, researchers might interact with participants, which might affect the setting (Hatch, 2002). Finally, when conducting a qualitative study, the researchers might interject their personal views about the topic. For that reason, researcher bias should be clarified at the beginning of the investigative process (Creswell, 2013; Stringer, 2014).

Synthesis of Past Research Findings

Much of the literature about the educational process poses questions about school accountability and its effect on science instruction. The literature regarding this topic can be divided into six subtopics: accountability, time constraints, science and literacy integration, classroom practices, professional development, and benefits of integration.

In the United States, the accepted form of educational accountability is high-stakes testing (Brassell, 2007; Kogan et al., 2016). Achievement in reading and mathematics constitutes the major components of the accountability process as these two areas provide the highest percentage of the formula for determining the success of schools and districts. For this reason, more time is allotted for instruction in these areas at the expense of science instruction (Darrow, 2016; Kogan et al., 2016). Diamond (2007) and Judson (2007) indicated that when influenced by administrators, teachers focus on tested material instead of implanting effective pedagogical strategies.

The emphasis on accountability provides pressure for administrators and teachers to adhere to time constraints. More time is spent on areas being tested to ensure higher student achievement on state testing (Cox-Petersen & Spencer, 2006; Lapp et al., 2013; McEwan, 2012; Romance & Vitale, 2012). McEwan (2012), Judson (2013), and Wills (2009) reiterated these findings because teachers do not believe they have time to teach science as they are expected to adhere to a prescribed curriculum. With increased emphasis on increasing student achievement in literacy and mathematics, time constraints decrease time for science as well as the natural connections between literacy and science (Girod & Twyman, 2009; Romance & Vitale, 2012; Van Meeteren & Escalada, 2010).

To enhance student achievement and use instructional time effectively, implementing an interdisciplinary approach to science and literacy has led to higher student achievement in both content areas (Judson, 2013; Nixon & Akerson, 2004; Sorvik et al., 2015). Romance and Vitale (2012) and Royce (2005) echoed these findings by stating that teachers can effectively address required state standards in both disciplines through integration, which reduces the pressure of

time constraints and makes the most of the school day. The development of literacy skills and the ability to interpret informational text is a fundamental science practice (National Research Council, 2012; Lapp et al., 2013). According to Slough and McTigue (2010) and Sorvik et al. (2015), science and literacy are inseparable.

To find effective solutions to increase accountability and maximize instructional time, classroom practices need to change. Many teachers still rely on the textbook and tend to include science only if there is time. Many teachers do not have experience using informational texts as a catalyst for teaching both literacy skills and science conceptual understandings (Hall & Williams, 2015; Mantzicopoulos & Patrick, 2011; Romance & Vitale, 2012; Siebert et al., 2016; Zhai & Tan, 2015). Teachers need continued professional development to support change as they progress toward an integrated approach (Cervetti & Pearson, 2012; Fuhui Tong et al., 2014; Greenleaf et al., 2011; Lapp et al., 2013; Odegaard et al., 2014; Mantzicopoulos & Patrick, 2011; Plummer & Kuhlman, 2008; Schmidt, 1999). This approach will take time but can help teachers no longer feel captive to teaching through a prescribed curriculum.

An analysis of the results of these studies suggests using an integrated approach to teaching literacy and science maximizes instructional time and improves achievement in both areas. Students have shown growth in science conceptual understandings, vocabulary, and reading skills. Reading informational texts increased comprehension while developing science literacy. In conclusion, science and literacy are not mutually exclusive (Brassell, 2007; Connor et al., 2010; Enfield, 2014; Fang & Wei, 2010; Hall & Williams, 2015; Mantzicopoulos & Patrick, 2011; McDonald et al., 2012; Plummer & Kuhlman, 2008).

Critique of Previous Research

The selected method for my study was action research. This qualitative approach is the study of a particular action with the intent of discovering a more effective means of performing that action (Stake, 2010). The researcher initiates an action research study and the plans for implementation are designed and performed by the participants (Herr & Anderson, 2015; Stake, 2010; Stringer, 2014). The scholarly articles analyzed in the literature review are studies in which the researchers enlisted the assistance of the participating adults to implement identified treatments. Even though the action research technique was not identified specifically in my research, it was an appropriate method for my research.

The topic to be investigated was to determine whether the integration of literacy and science would improve accountability by helping students improve scores on state achievement tests and if this process will be advantageous for using instructional time more effectively. The literature reviewed was relevant to my course of study because the conclusions reached by the researchers indicated positive correlations between integration and student achievement. In terms of extending a study of this topic to my work setting, the conclusions identified based on the analysis of these data were both sound and relevant (Brassell, 2007; Connor et al., 2010; Enfield, 2014; Fang & Wei, 2010; Hall & Williams, 2015; Mantzicopoulos & Patrick, 2011; McDonald et al., 2012; Plummer & Kuhlman, 2008).

To ensure my study was valid and credible, and guided by past research (Herr & Anderson, 2015; Stringer, 2014), I triangulated the results and used a mixed-methods approach when gathering, coding, and analyzing data. I combined interviews, focus groups, observations,

videos, field notes, and documents to answer the research questions, and provided descriptive summaries detailing the findings.

Chapter 2 Summary

Educators are charged with preparing students to be successful in a science-driven technological society. For this reason, I chose to focus on an action research study that would provide curricular transformations to enhance student achievement in an educational setting. I selected my school as the setting. Through this participatory process, the fourth-grade teachers will collaboratively design, implement the proposed intervention, and continually refine it. A review of the research on integrating science and literacy instruction suggests six themes my study addressed and why integration is important.

1. High-stakes achievement testing is the emphasized form of accountability in the United States. Schools are usually rated on student achieve in reading and mathematics. For this reason, administrators and teachers feel pressured to prepare students in these areas at the expense of other content areas.
2. With emphasis on these content areas, there is limited time during the day for inquiry-based science instruction.
3. Engaging in an interdisciplinary program where science and literacy complement each other is beneficial for both content areas and achievement scores.
4. To move toward an integrated approach, classroom practices need to be investigated and transformed as needed.
5. To assist teachers with the move toward integrating literacy and science, they need continually support and professional development opportunities.

6. Researchers have shown improved student achievement scores in both reading and science when their curricula are integrated. Instructional time is used more efficiently through the cross-pollination of the content areas.

The review of the literature provided sufficient evidence for pursuing an action research study. This study answered the three research questions listed in Chapter 1:

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

Chapter 3: Research Method

Introduction to Chapter 3

This study was designed to investigate fourth-grade teachers' perceptions about how literacy can be integrated with science to improve achievement scores in both content areas. Included in this chapter are the research questions and the rationale for the purpose, design, setting, and sampling method. The instrumentation, tools, and data collection analysis procedures are explained in detail. Finally, credibility, reliability, and research ethics are addressed.

Research Questions

In this study I explored fourth-grade teachers' perceptions of the benefits of implementing an interdisciplinary approach to literacy and science instruction. This action research study addressed the following questions:

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

Purpose and Design of the Study

The purpose of this qualitative action research study was to gain an understanding about the experiences of six fourth-grade teachers at an intermediate school located in the southern United States regarding the benefits of implementing an integrated approach to literacy and science instruction. Instructors were charged with successfully teaching the state-required

standards that are tested at the end of the year through the state-required achievement tests. With mandated time constraints, teachers failed to address the content areas equally and did not connect the core subject areas, especially with literacy and science.

To address this purpose, I proposed an action research study in which teachers would be actively involved in the research process. Action research is a collaborative investigative approach that engages participants as equal and full contributors in the research project (Herr & Anderson, 2015; Stringer, 2014). Participatory action research is completed in partnership with others who have a vested interest in the problem being investigated. In a participatory action research study, the participants are actively involved in the research. Its purpose is to help stakeholders better understand an existing problem and work collaboratively toward identifying viable solutions (Herr & Anderson, 2015; Stringer, 2014). Action research results not only in a collective vision but also in a sense of community (Stringer, 2014).

Action research requires a planned intervention (see Appendix G). First, a plan of action is developed to improve what is already happening in an identified setting. Second, participants act to implement the proposed plan. Third, the impact of the action is observed and evaluated. Fourth, the observations lead to further planning and action through a continual succession of cycles of observation and improvement (Herr & Anderson, 2015; Stringer, 2014). Stringer (2014) referred to the action research interacting spiral as the Look, Think, and Act routine. In the Look phase, data are gathered, and the existing problem is defined and described. Think is an analysis of what is happening in the setting and an interpretation and explanation of why things are as they are at the location. In the Act phase, the developed plan is implemented and evaluated for effectiveness. The participants then recycle through the spiral. Through these steps, action

research strives to transform an organizational setting where all participants benefit from the outcomes and work collaboratively to achieve a set of goals (Herr & Anderson, 2015; Stringer, 2014).

Herr and Anderson (2015) stated that most action researchers conduct studies at their personal locations. I chose this research method because I wanted to work with others in my school setting to bring about organizational change. The collaborative group consisted of six fourth-grade teachers and me. Based on Herr and Anderson's (2015) continuum of positionality in action research, I was an insider in collaboration with other skilled, supportive, resourceful, and approachable insiders. A purposeful stance is appropriate for action research (Stringer, 2014). I will use Stringer's (2014) terminology for describing the phases of action research as follows.

The Look Phase

During the Look phase, I met with participants to learn how they defined integration in their own terms. Based on these experiences and perceptions, I began developing a working intervention and viable solution in which the participants were willing to invest their time and energy (Herr & Anderson, 2015; Stringer, 2014).

The Think Phase

During the Think phase, I analyzed data from the *Look* phase to provide a deeper understanding of the issue by coding and categorizing participants' experiences to identify common themes. Common practices, lesson plans, and administrative arrangements were discussed as they related to the problem and setting. These topics were continually revisited to identify potential problems and ideas for change. In addition, all features of the setting were

discussed to design an effective solution (Herr & Anderson, 2015; Stringer, 2014).

The Act Phase

During the Act phase, sustainable solutions were created and implemented. Seven steps were addressed in this phase.

1. The goal or purpose of the treatment was identified.
2. The intervention objectives were selected.
3. Tasks were developed to address each objective.
4. The persons responsible for completing each task and activity were recognized.
5. The setting where tasks were implemented was determined.
6. A time line was created for the implementation of the intervention.
7. A list of resources needed to accomplish the tasks and activities was created. Throughout the intervention, the plan was monitored to determine its effectiveness. Results were analyzed and evaluated.
8. Amendments were made to the intervention and the cycle will be started over (Herr & Anderson, 2015; Stringer, 2014).

Figure 2 summarizes the steps included in each phase of Stringer's (2014) action research model.

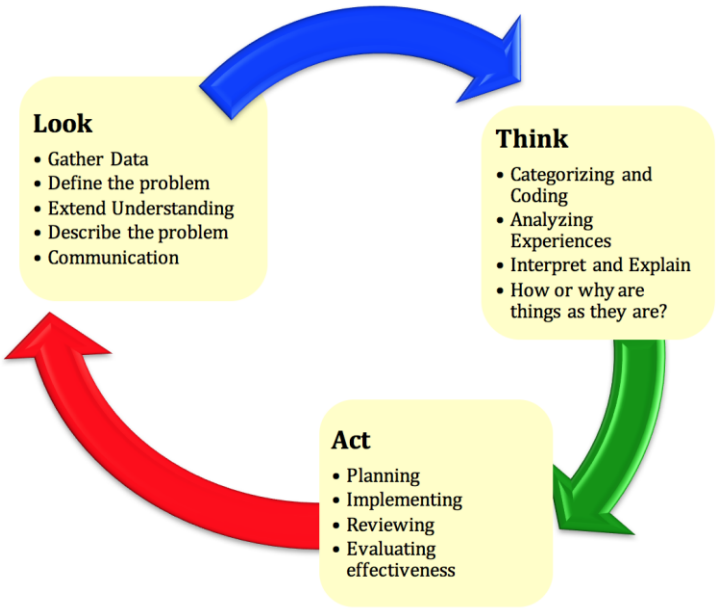

Figure 2. Summation of steps in Stringer's (2014) Look, Think, Act cycle.

Research Population and Sampling Method

Prior to beginning my action research study, I selected a research site and population through purposeful sampling.

Research Site

Because of my tacit knowledge about the location and the school leaders' desire to make changes and transform existing practices, I conducted the study at an intermediate located in the southern United States (Herr & Anderson, 2015; Stringer, 2014). The school's mission is to "provide a nurturing and safe environment full of diverse learning experiences that enable all students to become caring and productive lifelong learners in a global and technological society, leading to a warm, safe, and child-centered school" (School website). The school's vision is to empower students to develop the skills and life and career characteristics of the Profile of the

South Carolina Graduate (South Carolina Department of Education, 2015) by holding all students to high expectations. Teachers engage students in learning by following the state's curriculum in self-contained classrooms. Teachers have the flexibility to teach units of study across the various content areas. Reading, writing, and research through a balanced literacy approach is augmented by the High Progress Literacy Classroom initiative. Science is taught using an inquiry approach as students are provided opportunities to conduct lab experiments in the state of the art science lab. Daily instruction is infused with iPads, laptop labs, Promethean software, and many other instructional technology resources.

In addition to academics, students find success through engagement in the areas of the performing arts and extracurricular activities such as academic club, band, steel drum band, chorus, art enrichment, wrestling, first tee golf, First Lego League, and drama performances. The parents are strong supporters of the school's program, volunteering their time, talents, and gifts through their parent-teacher organization. According to the school's principal (personal communication, December 7, 2016), everyone strives to work together for the students to be successful. Teachers, students, parents, and administrators have developed best practices, resulting in high marks in student success and on state assessments

Population

The intermediate school serves students in Grades 4, 5, and 6. Although the students are taught in self-contained classrooms, sixth grade is referred to as middle school. There are six fourth-grade classrooms, eight fifth-grade classrooms, and eight sixth-grade classrooms. Augmenting the self-contained classrooms are two resource classrooms, one gym for physical education, one music room, one art room, one media center, one computer lab, one band room,

and one guidance room. The number of self-contained, heterogeneously grouped classrooms is determined by student enrollment. Because the school is not a Title I school, teachers can have up to 27 students per class (Principal, personal communication, January 30, 2017). The classes are heterogeneously grouped at each grade level. The total school population is 494 students and 32 teachers. The school serves a higher-than-average socioeconomic population.

Sampling Method

Purposeful sampling was the chosen method (Creswell, 2013; Stringer, 2014). In this type of sampling, a researcher consciously chooses participants based on a set of attributes that a group shares (Creswell, 2013; Stringer, 2014). In an action research study, the sample size depends on the number of participants needed to inform all elements of the purpose of the study (Sargeant, 2012). For this action research study, the population consisted of the six fourth-grade teachers at the intermediate school, so selected because this is the first year that students must complete the state achievement assessments in both literacy and science. The participating educators implemented the collaboratively planned intervention to the students in their classrooms.

Instrumentation

Data collection techniques were comprised of interviews, observations, pre- and posttests, and reflections (Creswell, 2013; Harding, 2013; Stringer, 2014). Data collected were used throughout each phase of Stringer's (2014) framework for action research, *Look, Think, Act*. As the participants cycled through each phase, they continually gathered data. They explored, analyzed, and explained what was happening as a result of the intervention, and amended the plan to include a new course of action. Then they implemented the new plan (Stringer, 2014).

Interviews

Action research is cyclical (Herr & Anderson, 2015; Stringer, 2014). The primary data in action research are collected during interviews with the participants. Through open-ended questions participants were able to express their thoughts and experiences regarding the issue of concern (Creswell, 2013; Hatch, 2002; Stringer, 2014). In addition, questions were clearly written using language familiar to the participants. Questions were crafted to elicit responses that were related to the objectives of the research (Hatch, 2002). During the interview, extension questions or prompts were used to acquire additional information and clarity (Hatch, 2002; Stringer, 2014). Initial interview questions are located in Appendix A. Interviews were recorded and immediately transcribed using Rev.com. Transcripts were available to participants to ensure their thoughts were captured as intended (Creswell, 2013; Harding, 2013; Stringer, 2014).

Observation

Observation is an important instrument to use for collecting data in an action research study (Creswell, 2013; Harding, 2013; Hatch, 2002; Stringer, 2014). As an insider during the research, I was completely engaged with the participants and was able to establish rapport and trust with the participants (Creswell, 2013; Herr & Anderson, 2015). Audio recordings were transcribed using Rev.com.

Pre- and Posttests

Teacher participants administered a multiple-choice pretest prior to the treatment (see Appendix C). The questions were aligned to the state standards in science. The questions were written in the format used on the state achievement test (South Carolina Department of Education, 2017). The same test was administered at the end of the intervention to provide

evidence of growth through the analysis of scores (Caponera et al., 2016; Connor et al., 2010; Girod & Twyman, 2009; Greenleaf et al., 2011; Hall & Williams, 2015; Wallace & Coffey, 2016).

Reflection

Action research addresses a topic that not only interests the researcher but one that engages the participants in collaboration to develop an effective solution to the identified problem (Herr & Anderson, 2015; Stringer, 2014). Reflection is an essential element of the process (Harding, 2013; Hatch, 2002; Herr & Anderson, 2015; Stringer, 2014). The educators need to spend time reflecting upon what worked or did not work as they strive toward designing an applicable solution (Harding, 2013). Reflection enables teachers to identify changes in their practices and pedagogical strategies. As indicated by Herr and Anderson (2015) and Stringer (2014), reflection and evaluation constitute the end of the first cycle of an action research study. At this point, the cyclical steps of action research begin again as the intervention is continually being improved.

Data Collection

Triangulation enhances the credibility and validity of a study because multiple types of data collection tools are used (Creswell, 2013; Stringer, 2014). In this study, I conducted interviews and informal observations, reviewed pre- and posttest data, and reflected on what I discovered (Creswell, 2013; Harding, 2013, Hatch, 2002; Stringer, 2014). Figure 3 represents the proposed data collection process. All data collection occurred only after the Concordia University IRB and all participants signed the informed consent (see Appendix D).

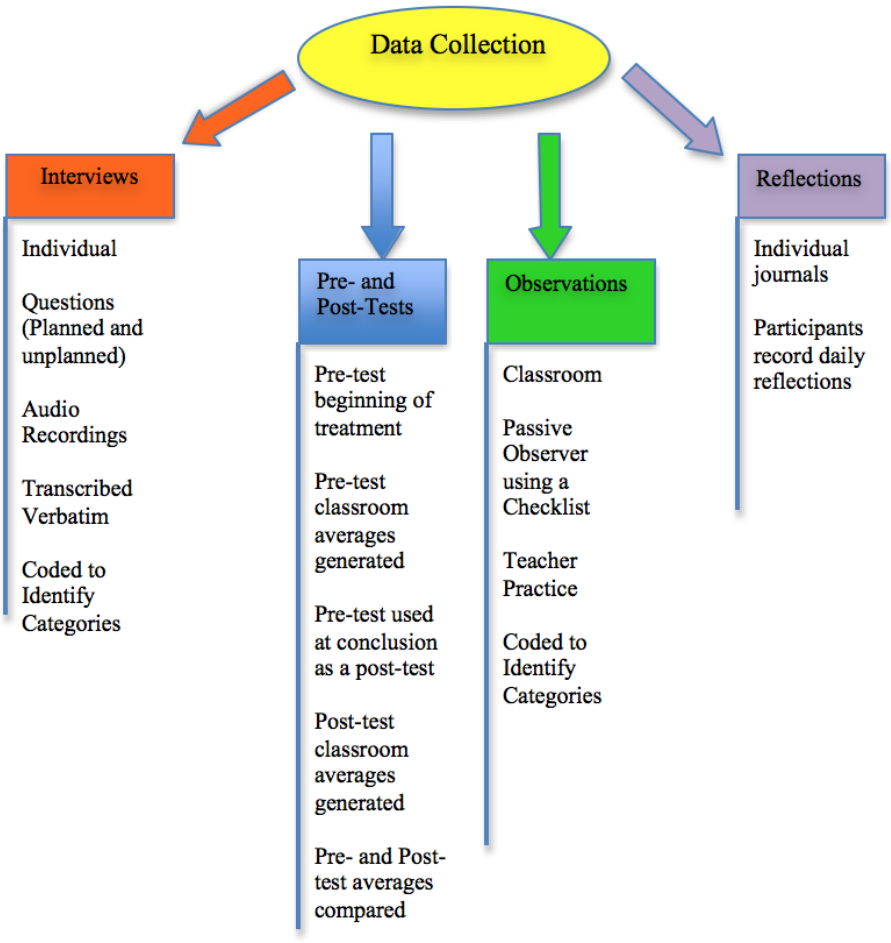

Figure 3. Data collection process.

Recruitment of Participants

Participants were recruited via email after the Concordia University IRB approved the research proposal. Forms submitted were redacted to preserve the anonymity of the district.

Reflection

Participating teachers engaged in reflective practice. I asked them to reflect on what they did in their classrooms and what they learned during the process of integrating literacy and science. This process enabled the participants to understand how they imparted knowledge to

their students as well as determine what strategies were successful and what might need improvement (Harding, 2013). Stringer (2014) added that reflection helps the participants identify any problems experienced during the intervention and if they were able to overcome them.

Interviews

Interviews are an essential strategy for gathering information in qualitative studies (Creswell, 2013; Herr & Anderson, 2015; Stringer, 2014). Participants were interviewed to determine instructional content, methodology, and pedagogical strategies designed to improve student achievement (Bryce, 2011; Diamond, 2007; Hall & Williams, 2015; Howes, Lim, & Campos, 2009; Madden, Peel, & Watson, 2014; Odegaard, et al., 2014; Slough & McTigue, 2010; Sorvik et al., 2015; Wills, 2009; Zwiep et al., 2011). Participants had the choice of selecting the best time for them to be interviewed, either during their planning time or after school. I interviewed the participating teachers during the intervention. To respect teacher time, interviews were limited to 60 minutes or less. Interviews were held in their classrooms and were recorded. The online audio transcription service *Rev* ("Rev," n.d.) was used to transcribe the sessions.

Observations

Informal observations in each setting were used to determine the participants' management and delivery of instruction. An informal checklist (see Appendix B) was used to document evidence of how literacy and science were taught and to indicate participant growth with using integration strategies throughout the course of the study. The duration of the study was seven consecutive weeks. Similar studies support these data collection tools and analysis

(Bryce, 2011; Diamond, 2007; Fuhui Tong et al., 2014; Girod & Twyman, 2009; McDonald et al., 2012; Nixon & Akerson, 2004; Wills, 2009; Odegaard et al., 2014; Sorvik et al., 2015; Zwiep et al., 2011).

Pre- and Posttests

Teacher participants administered a multiple-choice pretest to their students prior to the treatment. The questions were aligned to the state standards in science. The questions were written in the format used on the state achievement test ("Test Questions," 2017). The same test was administered at the end of the intervention to provide evidence of student growth (Caponera et al., 2016; Connor et al., 2010; Girod & Twyman, 2009; Greenleaf et al., 2011; Hall & Williams, 2015; Wallace & Coffey, 2016). The pretest was created in Google Docs. To complete their class pretest, students were assigned a number. For example, Charlie's class was identified as 100. The student numbers began with 101 and ended with 124 (see Appendix H). In the pretest field that requested a name, the student keyed in his or her number. This strategy maintained student confidentiality. Students used the same number when completing the posttest. This process enabled me to compare class averages for each class to determine growth from beginning to conclusion of treatment.

Identification of Attributes

The attributes that defined the study are collaborative vision, communication, and interpersonal skills. Bradberry and Greaves (2012) suggested a collaborative vision helps people understand why they are moving in a new direction because it sets clear expectations for creating change in the organization. A well-communicated vision will enable the participants to conceptualize the future state of the Intermediate School as they begin to make the journey

toward the transformation from teaching in isolation to interdisciplinary instruction (Bradberry & Greaves, 2012; Fullan, 2001). This action research study promoted connections between the participants as they prepared during PLT meetings and common planning time. Communication skills enhanced the planning process and inspired the participants to speak freely and motivate each other in a manner that continued the organization to move toward change. Even though interviews were conducted individually, this study promoted productive communication skills that led to the development of closer interpersonal relationships between the participants as they continually moved toward transforming how ELA and science was taught through the use of interdisciplinary instruction (Northouse, 2013).

Data Analysis Procedures

This action research study was a qualitative study. According to Harding (2013), qualitative data analysis involves gathering a data set, dissecting the data, and reassembling these data in a manner that is relevant and meaningful to the study. The data analysis procedures that were used in this study to analyze information from interviews, observations, pre- and posttests, and reflections was the constant comparative method (Harding, 2013; Stringer, 2014). Harding (2013) referenced that the constant comparative method was originally used as part of the grounded theory approach. However, Harding (2013) argues that the constant comparative method is the basis for all qualitative data analysis because the data are constantly being compared and contrasted to identify common themes.

Interviews

Data was gathered through semi-structured interviews. A protocol was established that enabled participants to voice their thoughts, ideas, and concerns during individual interview

sessions. Careful planning ensured that the participants were able to work through issues and meet identified goals (Herr & Anderson, 2015; Stringer, 2014). Although a list of questions guided the interviews, I probed further to elicit information as other topics arose (Harding, 2013). If participants so allowed, conversations were transcribed verbatim using the online audio transcription service *Rev* ("Rev," n.d.) and reread to make sense of the content in relation to the purpose of the study. The process enhanced validity of the study by ensuring that the data gathered accurately reflected the interviewees' responses (Harding, 2013; Hatch, 2002).

After the interviews were transcribed, the coding process began (Creswell, 2012; Harding, 2013; Hatch, 2002) by using the constant comparative method. The first step of the coding process was to read and reread the transcripts. Harding (2013) referred to coding as the process of selecting, separating, and sorting data. Key words and phrases were underlined to make note of what was interesting in each interview. An example of how I underlined words and phrases to get the codes appears in Appendix N. I created a handwritten list of words and phrases identified from each participant's interview (see Appendix O). This process guided me as to how to think holistically about the data (Harding, 2013; Hatch, 2002). By interacting with these data through the constant comparative method, I identified themes in which the codes were placed (Harding, 2013; Hatch, 2002). The list of phases and words were repeatedly amended through the analysis of each successive interview (see Appendix BB). During this process, some codes fit in any of the categories relating to the purpose of the study. As such, I had to decide if outlying codes should be kept because they contributed to the study or if they should be discarded (Hatch, 2002).

Data analysis was presented in narrative form. The narrative told the story of the study beginning of the first interview. The narrative presented the participants' initial thoughts regarding the purpose of the study and ended with how their experiences after engaging in the intervention changed (Creswell, 2013).

Interview Analysis Protocol

Interviews with participants were conducted face to face. Sessions were held in the participants' classrooms to provide a comfortable setting. I had previously established rapport with the teachers because we teach at the same school. According to Harding (2013), if a relationship has been developed between the researcher and participants, the interviews are more apt to provide useful data. However, I was careful during the interview to make sure that anything I heard did not bias my reaction or analysis (Harding, 2013). I was mindful that the interview did not become a two-way conversation. As the researcher, I was cognizant of maintaining rapport and an appropriate distance during the study (Harding, 2013).

The analysis of interviews followed the protocol identified by Harding, 2013. This process is called the constant comparative method. The constant comparative method was used to identify both similarities and differences within the data set. The constant comparative method originated in the grounded theory approach by Glaser and Strauss. However, Harding (2013) argued that it is the crux of all qualitative data analysis.

1. The interviews were recorded using an iPad. As per my consent letter approved by the Concordia University IRB, participants provided consent to participate.
2. Rev.com, an online transcription service, was used to transcribe the interviews.

3. After each transcription was completed, it was read and reread and reread to enhance validity.
4. Research questions were identified that each section of the transcript addressed. This action research study is guided by the following questions:
    a. What were the experiences of the fourth-grade teachers at an intermediate school in southern South Carolina regarding the integration of literacy and science?
    b. How did the fourth-grade transform before and after completing the intervention?
    c. How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in southern South Carolina change after an intervention was implemented?

    Annotations were made on the transcript using abbreviations to identify which question each section of the text aligned. The abbreviation RQ (Research Question) is used. Alignment to research questions adhered to interview questions located in Appendix A. Engaging in this process helped code and identify themes.
5. Pieces of data that were most relevant to the research questions were selected to include in the summary. As indicated in Step 4, responses were aligned to the research questions. Phrases that related to teacher experiences, integration, change, transformation, and views were the focal point of driving questions.
6. Repetition that needed to be eliminated were identified.

7. As these questions were answered using the transcripts, words and phrases were underlined in the transcript.
8. Only words were extracted from the interviews. Grammar was edited. In other words, when people talk, they might use “uh” or “um” and pause while answer questions. When extracting information that was used for the descriptive summary, these words will be deleted. Statements were written using the interviewees key words and phrases and edited and written correctly (see Harding, 2013).

Harding (2013) indicated that the constant comparative method can be used in qualitative studies to identify codes and themes because comparing and contrasting provides the foundation for all qualitative data analysis. The following steps guided the constant comparative method.

1. The first teacher was interviewed. As indicated in the interview analysis, information collected was aligned to this action research study’s questions.
2. After the second teacher was interviewed, the same interview analysis protocol was followed. Following the second interview, both teachers’ responses were analyzed for similarities and differences. To engage in this reflective practice, the research questions were the guide. The focus of the constant comparative method was on phrases that related to teacher experiences, integration, change, transformation, and views because these are the focal points of the driving questions. This process was used with each successive interview. Each participant’s interview was compared to those of her peers to identify similarities and differences (Harding, 2013).
3. As more interviews were added, I amended the similarities and differences list. This process continued until all interviews were completed (Harding, 2013).

4. After all interviews were finalized, research findings were identified. Descriptive summaries addressed similarities and differences in relation to the study's research questions (Harding, 2013).

Consistently adhering to the identified steps ensured validity of these data, I also kept a reflection journal to detail events that occurred during each interview. This journal helped me keep check of any possible bias (Harding, 2013; Hatch, 2002).

Observations

An informal observation method was used to capture as much data as possible to develop an accurate account of what occurred in teachers' classrooms. To narrow the focus, I identified key areas to look for prior to the observations (Harding, 2013). The observations took place only with the teachers' permission. A checklist (see Appendix B) of these categories was created and used during the informal observations to gather data (Harding, 2013; Stake, 2010). Appendix I provides an example of a completed checklist. Appendix M provides collective evidence of data gathered from the beginning to the end of the intervention.

Participants were made aware of the observation time and date. The information from the checklists was added to the coding process that began with the first interview session. These data were incorporated into the explanatory narrative (Harding, 2013; Stake, 2010; Stringer, 2014). As with the interviews, the constant comparative method was used to identify similarities and differences from data collected during the informal classroom observations.

Analysis of Observations Protocol

Classroom observations were structured. I created a checklist (see Appendix B) aligned to the research questions to identify specific behaviors observed during each informal visit.

Observations lasted 40 minutes. Participants selected the time and date for the observations (Harding, 2013). The process outlined by Hatch (2002) was used to analyze observations.

1. During the observation, the list of research questions helped keep the observations on track.
2. Harding (2013) referred to recording data as raw field notes. Raw field notes were recorded on the checklist using a check for each observed characteristic. A small column on the checklist was used for recording raw field notes.
3. As soon as possible after the observation, I completed the research protocols. The checklist and raw field notes were used to provide additional details. This process took approximately as long as the observation. By taking time to engage in this process, I wrote a descriptive account that provided a sense of being in the classroom setting during each informal observation (see Appendix L; Harding, 2013).
4. I engaged in the practice of bracketing during the observations. Bracketing is the craft of being aware of one's own assumptions, feelings, and misconceptions. For example, I was aware that seamless integration within content areas can increase achievement scores and student engagement. At the beginning of the study, the participants still taught each content area in isolated blocks of time. I had to be aware of my notions and personal beliefs and to be open and receptive to the actions of the teacher participants. During observations, I wrote my personal reflections and reactions in the margin of the checklist page (Hatch, 2002). Through this process, I kept my personal thoughts separate and focused on what was observed. By

working to put my personal views aside, I could focus clearly on data I collected during the observations (see Appendix P).

5. I kept a reflection journal in which I recorded experiences, ideas, fears, mistakes, breakthroughs, and problems that arose during the study. This strategy helped me keep track of any personal biases and feelings. I also used the reflection journal to select entries to use from the participants' journals (see Appendix L).
6. Finally, I knew when to stop. I continued to collect data until I could answer the research questions for this action research study.

The informal classroom observations provided useful data and evidence that indicated how the participants were or were not growing through the implementation of the intervention. The observations occurred throughout the intervention. These observations also provided data indicating where the participants were based on the Stringer's (2014) action research spiral.

Pre- and Posttests

Prior to beginning the treatment, the teachers administered a pretest to their students. The same test was given following treatment to measure student achievement (Connor et al., 2010; Caponera et al., 2016; Girod & Twyman, 2009; Greenleaf et al., 2011; Hall & Williams, 2015; Wallace & Coffey, 2016). Pre- and posttest collective averages were compared, and a narrative summary was developed to indicate growth. The participating teachers helped ensure these data were accurate (Stringer, 2014).

Reflection

During the research process, teacher participants engaged in reflective practice. At the beginning of the study, I provided the teachers with a journal and asked them to briefly reflect

daily, in writing, about what they did in their classrooms and what experiences they gained from doing so. This process enabled the participants to understand how they imparted knowledge to their students as well as determine what strategies were successful and what actions needed improvement (Harding, 2013). Reflections helped the participants identify any problems experienced during the intervention and if they were able to overcome them (Stringer, 2014). Teachers' reflections were summarized to provide evidence of teachers' growth regarding the integration of literacy and science.

Analysis of Participant Reflection Journals Protocol

Participants were invited to keep a reflection journal, which provided me with the participants' insights and thoughts during the study (Hatch, 2002). Expectations for journal entries were clearly explained to the participants. Well-defined directions about journal topics were explained. Participants wrote about successes and problems that occurred during the intervention. I analyzed journal data throughout the study. Journal entries were read to determine if participants were writing enough to provide understanding and that they were staying on topic. These two expectations led to rich data collection. To analyze the participants' journals, I read and reread each entry twice a week. Through the constant comparative method, words, phrases, and sentences were extracted and aligned with the research question they answered. Appendix J provides an example of a participant journal entry. Appendix Q provides a list of words and phrases extracted from a journal entry. Appendix R provides a sample constant comparative method word and phase list used to identify themes. This process helped me determine if the journal data answered the research questions (Hatch, 2002). To determine data that was used, the process was guided by the three research questions:

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

In my reflection journal, from each participant's journal I selected comments that aligned with the research questions. Comments were aligned to questions using the abbreviations RQ1, RQ2, and RQ3. In addition, phrases that related to teacher experiences, integration, change, transformation, and views were selected as these words provided the focal point of the research questions. Engaging in this process helped identify common themes, similarities, and differences.

Action research is cyclical. Even though this 7 consecutive week study ended, the process at the school continues to transform the participants' classroom instruction and methodology through the craft of integration (Herr & Anderson, 2015; Stringer, 2014). Stringer (2014) stated, "The steps and cycles of an action research process provide a compass or map that assists participants to track their progress, wherever and however they proceed" (p. 10). This cyclical approach continually improves educational practices in curriculum development and instructional processes. The participants will continue to grow professionally as they repetitively spiral through the *Look, Think, Act* Cycle (Stringer, 2014).

Limitations and Delimitations of the Research Design

Limitations and delimitations are conditions or circumstances that might affect the credibility of the study. This section provides information about possible limitations and delimitations and what I planned to do to ensure the trustworthiness of the study.

Limitations

Limitations refer to outside influences that the researcher might not be able to control. The outside limitations that might not be controllable in this action research study include time constraints, the setting, prolonged engagement, transferability, the pre- and posttests, and being a participant-observer (see Willis, 2009).

Time constraints. The literature review suggested administrators and school districts are increasingly moving toward a prescribed curriculum to increase student performance on state achievement tests. Administrators require specific time limits be allocated to each content area (Wills, 2009). Teachers are under pressure to ensure that their students perform well on state reading and writing assessments. For this reason, teachers often slight science to provide more time for literacy instruction because of pending time constraints (Plummer & Kuhlman, 2008). During this action research study, teacher schedules still adhered to the state's time allotment of 90 minutes of unencumbered English language arts per day and 180 minutes per week for science.

Setting. The setting was a limitation. This action research study took place in a National Blue Ribbon intermediate school in which I work, located in the southern part of South Carolina. I chose my site for not only convenience but the need for more interdisciplinary instruction.

However, this limited the possibility of studying different demographic groups, such as Title I Schools ("Stating the Obvious," 2017).

Prolonged engagement. Participants must be able to trust the integrity of the research process. To provide a feeling of trust, participants were provided adequate time and opportunities to express their experiences throughout the intervention. This included time to explore activities and describe issues pertaining to the purpose of the research (Stringer, 2014).

Transferability. The purpose of this study and its derived conclusions could useful to other schools. Even though the research was conducted at a specific site, the purpose is not site specific. As indicated in the literature review, schools throughout the United States confront time constraints and teaching-to-the-standards to ensure high student achievement on state achievement tests. More time is allocated to the tested content areas. Evidence indicated that integrating science and literacy improved student achievement in both areas. This study might be applicable to other sites because the procedures could be explored and utilized to achieve similar outcomes. For this to happen, a detailed narrative of the contexts, treatment activities, and outcomes will be provided (Stringer, 2014).

Pre- and posttests. The assessment used for both the pre- and posttests could be a limitation. The questions used were not pilot tested. The questions were not specifically identified as either assessing science or literacy. For this reason, improvement in both ELA and science might be inconclusive. The pretest was identical to the posttest. Students might have remembered items and answers from the pretest. Even though I trusted the teachers to adhere to the guidelines for the assessment, they might have "taught to" the test. For these reasons, the test score analysis could be a limitation.

Participant and observer. Acting as both a participant and an observer during the study could be a limitation. Assuming both roles might be difficult because I do not want my ideas or biases to influence the study. To ensure the credibility of the study, I used a research journal (Harding, 2013; Stake, 2010; Stringer, 2014) and bracketing (Hatch, 2002) throughout the duration of the study. In my research journal, I collected notes for the duration of the study. I included any personal biases or ideas that might influence the integrity of the study. Also, I engaged in the practice of bracketing during the observations. Bracketing is the craft of being aware of one's own assumptions, feelings, and misconceptions. For example, I am aware, based on existing research, that seamless integration within content areas increases achievement scores and student engagement. The participants still taught each content area in isolated blocks of time. I had to be aware of my notions and personal beliefs to be open and receptive to the actions of the teacher participants. During observations, I wrote my personal reflections and reactions in the margin of the checklist page (Hatch, 2002). Through this process, I kept my personal thoughts separate and focused on what was observed (see Appendix P).

Delimitations

Delimitations in an action research study are choices made by the researcher (Simon, 2011). In an action research study, the integrity of the processes must be maintained (Stringer, 2014). Therefore, the boundaries I chose also served as validity checks that enhanced the trustworthiness of the study. The boundaries I selected for this study were the sampling method, instrumentation, member checking, rich and thick descriptions, and reflexivity (Simon, 2011).

Sampling. Purposeful sampling was used to select participants from the fourth grade at an intermediate school located in southern South Carolina. I had previously established rapport

and connections with the teachers in this setting. The sample size included six teachers and 146 fourth-graders. I presented myself as a skilled, supportive, and approachable researcher (Herr & Anderson, 2015; Stringer, 2014). To ensure credibility, I was careful not to allow my own ideas or biases influence the study (Herr & Anderson, 2015; Stake, 2010; Stringer, 2014). The administrator is always seeking ways to transform educational strategies to provide an effective and enriching education for the students. This delimits possible complications at the study site (Hatch, 2002; Herr & Anderson, 2015).

Instrumentation. As noted earlier, by using triangulation, I was able to look again and again through several methods to ensure accurate findings. My study included interviews, observations, pre- and posttests, and reflections, which added to the integrity of the research process (Herr & Anderson, 2015; Stake, 2010; Stringer, 2014).

Member checking. The process of member checking provided participants with opportunities to review the analysis of data for accuracy. The participants were able to verify that the documented evidence was representative of their thoughts, perspectives, and experiences. It gave them the chance to clarify and extend the information as it related to their experiences during the action research study (Herr & Anderson, 2015; Stake, 2010; Stringer, 2014). When the research process began, participants were made aware of member checking. This helped them understand that they could provide additional information and make corrections to ensure that the final narrative was accurate and complete (Creswell, 2013; Stake, 2010).

Rich and thick descriptions. Data were presented in a detailed storytelling narrative (Creswell, 2013). As the narrative was written, participants read the story to ensure it reflected their experiences and perspectives accurately. The narrative was grounded by using the

participants' words and terminology to ensure it was easily understood by them (Stringer, 2014; Creswell, 2013).

Reflexivity. Reflexivity is a critical concept that is associated with enhancing the validity of a qualitative study. This process involves researcher reflection or the self-evaluation of how the research findings were collected, summarized, and communicated (Harding, 2013). Throughout the process, I kept a research journal, which helped me recognize my biases and subjectivity regarding the purpose of the study (Harding, 2013; Stake, 2010; Stringer, 2014). Journaling enabled me to determine how evidence was gathered and meaning produced by analyzing data. Findings were determined throughout the process. Through constant self-reflection and member checking, the final research was accurate and understandable by all participants and will led to a credible report (Harding, 2013; Stake, 2010; Stringer, 2014).

Validation. Validation refers to the credibility and dependability of a study. In this action research study, validation was ensured by the extent that the actions deemed appropriate to meet research goals were addressed and how these actions led to a possible resolution of the research purpose.

Credibility. To ensure this action research study was creditable, triangulation was used for collecting data. Gathering collection tools were interviews, observations, pre- and posttests, and reflections. Using different methods corroborated evidence from diverse sources (Creswell, 2012; Stringer, 2014). I relied on the constructivist learning theory to encourage a growth mindset of teacher participants. Teacher participants built knowledge through experiencing the intervention (Creswell, 2013; Danielson, 2007; Ravitch, 2016; Rebore, 2015; Richardson, 2003).

I further provided validity through member checking. Teacher participants were provided with transcripts from the audio recordings to check for accuracy (Stringer, 2014). The participants' stories were told using rich and thick descriptions (Creswell, 2013; Stringer, 2014). In addition, I kept all data collected and audio recordings. According to federal regulations, research data must be kept at least 5 years ("Research Records," 2017). Finally, identifying my position in the study was important. I clarified any personal biases at the beginning of the study and kept check that when analyzing data, I did not interject personal preferences (Creswell, 2012).

Dependability. Dependability refers to showing that the data collected are consistent and stable. Trustworthiness, part of dependability, was established through the consistency of data collection and representation. To ensure dependability, research procedures were clearly defined and open for review (Stringer, 2014). This action research study guaranteed that readers will be able to trust that all measures of the systematic research process were followed (Stringer, 2014).

Expected Findings

The intent of this action research study was to contribute to the existing research findings on how a seamless integration of literacy and science can improve student achievement in both content areas. Classroom teachers will continue to endure time constraints as they strive to teach their students' state-required standards in both literacy and science (Cox-Petersen & Spencer, 2006; Lapp et al., 2013; McEwan, 2012; Romance & Vitale, 2012). In the United States, high-stakes testing continues to be the most emphasized form of accountability. Reading and mathematics receive more attention because these scores are weighted more than science (Brassell, 2007; Kogan et al., 2016).

Based on information from the literature review, I identified the results I expected to uncover from beginning to end through each method of data analysis. The methods for this study were interviews, classroom observations, pre- and posttests, and reflections.

Interviews

Questions presented during individual interview sessions were designed so participants can express their thoughts and feelings regarding the purpose of this action research study (Creswell, 2013; Stringer, 2014; Hatch, 2002). I expected participants to indicate they were teaching ELA and science in isolation because of the emphasis on state achievement tests. I expected they would have limited time in a day to teach and that the primary focus of instruction would be ELA and mathematics because these content areas are weighted more according to the state's increment of scoring. I thought they would indicate they understood how to use informational text but that they would not understand how integrate ELA and science because they had not been taught how to do so and lacked sufficient planning time during the day. Throughout the study, I expected the answers to change as the teachers experienced how interdisciplinary instruction was beneficial to both content areas.

Observations

I observed phenomena related to the purpose of the action research study in the actual setting (Creswell, 2013; Herr & Anderson, 2015). I developed a checklist to use during observations (see Appendix B). At the beginning of the study, I expected the teacher participants would not organize lessons during the ELA and science blocks in a manner that would make connections to both content areas. I expected to hear recall questions instead of open-ended questions that would promote critical thinking. The teachers were accustomed to sitting at a

"small group table" to work with small groups of students. I expected they would have difficulty walking around, listening to groups of students working, and facilitating learning through thought-provoking questions. I also wondered if the teachers would have their students using interactive science notebooks as a formative assessment piece. However, as the study progressed, I believed the participants would demonstrate how to teach ELA and science through an integrated approach.

Pre- and Posttests

Prior to the intervention, the teachers administered a multiple-choice pretest. The questions were aligned to the state standards in both ELA and science. I predicted most students would not perform well on the pretests because they did not have the prior knowledge. Therefore, I expected the class averages to be low. However, when this test was administered as the posttest after the intervention, I expected student achievement to increase, thus increasing classroom test averages (Caponera et al., 2016; Connor et al., 2010; Hall & Williams, 2015; Girod & Twyman, 2009; Greenleaf et al., 2011; Wallace & Coffey, 2016).

Reflection

Reflection is an essential element in an action research study (Herr & Anderson, 2015; Stringer, 2014). Participants were provided with a journal and asked to honestly reflect about their experiences during each step of the study. Initially, I expected the teachers to include such thoughts as "This will not work. We do not have enough time to plan. Where do we find materials? How to we fit this strategy in with existing strategies? Our students perform well, so what difference will integration make?" Even though the participants willingly opted to engage in the study, I believed negativity and lack of desire to transform classroom practices would

dominate the initial responses. As the intervention progressed, I expected their reflections would become more positive. The teachers would want to use more effective strategies and methodologies for integrating the content areas. They would discover students were enjoying themselves, and the teachers would witness improvement in both formative and summative assessments.

In conclusion, interdisciplinary instruction is a strategy for maximizing instructional time during the school day (Nixon & Akerson, 2004; Sorvik et al., 2015). I anticipated that by the participants crafting instruction to promote the integration of literacy and science, each content area would receive more time during the day, resulting in improved achievement scores (Brassell, 2007; Connor et al., 2010; Enfield, 2014; Fang & Wei, 2010; Hall & Williams, 2015; Mantzicopoulos & Patrick, 2011; McDonald et al., 2012; Plummer & Kuhlman, 2008). This study contributed to previous research that focused on an integrated approach to teaching and evidence that teachers maximize time allotted during the school day to provide more efficient instruction in both content areas. The results suggested that content areas can complement each other, and that as a result student learning improves.

Ethical Concerns

Ethical procedures are an essential part of the action research process. Research institutions have established protocols for ensuring research is conducted ethically (Hatch, 2002; Herr & Anderson, 2015; Stringer, 2014). Ethical issues included assessments of potential conflict of interest and the researcher's position. To honor the Belmont Report, I abided by the three principles. First is respect for people. Participants were informed of any possible risks and benefits prior to consenting to joining the study (Adams & Miles, 2013). Confidentiality was

preserved by assigning each participant an alias. The second principle is beneficence. The Belmont Report defined beneficence as an obligation consisting of two complementary rules: do not harm, and maximize benefits and minimize possible harm. No one was harmed because of a lapse in confidentiality. The third principle is justice, which refers to who will benefit from the study. Participants benefited by growing as educators (Adams & Miles, 2013). The participating teachers increased their knowledge of how to integrate subjects, which I expected would improve student achievement in all content areas.

Conflict of Interest Assessment

Prior to conducting the study, I obtained approval from Concordia University's Institutional Review Board ("IRB," n.d.). Permission was obtained from the intermediate school and the school's administrative office located in southern South Carolina. This consent form provided a transparent summary of the action research study (Creswell, 2013; Stringer, 2014). Participants' signatures served as evidence of their intent to take part in the study voluntarily (Creswell, 2013; Stringer, 2014). Participants were recruited via an email invitation patterned from one presented by Creswell (2013). Interviews were audio-recorded and transcribed using the online transcription service Rev. The transcripts were sent to the participants for them to review, make changes as needed, and approve. Participant confidentiality was maintained in all documentation (Creswell, 2013).

Researcher's Position

I conducted and transcribed all interviews. Participating teachers had the flexibility to select times for the interviews in a setting in which I teach. As a veteran educator, I have a working knowledge of how to effectively implement integrated instruction. I am not an

administrator, but because of my knowledge of the research setting and related experience, participants viewed me as a credible researcher, one to whom participants would respond candidly in both interviews and reflections (Creswell, 2013; Hatch, 2002). Teachers received no financial compensation for participating.

Additional Ethical Concerns

Potential ethical issues that needed to be addressed included how the data were analyzed and reported. As an employee at this school, I reported multiple perspectives to maintain the credibility of the study (Creswell, 2013). When I communicated the findings, the language used was clear, concise, and understandable for audiences interested in the purpose of this action research study (Creswell, 2013).

Chapter 3 Summary

In Chapter 3 I described the methodology and action research design for the study. In this section, I provided the research questions, setting, participants, data analysis, limitations, and delimitations. In addition, I provided issues related to validation and dependability of the study. Finally, I discussed my role in the study. In Section 4 the results of the proposed study are documented.

Chapter 4: Data Analysis and Results

Introduction

In this chapter, I present the analysis of the pre- and posttest data, interviews, informal classroom observation checklists, and reflection journals. The purpose of this action research study was to better understand the experiences of six fourth-grade teachers at a school in southern South Carolina regarding the benefits of implementing an integrated approach to literacy and science instruction.

Description of the Sample

An invitation was sent to each of the six fourth-grade teachers at the school. All six fourth-grade teachers agreed to participate. I used pseudonyms to protect the participants' identities. In this study, teachers who had more than 10 years of experience were considered veteran teachers. Five of the teachers had more than 10 years of experience. The fourth-grade teachers had self-contained classrooms and taught all subjects (English language arts, mathematics, science, and social studies).

Table 1

Participant Demographics

Teacher (pseudonym)	Gender	Ethnicity	Years of Experience
Charlie	Female	White	>10 years
Madea	Female	White	>10 years
Jen	Female	White	>10 years
Jess	Female	White	>10 years
Paula	Female	African American	>10 years
Bee	Female	White	<10 years

Prior to moving to the selected school setting, Charlie taught third grade at another school in the district. She moved to her current location 10 years ago. She has her students sitting in teams where desks are pushed together. Her daily schedule is regimented. She adheres to the fourth-grade schedule where she completes instruction in one content area prior to moving to the next. Charlie is a kind person who loves family and animals. She thrives on spending time with her grandson.

Madea, a veteran teacher, has taught fourth grade for most of her professional career. She was a reading coach for a few years but realized her heart belonged in a regular classroom with her "own" students. She requested to return to the general education classroom. Madea has a growth mindset. She enjoys attending conferences, professional development opportunities, and networking with teachers. She continually improves her instructional practices and strategies so that learning is exciting for her students. Her students have fun while learning. Her students usually have the highest scores on the state achievement assessments. As a passionate educator, Madea spends most of her time preparing enticing lessons for her students. When not preparing lessons, Madea enjoys shopping and spending time with her two puppies.

Jen, a veteran teacher, has taught fourth and fifth grades. As a classroom teacher, she is firm and adheres to the school schedule. Instruction in all content areas revolves around the schedule. Jen depends on the science specialist to teach her students science. She has four small children and enjoys spending as much time as possible with her family. She attends professional development opportunities offered by the district, school, and during professional learning team meetings.

Jess, a minister's wife, has taught fourth and sixth grades. Like the other fourth grade teachers, Jess follows the fourth-grade schedule created by the school administrator. She likes incorporating technology into instruction. She has a degree in instructional technology and hopes to continue with a second degree. Jess, like Jen, teaches science using informational text only, the purpose of which is to apprise readers about explicit topics. The authors of informational text use text features that enable readers to locate specific facts that will help with student comprehension. Jess is also dependent on the science specialist to teach science to her students. She enjoys working with the school drama team. She freely gives time to volunteer to help after school twice a week. She has two adult daughters, one of whom just got married. She enjoys spending time with family and her two dogs.

Paula, a veteran teacher, has taught fourth grade for the duration of her career. She was transferred from another school in the district to the selected setting. She has been at this setting for 8 years. She engages in team planning with the other fourth grade teachers and shares ideas. Paula adheres to the fourth-grade schedule and prefers to focus on ELA and mathematics. Paula has a second job and is hard worker.

Bee is in her second year of teaching. She is filled with energy and eager to learn. She enjoys teaching science and frequently comes to my lab or calls me to see if I have materials she can use with her students. She seeks opportunities to continually improve herself as an educator. Prior to beginning her first-year teaching, Bee got married. For now, she enjoys spending time with her husband, their two dogs, and a new kitten. When I sent the email request to the perspective participants, Bee replied that she and the "Bees" were excited to be invited to participate. She calls her students "Bees" because she has a passion for bees. She constantly

learns new facts about bees, collects bee figurines, and is concerned about the possibility of the extinction of various species. She is an advocate for the environment.

Research Methodology and Analysis

This action research study was designed to address the integration of science and literacy to improve achievement scores. Action research is a collaborative approach to inquiry that provides the researcher and participants with a means for developing a systematic action or intervention that results in resolving an identified problem (Herr & Anderson, 2015; Stringer, 2014). Action research is different from traditional scientific research because it does not look for generalizable explanations for all environments. Instead, action research focuses on specific situations and targeted solutions (Stringer, 2014). Action research results lead to the development of new knowledge, the achievement of action-oriented outcomes, the education of the participants, and results that are relevant to the selected research site (Herr & Anderson, 2015; Stringer, 2014).

Stringer's (2014) basic framework of action research follows three phases: Look, Think, Act. (see Figure 1). This model inspires participants to start their inquiries in a direct manner and build the details of the process as issues arise during the study. Stringer's (2014) model applied to the study as participants remained active members during the research. Data were collected during the Look phase. During the Think phase, these data and participant feedback were analyzed. During the Act phase, new actions were instituted as a result of data collection, reflection, and analysis.

In the first phase, Look, I elicited information from the participants regarding their experiences and beliefs about integrating subjects, specifically science and ELA. Carefully

crafted, open-ended questions were used to encourage participants to express their thoughts and experiences. Through analysis of interviews, reflection journal entries, and classroom observations, I interpreted and began to understand the perspectives of each participant (Creswell, 2013; Stringer, 2014). The participants' responses indicated that they taught subjects in isolation and were not confident attempting to integrate different content areas as an instructional strategy. Throughout the action research study, questions were continually used to gather information (Herr & Anderson, 2015; Stringer, 2014).

During the Think phase (Stringer, 2014), I developed an intervention that integrated ELA and science. I reviewed the intervention with the participants prior to implementation. I requested input from the participants. However, they selected to implement the plan as written at the beginning of the study.

The participants executed the planned intervention during the last phase, Act (Springer, 2014). Participants engaged in active discourse during the intervention. They began to question their instructional strategies as they systematically used the initial treatment. They requested if they could add additional resources and strategies to enhance their instruction. Based on their reflections, they added additional instructional materials to the initial intervention. The strategies in the intervention encouraged teachers to question teaching in isolation and motivated them to include amendments to the initial treatment.

As the participants implemented the treatment, they reflected individually in journals (Herr & Anderson, 2015; Stringer, 2014). During the implementation phase, participants revisited identified plans, thought about them, and tried the outlined, integrated activities in their classrooms. Action research is cyclical. Following reflection upon what was learned as they

progressed through the study, the cycle started over. When the sequence started over, the teachers asked each other questions, added additional plans to the intervention, and implemented the new plans. In other words, during the treatment, the teachers began to look at their practices, think about what was or was not working, continually amended the initial intervention to include more integration, and implemented their changes during classroom instruction. The participants became engaged in the cyclical Look, Think, Act phases of action research as defined by Stringer (2014).

The paradigm that drove and supported this study was the constructivism theory of learning. The constructivist theory supports integrated contextual learning. That is, individuals do not learn based on isolated facts; instead, individuals learn in relationship to what is already known (Hein, 1991; Richardson, 2003). The theory of constructivism also recognizes that learning is a social activity, and that interactions with peers are an integral element of learning (Ackermann, 2001; Richardson, 2003; Hein, 1991).

This action research study used primarily qualitative data collection techniques; interviews, observations, and reflections. According to Harding (2013), qualitative data analysis involves gathering a data set, dissecting the data, and reassembling these data in a manner that is relevant and meaningful to the study. Harding (2013) referred to this type of qualitative data analysis as the constant comparative method. Harding (2013) argues that the constant comparative method is the basis for all qualitative data analysis because these data are constantly being compared and contrasted to identify common themes. The teachers gave a pretest at the beginning of the intervention. The same test was used as the posttest at the end of the study.

Class averages were calculated to determine overall growth in both content areas following the intervention.

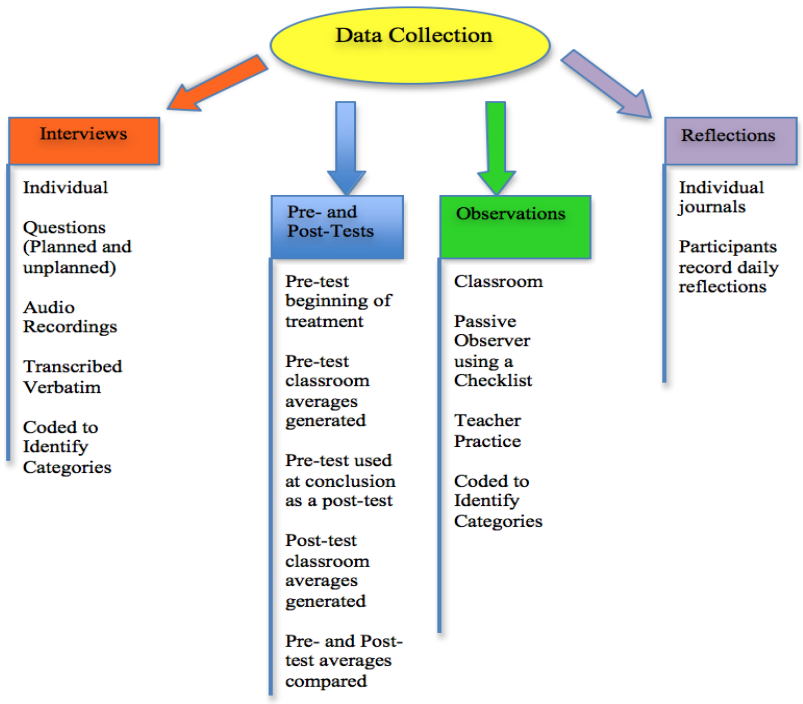

Figure 4. Data collection process.

These data analysis procedures selected provided information that addressed the three guiding research questions. Each research question was answered using a compilation of all types of data collected.

Interview Analysis Protocol

Interviews with participants were conducted face-to-face in each teacher's classroom. The participants were comfortable during the interview because we had previously established rapport. According to Harding (2013), if a relationship has been developed between the researcher and participants, their interviews are more apt to provide useful data. I was careful during the interviews to ensure that anything I heard did not bias my reaction or analysis

(Harding, 2013). I was mindful that the interview did not become a two-way conversation. As the researcher, I was cognizant of maintaining rapport and an appropriate distance during the study (Harding, 2013). Prior to the beginning of the interview, I informed the participants that I could only ask the questions and they would only respond.

The analysis of interviews, observations, and reflective journals followed the protocol identified by Harding (2013). This process is called the constant comparative method.

1. The interviews were recorded using an iPad. Participants provided consent when agreeing to participate.
2. Rev.com, an online transcription service, was used to transcribe the interviews.
3. After each transcription was completed, I read and reread and reread all data to enhance validity.
4. I identified research questions each section of the interview transcripts addressed. Annotations were made on the interview transcripts using abbreviations to identify which question each section of the text aligns. Abbreviations are RQ (Research Question)1, RQ2, and RQ3. Alignment to research questions adhered to the interview questions located in Appendix A. Engaging in this process helped identify themes that helped to answer each research question.
5. After annotations were made on the interview transcripts using abbreviations to identify the research question each section of the text aligned, I used the constant comparative method to extract words, phrases, and ideas that were common to each participant.

6. I identified any repetition that needed to be eliminated after coding to acknowledge common themes.
7. Through the constant comparative method, the following words and phrases were identified as codes, which led to my identification of five themes: time constraints (TC) teaching in isolation (IS), state standards (curricula) (SS-C) mandated state testing (ST), and integration (IN).

Two themes, *time constraints* and *teaching in isolation,* emerged from the following words and phrases that were common to each interview: literature is priority; teach in chunks; follow the fourth-grade schedule; isolation; schedule is separated for required minutes; spend right amount of time on each subject; and block time for each subject.

The theme *state standards* (curricula) emerged based on the following words and phrases: state standards; curricula based on state standards; address the state standards; teach all standards in in ELA and science; integration addresses state standards well; and using the intervention plan because it is aligned to the ELA and science standards. Curricula in all content areas are driven by the state standards, which are the vehicle for instruction because the standards identify what will be tested on the mandated state assessments.

The theme *state testing* was derived from the following words and phrases: literature is a priority; state testing at the end of the year; scores will improve because students are interested; intervention should help state assessment; must do well on the end of the year testing; and pressured to raise test scores.

The final theme uncovered was *integration*. Several words and phrases described integration: these are subjects mesh together; integration is integral; students do not know what subject they are doing; intervention helped make connections between science, literacy, and writing, we do not live in isolation; should not teach in isolation; not integrating before intervention; integration enables all standards to be rolled into one; integration helps with time; and writing and reading more in science.

8. Only words were extracted from the interviews. In other words, when people talk, they might use "uh" or "um" and pause when answering questions. When extracting information I used for the descriptive summary, these words were deleted. Statements were written using the interviewees key words and phrases. Statements were edited and written correctly (Harding, 2013).

Observations Protocol

I created an informal observation checklist (see Appendix B) aligned to the research questions to identify specific behaviors observed during the visit. Observations lasted 40 minutes. Participants were advised of the time and date that I would visit the classroom (Harding, 2013). The constant comparative method as defined by Harding (2013) was used to analyze observations.

1. During the observation, a list of research questions was used to ensure observations stay on track. A checklist was developed (see Appendix B) that would provide evidence for each research question.

2. Harding (2013) referred to recording data as raw field notes. Raw field notes were recorded on the classroom observation checklist using a check for each observed teacher behavior. A small column on the classroom observation checklist was used to record raw field notes.
3. Data collected during observations were tallied by theme and recorded on a summative observation checklist. During the intervention, each participant was observed twice. They were observed at the beginning and again at the end of the intervention. After each observation, a tally mark was placed in either the yes or no column on the summative checklist form. Yes, the behavior was observed or no, the behavior was not observed. The tallies were counted to determine the number of identified behaviors during the observation (see Appendix N).
4. I engaged in the practice of bracketing during the observations. Bracketing is the craft of being aware of one's own assumptions, feelings, and misconceptions. For example, I am aware, based on existing research, that seamless integration within content areas increases achievement scores and student engagement. The participants still teach each content area in isolated blocks of time. I had to be aware of my notions and personal beliefs to be open and receptive to the actions of the teacher participants. During observations, I wrote my personal reflections and reactions in the margin of the checklist page (Hatch, 2002). Through this process, I kept my personal thoughts separate and focused on what was observed (see Appendix P). By working to put my personal views aside, I was able to focus clearly on data collected during the observations.

5. After the observation, I filled in the research protocols (Harding, 2013). The completed research protocol was written to provide the reader with a sense of being in each classroom during the observations. The checklist and raw field notes were used to provide additional details. This process took approximately as long as the observation. By taking time to engage in this process, I was able to write a descriptive account that provided a sense of being in the classroom setting during the observation (see Appendix K).
6. Each section of the informal observation checklist was analyzed. Through the constant comparative method, the checklists were coded to identified themes from interviews and journal entries.
7. I kept a reflection journal in which I recorded experiences, ideas, fears, mistakes, breakthroughs, and problems that arose during the study. This strategy helped me keep track of any personal biases and feelings.

The informal observations provided useful data and evidence that showed what the participants were doing through the implementation of the intervention. The observations and the classroom observation checklists provided evidence of changes that occurred during the intervention Informal observation data were categorized as observations during the beginning and end of the intervention (see Appendix N).

Pre- and Posttests Protocol

Prior to beginning the treatment, the teachers administered a pretest to their students. The same test was given following treatment to measure student achievement (Connor et al., 2010; Caponera et al., 2016; Girod & Twyman, 2009; Greenleaf et al., 2011; Hall & Williams, 2015;

Wallace & Coffey, 2016). Pre- and posttest collective averages were compared, and results were represented in a graph.

Researcher Reflection Journal

In my research journal, I collected notes throughout the intervention. I began with the introduction to the intervention when I met with the fourth-grade team. I wrote notes about the discussion. I included my written notes as I constantly compared the interviews to determine similarities and differences. This process enabled me to code the data and identify themes as I collected data. I recorded notes from each in my journal in order to compare and contrast data gathered from the checklists. I either wrote or typed selected journal entries and used this method to align journal entries with RQs. I also recorded any information pertaining to study including conversations with the principal and reading coach, observations of displayed student work, and conversations with teachers.

The Action Research Spiral

Stringer's (2014) action research model is cyclical in nature. Both myself as the teacher-researcher and participants continually cycled through the Look, Think, Act phases as they worked toward viable solutions to the research problem. Stringer (2014) used an interacting spiral to show how the cycles of the research are constantly repeated. Each Look, Think, Cycle constituted one spiral in the research process. As each plan was completed during the intervention, participants reviewed their actions (Look), analyzed successes and challenges (Think), and reacted (Act) again as they modified their initial actions and applied new practices into their classroom settings. Figure 5, previously discussed in Chapter 3, provides a summary of what happened during each of the three phases (Stringer, 2014).

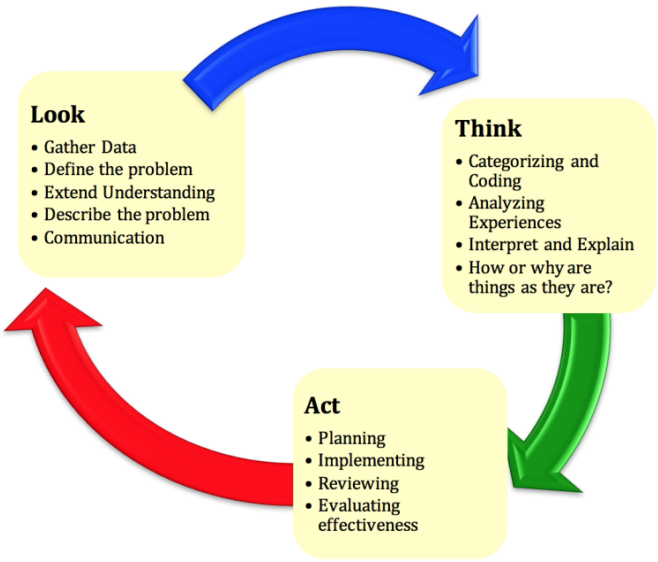

Figure 5. Summation of steps in Stringer's (2014) Look, Think, Act cycle.

The spiral indicated how the participants progressed through each Look, Think, Act cycle. Stringer's (2014) model begins with the initial Look, Think, and Act spiral located at the bottom of the spiral. For clarity, one page will be dedicated to each spiral the participants progressed through during the action research study. The model for this study began with the initial spiral and progressed to the final one. During the Look phase, data were gathered to define and describe the problem. Throughout the Think phase, exploration, analysis, and interpretation became the focus. This phase explained how or why things are as they are in the classroom setting. In the Act phase, a course of action was defined based on the analysis of the situation. During this stage, specific actions were implemented and evaluated for effectiveness. Then the cycle or spiral started over (Stringer, 2014). These spirals provide an overall summary of how the action research cycle evolved during this study. To identify each spiral of this action research study, the following headings are used: The First Spiral, The Second Spiral, The Second Spiral, The Third Spiral, The Fourth Spiral, and The Fifth Spiral.

The First Spiral

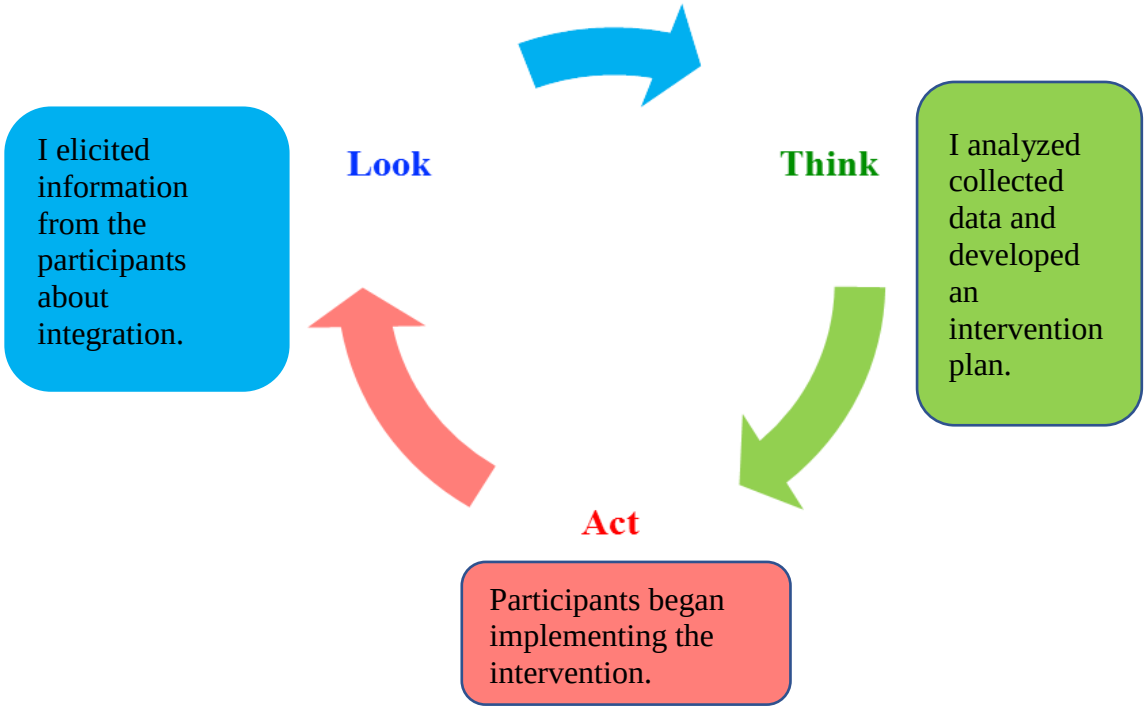

Figure 6. The first Look, Think, Act spiral.

Prior to the intervention, I met with the fourth-grade participants to identify their thoughts about integration. Based on the principal's expectations, they knew there was a need for more integration between content areas in the classroom. The fourth-grade team decided they would focus on an intervention that would integrate both ELA and science content. I developed an intervention complete with prepared resources needed to implement the plan, and I shared and discussed the intervention with the participants. Following the discussion, the participants began implementing the plan in their classrooms. They opted to use the initial plan because they knew additional queries would arise during the study.

The Second Spiral

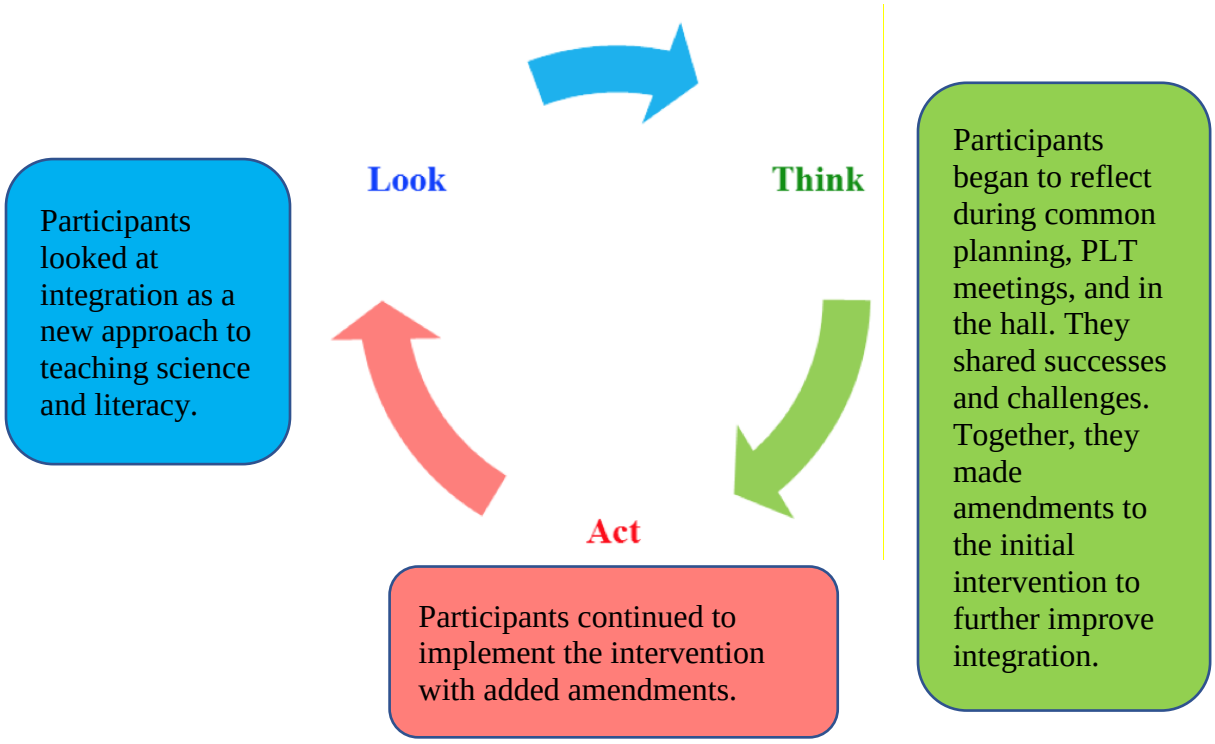

Figure 7. The second Look, Think, Act spiral.

I met with the participants during professional learning team meetings (PLTs) during the intervention. Prior to the meetings, the teachers were discussing the intervention and how their personal knowledge changed because of their experiences. They shared successes and challenges of the various strategies and activities used in the intervention. The teachers were reflecting to determine where they needed to improve instruction. They asked if they could add more to the intervention including science investigations, interactive notebook activities, informational texts, and writing ideas. They continued to implement the intervention with amendments (see Appendix R).

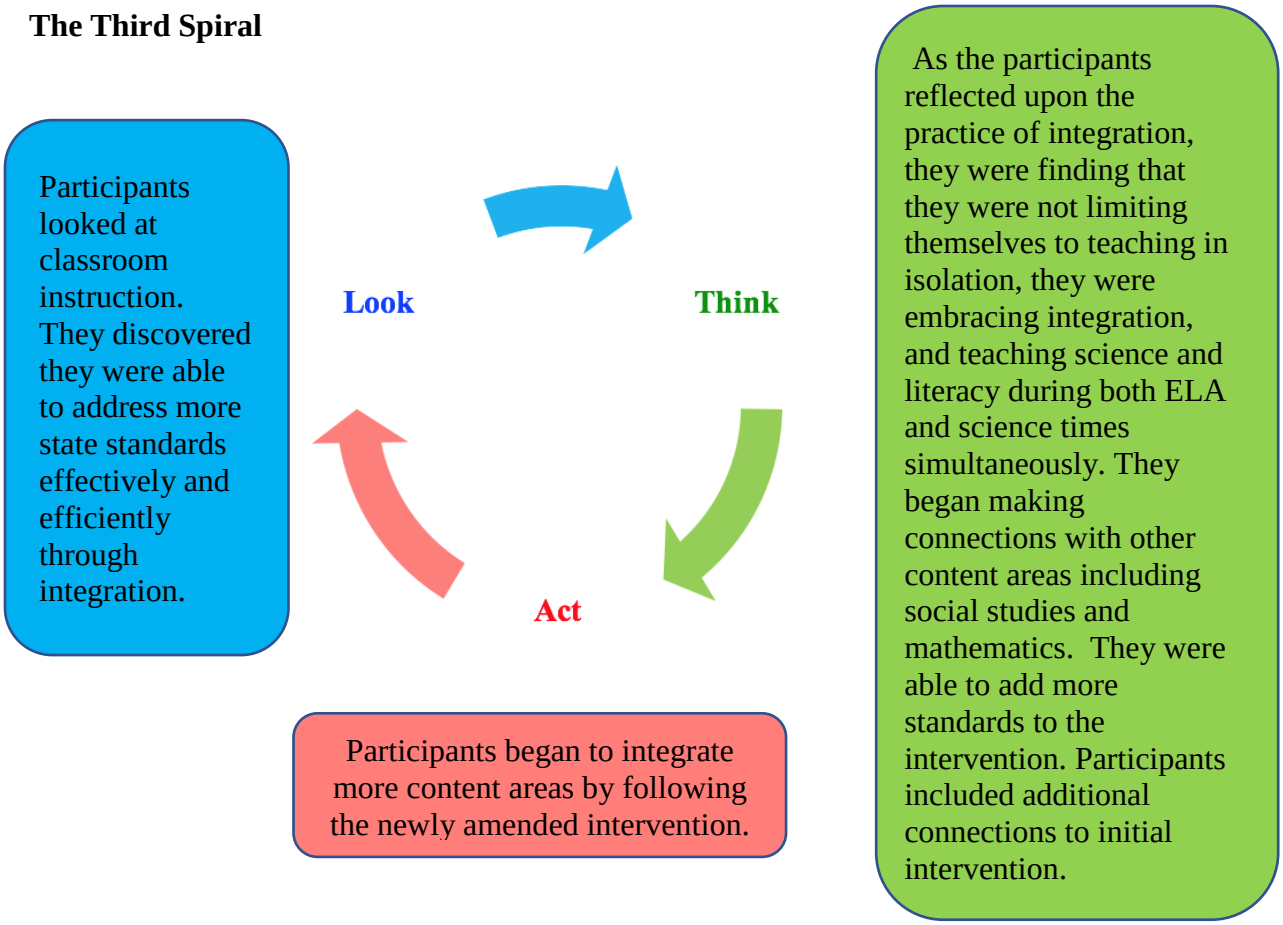

Figure 8. The third Look, Think, and Act spiral.

Teachers were integrating science and literacy more effectively and efficiently. They adhered to the fourth-grade schedule to ensure they arrived at special areas, lunch, and recess on time. Through integration, they discovered it was still possible to meet the maximum number of minutes, 90 minutes, for ELA required by the state. They were teaching both ELA and science together. In addition, the participants were integrating more subjects including social studies and mathematics. For example, during the study of indigenous peoples and the explorers, the teachers were incorporating climate because weather was the science focus during the study. Teachers were teaching math skills, especially measurement during science.

The participants discovered that making connections between subjects helped their students better understand both ELA strategies and science content. The students wrote during science and used essential vocabulary required by the state standards. Teachers were continually progressing toward making connections between all content areas. As one teacher said, “We do not live in isolation. Therefore, we should not teach in isolation.” The teachers expressed that by making connections between content areas, they were helping the students make real world connections.

Prior to the intervention, the teachers discussed how they felt rushed to teach all the standards prior to the mandated state achievement tests in the spring. As they worked toward integrating not only ELA and science but also mathematics and social studies, they shared that they were addressing more standards and felt more confident that their students were learning more because integration leads to more effective instruction. In addition, they discovered that integration leads to more efficient use of instructional time.

The Fourth Spiral

After spending time reviewing the intervention and talking with the participants about their progress, my principal approached me and asked if he could use the intervention and pre- and posttest scores for his required district evaluation. He said wants all classes to become seamlessly integrated. In other words, his goal is for the district is to walk into a classroom and not know where one subject ends and another begins. He indicated he believes my intervention was the beginning of this process and was sure that the teachers would work toward integrating content areas. In addition, he asked the school reading coach to work with fifth grade to write a similar intervention plan for fifth grade integrating ELA and social studies.

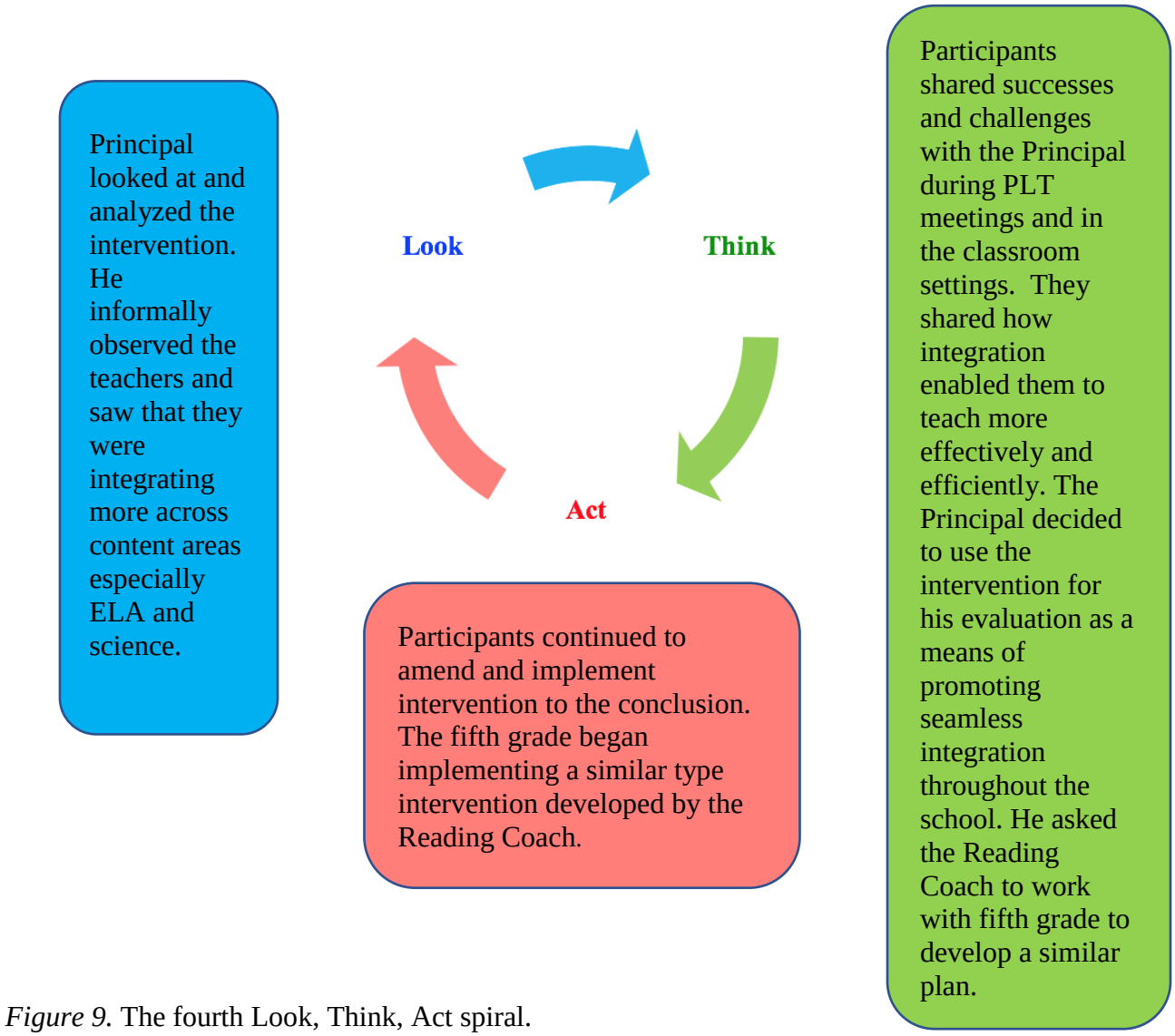

Figure 9. The fourth Look, Think, Act spiral.

The Fifth Spiral

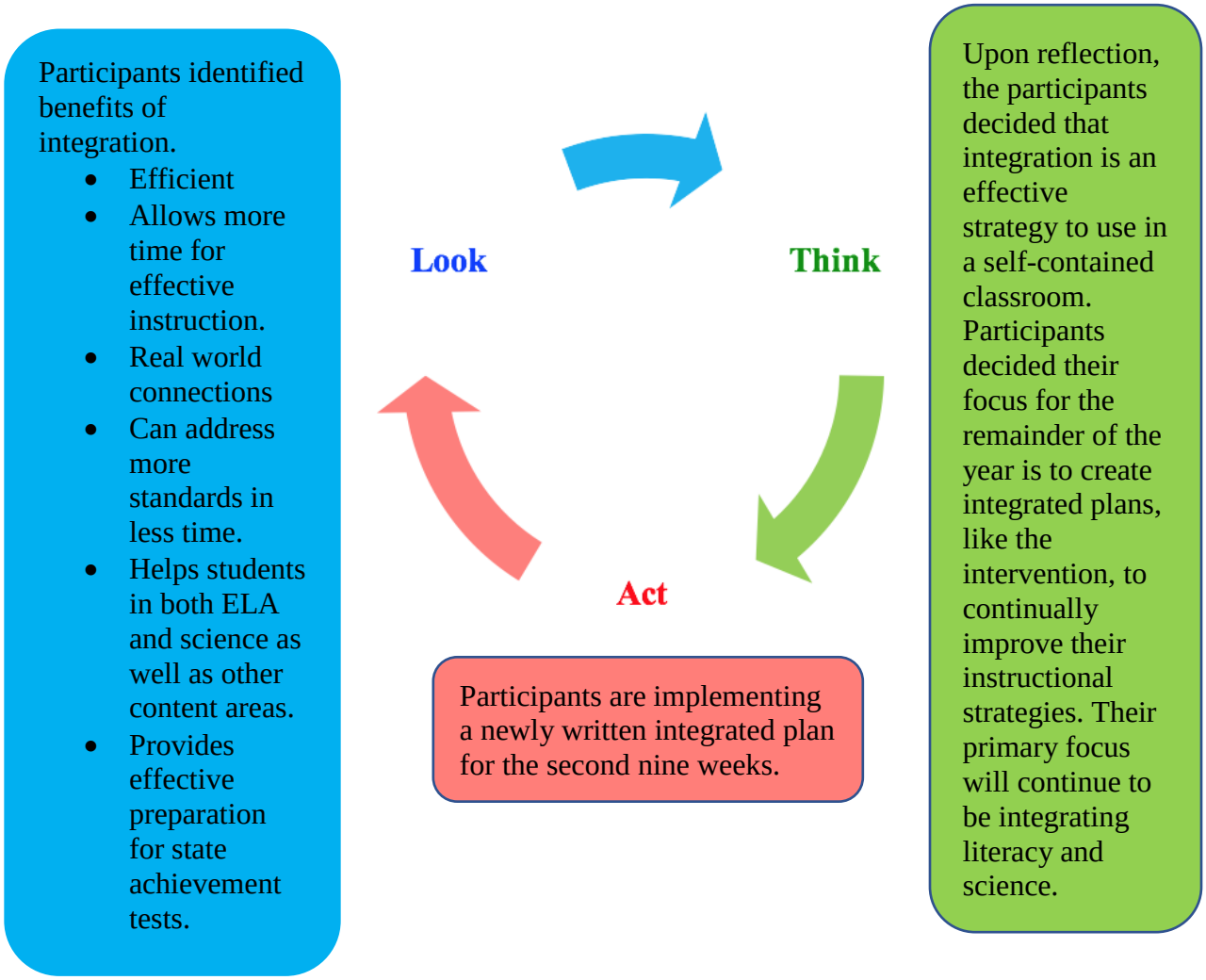

Figure 10. The fifth Look, Think, and Act spiral.

At the beginning of the second 9 weeks, the fourth-grade team had to submit a focus plan. Their focus was to continue honing their skills and strategies to enhance integration between ELA and science as well as including social studies and mathematics when possible. The fourth-grade team members decided they needed to follow this process for the remainder of the year

The participants' transformation during the fifth spiral supported Stringer's (2014) theory of action research. Stringer (2014) stated action research is focused on a localized problem identified in a setting and the problem being investigated is a concern to the selected participants. During the study, the participants needed to understand how instruction was happening in their classrooms and what needed to change. They moved from teaching in isolation to using strategies to promote integration between science and literacy. This instructional transformation was created by their continued engagement in Stringer's (2014) Look, Think, Act cycle. During the Look phase, participants gathered data to define and describe instructional strategies. In the Think phase, they explored, analyzed, and interpreted these data. For the Act phase, a course of action was defined based on the analysis of the situation. During this stage, specific actions were implemented and continually evaluated for effectiveness. Then the cycle or spiral started over (Stringer, 2014). When each Look, Think, Act cycle was completed, one spiral was finished and then the process starts over with Look, Think, Act. Each Look, Think, Act cycle constituted one spiral in the research process (Stringer, 2014).

As the spirals indicated, the participants explored their experiences while implementing the intervention. They gleaned clarity and understanding of the activities outlined in the intervention, and they used their newly acquired understandings and knowledge to construct effective solutions for the focus of the study (Stringer, 2014). In other words, once the participants realized the benefits of integrating literacy and science, they began adding additional activities to the initial intervention to provide a more comprehensive solution. The cyclical process led teachers to implementing more sustainable solutions to transform instructional strategies (Stringer, 2014).

Summary of Findings

Action research is a collaborative approach to examining a specific problem by taking systemic action (Stringer, 2014). Stringer's (2014) basic research model of Look, Think, Act is used to guide the action research process. During the Look phase, the focus is on collecting data and defining the problem. Throughout the Think phase, the focus is analyzing, interpreting, and theorizing transpires. During the Act phase, action occurs. The plan is implemented and evaluated for effectiveness (Stringer, 2014). The action research spirals above highlighted the actions that emerged throughout this action research study and its continuous cycles.

In the first Look phase, the participants shared their thoughts and experiences with integrating content areas. During the Think phase, these data were analyzed, and an intervention plan was developed. The participants implemented the plan as written during the Act phase. When the second iteration began, the Look phase started with the participants viewing integration as an effective instruction strategy. During the Think phase, they analyzed the intervention and made amendments. In the Act phase, the teachers continued to implement the revised intervention. During the third iteration of the cycle, the Look phase began with the participants looking at how efficient their instruction was becoming due to integration literacy and science. In the Think phase, they continued to analyze the practice of integration and began theorizing how to make connections with addition content areas. As a result, they amended the intervention to include social studies content with weather. During the Act phase, they implemented the once again revised intervention to include additional content areas. In the fourth phase of the cycle, the Look phase included the principal observing the integration process of ELA and science in the fourth-grade classes.

The principal gathered information during his visits. During the Think phase, the participants shared successes and challenges with the principal. He listened and joined the conversation as the teachers continued to analyze their progress and amend the intervention. In addition, the principal asked the reading coach to develop a similar plan for fifth grade that integrated ELA and social studies. Throughout the Act phase, the participants continued to implement and amend the intervention. In addition, the fifth-grade teachers began a similar process with the reading coach. With the start of the fifth iteration of the cycle, the Look phase involved the participants identifying the benefits of using integration as an instructional strategy. During the Think phase, the participants analyzed their experiences during the study and deemed that integration was an effective strategy. To continue their learning, they decided their grade level focus plan for the remainder of the year would be to develop plans that integrated literacy and science as well as include other content areas. In the Act phase, the participants began implementing the new integrated plan for the second 9 weeks.

After participating in the study, the participants' positive experiences transformed their instructional strategies. For this reason, the action research model will continue to spiral in this learning setting. This transformation confirmed Stringer's (2014) action research process. Throughout this action research study, collaboration was key (Stinger, 2014). The "subjects" are regarded as equal participants in the research process. As the principal investigator, my role became less facilitative and less directive during the process. Action research helps all stakeholders study a phenomenon they are faced with and how to continually go through the cyclical process to gather data, analyze and theorize, and develop potential solutions (Stringer, 2014). Details of how these actions evolved were discuss in the Action Research Spiral section.

Presentation of the Data and Results

To analyze these data collected from this action research study, I used Harding's (2013) constant comparative method. According to Harding (2013), qualitative data analysis involves gathering a data set, dissecting the data, and reassembling these data in a manner that is applicable and meaningful to the study. Harding (2013) termed this qualitative data analysis as the constant comparative method. Harding (2013) argues that the constant comparative method is the foundation for all qualitative data analysis because these data are constantly being compared and contrasted to identify common themes. I organized these data collected from interviews, informal observations, journal reflections, and pre- and posttests to support the three guiding research questions.

The research questions follow:

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

The themes that emerged through constant comparative analysis from interviews, reflective journals, and classroom observations were *time constraints, isolation, state standards (curricula), integration,* and *state testing*.

Overview of Teachers' Experiences

During this action research study, the participants' experiences changed from the beginning of the study until the end. When the participants began the study, they were teaching both ELA and science in isolated blocks of time. They taught each subject according to the time frame provided on the fourth-grade schedule. Time constraints guided the amount of time they allowed for content area instruction. The participants focused on the state standards as the basis of their curricula. They addressed state standards in isolation when teaching each subject. As the intervention progressed, the teachers began to integrate ELA and science. As the intervention progressed, the teachers discovered they were teaching both ELA skills and science content together. Even though they continued to adhere to the time frames on their schedule, the teachers were integrating science and ELA throughout the day. The teachers discovered that by using integrated instructional strategies they could incorporate both science and literacy standards more efficiently and effectively. By the end of the intervention, the participants noted that their students did not know when ELA ended and science began. Through the seamless instruction of ELA and science, the students were learning skills in both content areas simultaneously. The participants believed that utilizing integration strategies would help improve student scores on both the ELA and science state achievement tests. As the intervention concluded, the teachers transformed their instructional strategies to include integration. Their transformation, because of the study, led them to set integration as their focus for the remainder of the school year.

Research Question 1

What were the experiences of the fourth-grade teachers at an intermediate school located in the southern United States regarding the integration of literacy and science?

The themes that supported RQ1 were *time constraints, teaching content areas in isolation,* and *the state standards (curricula).* Prior to the intervention, the participants adhered strictly to the schedule created by the principal. The participants taught each subject during the designated time, as was demonstrated in data collected from both interviews and journals.

Time constraints. At the beginning of the intervention, the participants described classroom environments that adhered to predictable structures. The predictable structures or daily schedules indicated that they were limited to time constraints for each content area.

Jen said that her students have rules and procedures they are encouraged to follow. She indicated that her class follows the fourth-grade schedule. For example, from 8:00 am to 9:00 am, the students read. From 9:00 am until 10:00 am, they write. Jen reiterated how she adheres to the time constraints as outlined by the administration. She said,

> I have not had much time to do science lessons because math needs two lessons per day. Language arts and social studies standards are taking time, too. There is no time for science labs.

Following a PLT meeting, I had a conversation with the fourth-grade team members. Jen stated they were informed they must teach mathematics twice a day because the state assessment scores for mathematics were low. In addition, she said if she skips a content area during the day to complete all mathematics for the day, she usually misses science. Jen said, "I skip science except for using the textbook to teach content. I use the science time on the schedule for extra math time."

During our conversation, both Madea and Charlie confirmed Jen's statement. Madea replied,

> You know how low our math scores were last year. We have a consultant coming in changing how we teach math and is insisting that we teach math twice a day. I am trying to put more science in ELA like you suggested so I can catch-up on math during science or social studies time if needed.

Charlie said, "I like science. I do not like to skip science. But we have been told to get math in either during science or social studies times so our scores will go up."

Bee added,

> I always follow my schedule. Now the administration is changing the schedule because the consultant said to do so in order to teach more math. I know will be skipping either science or social studies in order to get all the math taught.

Madea described the difficulty of creating a student learning environment "because we are expected to follow the fourth-grade schedule we were given at the beginning of the year." She said that literacy and mathematics are the primary focus because the scores for these content areas are weighted more than science and social studies. During the interview, I asked Madea how many minutes fourth-grade teachers are expected to teach ELA.

Madea stated,

> You know we must have at least 90 minutes of unencumbered ELA instruction per day. Right now, we have 60 minutes of ELA, go to special area, and return to continue the remaining 30 minutes. We are trying to change our schedule so we can go to special areas at 10:00. That would give us the entire 90 minutes without interruption.

Charlie confirmed Madea's statements by noting my own experience as a teacher:

> You taught general education. You understand that we are expected to teach reading and

and writing for 90 minutes. Our schedule indicates that we must teach reading and writing in the morning.

These data indicated that the teachers were expected to adhere to specific time frames and time constraints for instruction. Administration wanted to ensure the teachers were doing all they could to improve ELA and mathematics state achievement scores.

I noted that when I informally observed Jess, she ended science abruptly and stated, "Students, we will have to finish science tomorrow because it is time for math." She provided no closure to the lesson. Instead, she quickly collected materials and promptly changed instruction to mathematics.

Teaching content areas in isolation. During the interviews, the participants were asked to describe a typical day in their classrooms and explain their instructional strategies. At the beginning of the intervention, the participants were teaching science and literacy in isolated blocks of time. The participants said they were trying to integrate social studies during ELA, but not science. Madea stated,

> My instructional day consists of subjects taught in isolation. I have always thought that teaching science was the science lab teacher's job, not mine. Literature is my top priority. I have worked on integrating social studies with ELA because it is easier than science. However, subjects are usually taught in chunks. Science is an isolated subject and usually, so is math.

Jen continued to explain how she followed the provided schedule:

> By this time of year, they are really up and running and there are limited interruptions during ELA time. I spend more time teaching literacy than science. I have to be sure I

teach all subjects during the day. So, I follow the schedule to make sure I get [all content areas] into each day.

Both Bee and Charlie said they followed the provided schedule because of the time they must focus on the different content areas. Bee posited, "We follow the daily schedule. The schedule is separated to make sure we get in the required number of minutes for all subjects."

Charlie confirmed Bee's statements. "We follow a schedule. We block time for each subject."

Paula said, "I follow the schedule and I teach subjects in isolation."

The constant comparative method provided evidence that at the beginning of the intervention, the participants followed the fourth-grade schedule. By following the schedule, they taught skills in isolation based on the time frame in which each content area was expected to be taught.

State standards (curricula). These data analysis indicated that the participants used the state standards to drive their instruction. The state standards were the focus of instruction for ELA and science. During the interview process, the participants were asked to describe the curricula they used for ELA and science instruction.

Madea said, "We use the state standards to teach by."

Paula stated, "The curricula is based on the state standards."

Jess concurred with Madea and Paula. "We use our science books to address the state standards."

Bee replied, "The standards are used for all instruction."

Charlie said, “For my curriculum, I am using the intervention plan because it is correlated to the state standards.”

The data analysis indicated that the participants used the state standards to drive their instruction for ELA and science. The participants used district provided materials and supplemental resources to enhance student understanding of the state standards.

Jess said, “We get supplemental materials from the website *Teachers Pay Teachers*. The materials we got are based on our state standards. We have to supplement because the state adopted materials do not completely address all the state standards.”

Madea stated, “I use the district science kits because they purchased them to help us teach the science standards.”

Bee said, “In addition to Journeys [the district adopted reading program], I use Story Works Magazine because it has science content that addresses the state science standards.”

Charlie said, “For reading and writing, I group my students based on their Measures of Academic Progress (MAP) data because these data are aligned to the state standards and predicts how students will perform on SC READY, the state achievement test for reading and writing.”

Through the constant comparative method of collected data, the evidence indicated that the participants used the state standards to guide instruction. They used district purchased materials that are aligned to the stated standards in addition to additional materials to ensure all standards

Through the constant comparative method of collected data, the evidence indicated that the participants used the state standards to guide instruction. The state standards provide the basis for instruction in all content areas.

Research Question 2

How did the fourth-grade teachers transform after the study?

All five themes that emerged from the interviews, reflective journals, and informal observations supported RQ2. The themes were *time constraints, isolation*, *state standards (curricula), integration,* and *state assessments*. Data collected from interviews, journals, and informal observations provided of evidence of how the participants began to transform their instructional strategies during and following the intervention.

Time constraints. As the intervention progressed, the participants began to look at the fourth-grade schedule. Their ideas of when to teach each subject changed. The evidence indicated that even though the participants continued to follow the schedule, they were less concerned with teaching a specific subject during the scheduled blocks of time. Instead, they were beginning to integrate and focused on the schedule only to ensure they arrived at lunch, recess, and special areas on time.

Paula was trying to include more science during literacy time instead of teaching the two content areas separately. Paula stated, “I now follow the schedule because we have to in order to get to special areas, lunch, and recess on time. But I am trying to teach literacy and science together even if it is not time for science.”

Referring to how integration seemed to reduce time constraints and how she viewed the provided schedule, Madea stated:

> Even though I follow the times provided on the fourth-grade schedule, I am combining ELA and science during the designated times from each of these content areas. Integration seems to add more time to the day. It is like it all [content areas] just meshes together.

Bee discovered that she did not have to teach the subjects according to the schedule. She began to realize that content areas overlap. Bee said, "If I do not complete literacy during the ELA block, I know I can easily complete it during science time."

During the intervention, I conducted informal observations. According to the classroom observations, the teachers were beginning to preplan for integrated activities to ensure efficient use of time. They were more focused on using strategies that effectively integrated ELA and science than the actual times indicated on their schedules. One teacher did need to stop instruction because it was time for special areas.

Teaching content areas in isolation. During the intervention, the participants continually reflected upon their instructional strategies. They looked at what they were doing and thought about what they needed to change to move from teaching science and literacy in isolation to using a more integrated approach. As the participants reflected, they began to make connections between the two subjects. These connections led them to planning a more integrated approach to learning.

Prior to the intervention, Jen taught subjects in isolation. She would complete one lesson in on subject prior to moving to the next. Jen stated:

> The intervention has helped me to see that I do not have to teach subjects by themselves. The intervention helped me to connect science, writing, and reading. We now sing raps,

write poems, write narratives, and bring science into literacy. I now know to include literacy mini-lessons in science and not just in ELA.

Bee also thought the intervention helped her understand how to use strategies to integrate instruction. “This intervention that helped me better understand integration,” which, Bee said, “has helped me learn that connections can be made between both subjects. I missed these connections before because I taught them (literacy and science) in isolation.”

Preceding the start of the intervention, Charlie was concerned about how to teach science and literacy together. However, after reflecting upon her practices and working toward integrating ELA and science, Charlie stated,

> Now I am using a variety of informational science texts during both science and ELA. I am finding that it is easier to integrate science and literacy than I thought. I am able to make more connections between reading and science than when I was teaching each subject separately.

Jess believed that only social studies and science could be taught together until she began implementing the intervention plan during the act phase of Stringer’s (2014) Look, Think, Act spiral. Jess stated, “I have found that I can use more ‘in-depth’ science informational texts to teach both reading skills and science content. These (science and literacy) do not need to necessarily be taught separately like I thought.”

Data collected from informal observations supported that teachers were moving from teaching science and literacy in isolation to utilizing a more integrated approach. The observations provided evidence of integration between ELA and science and the use of strategies that integrated both content areas. These strategies included using close reading with

informational texts (science content), summarizing data in interactive notebooks, and mentor texts (science content) as a model for writing informational pieces.

These data collected from the participants indicated that they are beginning to change their instructional strategies from teaching in isolation to using a more integrated approach. As they progressed through the intervention and continually reflected, they began to add additional activities to enhance the integration process. As Jess stated, "We are sharing with each other and we are reflecting more to improve integration in between ELA and science."

State standards (curricula). As the teachers continued to implement the intervention, they used the state standards (curricula) to guide instruction in both ELA and science. However, the teachers were beginning to make connections between both ELA and science standards instead of addressing them in isolation. As the participants began making associations, they were able to help their students make connections between subjects.

When the intervention began, Madea taught the students the standards in isolation—for instance, only the science standards during science. As she began making connections through integrating instructions, Madea's instructional practices changed: "My instruction aligns to the state standards. As I worked through this plan, I saw how I could address more content standards, like science and literacy, into one lesson. This process helps my students make connections, too"

Paula realized that she was beginning to make connections between literacy skills, writing, and science by participating in this action research study. She discovered she was using more standards during instruction. Paula stated, "We are incorporating literacy into everything

we teach including science. The writing program we use is based on the state standards. Students are using notebooks to collect data in science. This is also in the state standards for science."

Data collected from informal observations supported that teachers were continuing to address the state standards during instruction. They were beginning to present the overview of lessons with connections to both ELA and science standards. In addition, the observations provide evidence that they were also beginning to relate lessons to previous and future studies that were also standards-based.

Integration. When the participants put the intervention plan into action, they were teaching ELA and science as isolated subjects. As they progressed through the action plan, they began reflecting upon each activity. They discovered that using integration as an instructional practice led to more effective instruction because the students were making connections across content areas.

Madea, a veteran teacher, thought science and mathematics needed to be taught in isolation. However, by participating in the study, she said she became open to the idea of integration:

> The activity *Water Wonders* opened my eyes to integration. This activity helped me understand that reading, writing, personification (acting), and science can be taught in one lesson. During this activity, my students even wrote factual stories through the eyes of a water droplet. I just never realized how much can be accomplished in one lesson if I take the time to think about it when planning. Connections can be made across all subjects.

Bee, a second-year teacher, taught literacy skills using fiction books. She discovered that she could teach writing using an informational text as a mentor text. She realized that using this strategy was integrating literacy and science. Bee said,

> There are picture books that are science-based. I have one. We just studied clouds and the book was called *Cloudette*. It talked about this cloud becoming named Cloudette. The book has a storyline, but it also includes factual information. The students followed the author's style (teaching writing using a text model) to write their own book about the adventures of a water droplet in a cloud. Reading and writing are really in all subjects including science. It (literacy skills) can really be integrated.

Paula shared that she was glad to have the opportunity to try to learn to integrate through the proposed intervention. As she reflected upon her actions during the intervention, she discovered she was teaching literacy skills in isolation and then integrating those skills into science. Paula explained,

> Sometimes when I have a particular topic I am focusing on in literacy, I might teach that skill in isolation for just a moment. Then I take that one skill, like writing a Haiku, and incorporate that it into another subject. I will be able to use it in science to teach the students how to write a poem about whatever we are learning in science.

Jen was asked to explain the strategies she used to teach science and literacy to her students. Using literacy as her focus, she described how she now integrated the content areas and why:

> Literacy is the background for everything. Using literacy skills is the most important skills the students learn. Literacy encompasses not just reading and writing, but science

as well. Communication is both a literacy and science skill. They go together. Scientific research and learning must be communicated. Integrating literacy with science has to happen. Before beginning the intervention, I do not think the students were able to make connections between the two subjects. As I began to understand the connections, I have been able to help them make connections between science and language arts. I am purposefully showing them how each part of what they are learning is connected. It is becoming much easier to combine content areas. I am not only integrating science with ELA, but I am also including mathematics.

The informal classroom observations provided evidence that the teachers were beginning to integrate content areas. They were using more strategies to show connections between literacy and science. These strategies included group work, collaboration, responding in writing in science notebooks, and communication.

State testing. Schools are rated on student scores earned on mandated state achievement tests. The state required tests are aligned to the state standards for all content areas. Before beginning the intervention, the teachers administered a pretest. The same test was used at the conclusion of the intervention to determine growth. The test was aligned to the state standards. The participants were asked if they thought the scores would improve following the intervention. Each participant thought the posttest scores should improve following the intervention.

Bee stated, “Integration should help raise test scores not only on the posttest, but also help raise the scores on the end of the year state testing in ELA and science.”

Jen said, “The posttest scores will improve because the students are making connections between subjects.”

Paula indicated that the "posttest scores will improve because the students seem more interested in learning about science."

Jess stated, "Science and ELA are tested at the end of the year. We must do well on both tests. Hopefully, using more integration will help improve both the posttest scores and the state mandated ELA and science assessments."

The informal observations provided evidence that the participants were beginning to use formative assessments that addressed both literacy and science standards. Observation data is used to support interview information. Using observation to complement interviews continued throughout the duration of the study. The questions they used required students to make connections between literacy and science. Following an observation, I asked Madea about the questioning technique. She said, "After I thought about (think phase) the questions I was using, I was asking about skills in isolation. I began making a conscious effort to use (act) questions that connected both subject."

Research Question 3

How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

Introduction. The themes that supported RQ3 were *time constraints*, *integration, state standards (curricula), and state testing.* After intervention was implemented, the participants' views, methodologies, and experiences changed. This was demonstrated in data collected from interviews, journals, informal observation checklists, and pre- and posttests.

Time constraints. The experience of implementing the intervention led the participants to view time constraints differently. Teaching subjects in isolation based on scheduled blocks of

time moved toward seamless instruction between science and literacy. The teachers were not completing one subject before beginning the next. Instead, they continued with instruction.

Initially, Madea followed the grade level schedule because she was expected to do so. As she began to integrate literacy and science, she said she stopped adhering to the schedule except for specific times:

> I have integrated so much since beginning this intervention that I do not even know what subject I am teaching. I continue teaching until time for special areas. Prior to stopping, I have taught science, literacy skills, used informational text, mathematics, and pulled individual students for extra help. Integrating subjections seems to reduce time constraints because [integration] seems to add more time during the day.

Before the intervention, Jen's instructional day revolved around specific procedures. These procedures included following the daily schedule. Jen said her view of the schedule changed as she looked at how integration was helping the students make connections:

> As I am moving more toward integrating subjects, I teach all morning without stopping. I only stop when it is time for special areas. When we return, I begin instruction from where we stopped. It is not about time anymore, it is about using integration to make connections.

The informal observations supported the change in view regarding time constraints. For example, when I observed Charlie's class during ELA, her students were rotating from station to station. Students were completing assigned activities. These activities included students writing about severe weather, creating simulations of severe weather on laptops, reading an informational text article about tornadoes and answering questions, and constructing models of

tornadoes in two-liter bottles and writing about the models in their science notebooks. Charlie was walking around the room facilitating learning through questioning. Charlie did not focus on time. Instead, she focused on student learning across content areas.

Integration. Evidence indicated that the planned intervention inspired the participants to change their instructional practices. Using the intervention inspired teachers to reflect about their practices and strategies, how the intervention was causing the instructional day to change from teaching in isolation to an integrated learning environment, and how they could continue to hone their practices to include more integration between content areas. The participants continued to implement the intervention, but also began including additional materials to promote more integration.

Charlie was concerned at the beginning of the intervention because she had attempted to integrate only ELA and social studies. As she taught her students literacy and science according to the planned intervention, she said she realized that using integration for instruction was beneficial:

> To be honest, I feel like we are putting more emphasis on science because it will be tested in the spring. But, I also think that the way we are teaching science this year is more interesting more student friendly because we are integrating. The students are getting background knowledge that they did not before. Then, they actually go and do something hands-on where they can apply the new knowledge. The students are doing things that they did not before because of integration. Integration has also helped me use instructional time more effectively. I am now using science informational texts in both

ELA and science. I am also teaching the little things like how to include essential vocabulary. I am finding that integrating these subjects is easier than I thought.

Madea indicated that participating in this study has changed how she views instruction. She thought it was acceptable to use only literacy skills to teach content. She said the students read about everything they needed to learn according to the state standard:

> I would have the students read about what they were learning. I did not include experiments during science. But that is how they really learn. I did not stress key words in science and all the activities that help students better understand the vocabulary. This plan helped me see that I need to include literacy, science, and activities together. With integration, everything just seems to mesh together. We read science informational texts for content, we do experiments or make models where the students apply what they have learned, and they write information in their notebooks. My students are learning more because I have changed how I teach. Using integration as a teaching strategy makes instruction more effective and efficient.

Jess indicated that the experiences provided by the intervention helped her view science and literacy differently. Reflecting on her teaching strategies, she said she realized that integration was an effective practice that promoted student learning:

> Now I am integrating science with literacy more. I am using more science informational texts during reading to teach the reading standards. Even though this has been challenging for me, I am successfully integrating both subjects. Integration is helping the students understand the information better, retain the information, and use the

information in different learning situations. I am not sure I actually have more time during the day, but integration leads to effective and efficient learning opportunities.

Jess also shared that the fourth-grade team is sharing more to add to the intervention. Even though they were provided with materials to implement the plan, the participants decided they needed to add additional materials to enhance the integration process. Jess stated:

> Now we are doing more literacy integration with science. We were provided with materials. However, we have also found good text-based science articles that we have been using as well. Our team discussed how helpful these articles have been because the students are learning both reading and science skills. It is like science and literacy have been rolled into one.

Before the intervention, Jen said she followed the schedule to teach. She recited how her day looked word-for-word. She said that after experiencing the planned intervention, her views changed:

> My main focus is connecting literacy and science. I am focusing on bringing the science curriculum into literacy and literacy into science. The two just seem to go hand in hand. When a visitor walks in my room now, he/she might not necessarily know if the students are involved in a science lesson, a writing lesson, or a reading lesson. It is all in one because it has been integrated. By embedding science during language arts, the students are making connections that they were not before the intervention.

As Jen continued to describe how literacy and science have been integrated, she also added social studies. She indicated that it was “neat” to bring in other content areas when integrating.

> I have been able to actually integrate social studies with science. We are studying different environments where Native Americans lived. I had the students focus on the climate of each region. Through integration, the students are really seeing that what they learn in one content area connects to other subjects. In my opinion, there is just no other way to teach. Integration is just how [instruction] has to be.

The informal observations supported how instructional practices changed during the intervention. As the study neared an end, the participants were integrating seamlessly between ELA and science. They were teaching literacy skills, science content, and science practices concurrently. The participants helped the students make connections between content areas. As Jen said, "We do not live in an isolated world. So, we should not teach skills in isolation."

During a professional learning team meeting, the teachers decided that they wanted to continue honing their integration skills by using this methodology for the remainder of the year and continue integrating ELA and science. In addition, they decided to work toward including mathematics and social studies when possible. Their selected instructional focus, integration, was written in detail and given to the principal.

State testing. Teacher participants administered a multiple-choice pretest to their students prior to beginning the intervention (see Appendix C). The questions were aligned to the state standards in science. The questions were written in the format used on the state achievement test ("Test Questions," 2017). The same test was administered at the end of the intervention to provide evidence of growth. Figure 11 indicates classroom averages for both the pre- and posttest. Average pretest scores were low. When I provided the participants with their

class averages, they were surprised at the performance of their students. Madea stated, “I know my children can read and they should have performed better.”

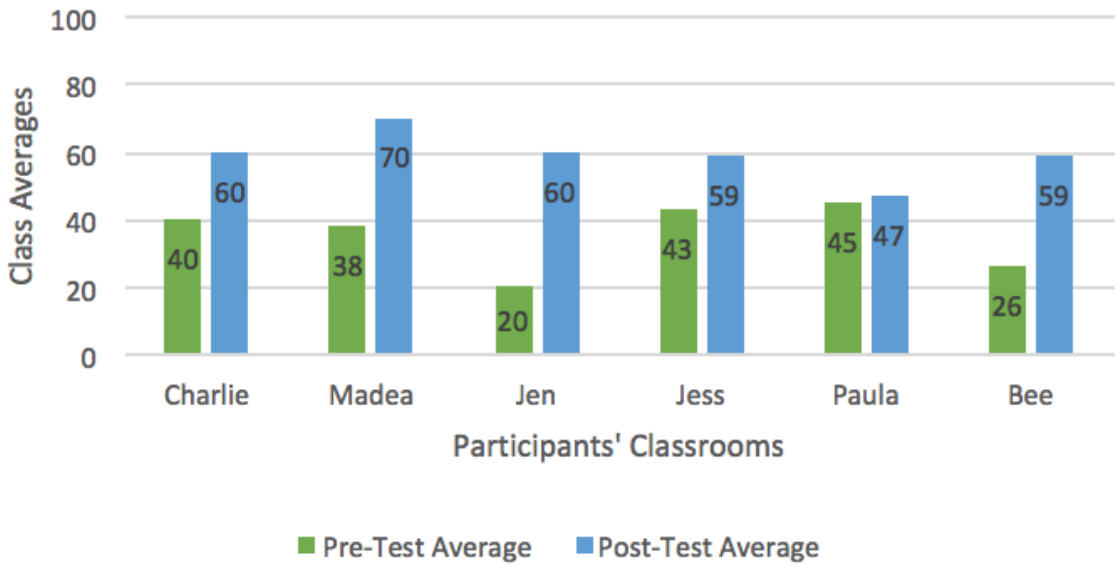

Figure 11. Comparison of pre- and posttest averages.

During the interviews, I added a question addressing if the teachers thought the scores would improve when the students take the posttest. Among others, Madea stated she thought the scores would improve “because I have changed how I teach. The students’ increased understanding will be reflected in the posttest scores. Using an integrated approach will also help students when they complete the state assessment in the spring.”

Charlie believed the test scores would improve because there has been more emphasis on science instruction. Charlie said,

> I believe that integration makes both science and literacy more interesting and student friendly. I think that integration will make a huge difference because students are making connections that they were not making before the intervention. They are getting

background knowledge that they did not before. Now they are using what they have learned when doing hands-on activities.

Paula thought the test scores would improve because "the students seem more interested in science. They are writing more and enjoy it. They're eager to write about what they've learned after science activities and experiences."

Jess concurred with her peers, stating, "I would say yes, the scores will improve. To be honest, that is the goal. I hope that using more integration will also help improve that scores on the end of the year testing. That is what I am hoping will happen."

As indicated in Figure 11, all class averages improved on the posttest. Following the posttest, I asked the participants why they thought the scores improved. They agreed that using the intervention helped them practice integrating science and ELA, which helped the students make connections in both content areas. Madea said,

> During this intervention, I focused on essential science vocabulary. This is part of reading in science. I had not taught that before during science instruction. I have also changed how I teach. I have learned how to use integration effectively and that has helped my students.

Bee was surprised by the growth her students made from the pretest to the posttest. She was concerned about her students with individualized education program (IEPs):

> I predicted the scores would be better on the posttest and they were. I did not expect as much growth, though. I am really excited. When the students do not know which subject they are learning, they really do better. Integration has changed how I view teaching. Integrating more has helped both my students and me.

Following the pretest, the teachers were surprised at the scores. They did not understand why they were so low because they were confident their students could read. However, after they began integrating science and literacy, teaching science content, vocabulary, and literacy skills together, they realized the students were making more connections that when the subjects were taught in isolation. Through their participation in this action research study, the participants changed their instructional strategies to include more integration because this methodology proved to be beneficial to student learning.

Chapter 4 Summary

The purpose of this action research study was to understand teacher perceptions and experiences in relation to integrating content areas during instruction before and after implementing an intervention (action). To analyze these data collected from this action research study, I used the Harding's (2013) constant comparative method to examine data gathered during this action research study. Through this process, five themes were identified: *time constraints, teaching in isolation, state standards (curricula), integration, and mandated state assessments, the state standards (curricula),* and *integration.* Data collected through interviews, informal classroom observations, reflection journals, and pre-and posttest scores provided insight into how the participants' views, methodologies, and experiences changed by implementing the intervention during the study. Chapter 5 provides an in-depth summary and discussion of the identified findings and how the results compared to the literature review.

Chapter 5: Discussion and Conclusion

Introduction

The purpose of this chapter is to discuss the results of this action research study. The chapter begins with a brief introduction followed by a summary of findings and a discussion of the results. I then discuss the results in relation to existing literature on the topic, some of which was discussed in Chapter 2, as well as the addition of more recent research. Next, I review limitations of the study, consider implications of the results for practice, policy, and theory, and offer recommendations for further research. In Chapter 4, I presented the factual information I collected during the study. In this chapter, I present and evaluate the results of my research, add personal insight and interpretation, make connections between what it means to the community of practice, and discuss how it informs the literature.

Summary of the Results

Research Questions

The purpose of this action research study was to gain an understanding about the experiences of six fourth-grade teachers at an intermediate school located in southern South Carolina regarding the benefits of implementing an integrated approach to literacy and science instruction. This action research study was guided by three research questions.

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

Theory and Significance

This action research study was based on the constructivist theory. According to constructivist theory, adult learners, like children, construct knowledge structures in their mind in a nonlinear fashion. Through opportunities for hands-on explorations, learners develop conceptual understandings. Knowledge is created through interactions with the world, people, and things (Ackermann, 2001; Fosnot & Perry, 1996). Put another way, knowledge is actively constructed and reconstructed through personal experiences (Ackermann, 2001; Hein, 1991; Richardson, 2003).

The term constructivism refers to the idea that learners construct knowledge for themselves as they learn both individually and socially as they learn (Hein, 1991). Constructivist pedagogy is characterized by a student-centered (adult-centered) approach to learning and an engagement in dialogue that leads to knowledge creation about a topic. If needed, direct instruction is offered (Richardson, 2003). In contemporary times, constructivist learning can involve reference to informational texts, exploring websites, and structured opportunities for students to challenge, change, or add to previous knowledge and develop their critical thinking (Richardson, 2003).

The constructivist theory guided this study. This theory helped to describe how the participants created meaning of their experiences. The participants learned through the implementation of the intervention. They communicated and worked collaboratively as a team to

share reflections, provide feedback about their experiences, and offer suggestions to include amendments to the intervention to continually improved their instructional pedagogy. For example, the participants met during PLT meetings, common planning, and in the hall to add more actions to the intervention. During their discussions, they wrote notes about the new actions on the initial treatment. These actions were initiated and implemented by the participants in their classroom settings. This process supported the constructivist theory.

Constructivist theorist John Dewey called for learning to be based on real experiences (Abarbanel, Kol, & Schcolnik, 2006). Dewey (as cited in Hein, 1991) stressed that the "learners need to do something; that learning is not the passive acceptance of knowledge which exists 'out there' but that learning involves the learners engaging with the world" (p. 2). Knowledge is not independent of meaning created by experience that is constructed by the learner or community of learners (Hein, 1991). In this action research study, Dewey's ideas were evidenced as the participants cycled through each of the three phases of the Stringer (2014) action research model.

Constructivist theorists indicate that learning is an active process that requires changes in mindset (Danielson, 2007; Riehle, 2012). Constructivists do not follow a traditional curriculum. Participants in this action research study engaged in active discourse as they planned and evaluated the intervention. Dewey (as cited in Hein, 1991) indicated that there is a social aspect for learning that includes conversations, interactions with others, and the application of new knowledge. The study encouraged teachers to avoid working in isolation. Professional learning team meetings and common planning time allowed participants to discuss ideas, experiences, strategies, and support each other (Blumenfeld et al., 1994). According to the constructivist theory, teachers need to be willing to take risks as they implement new methodologies and

practices. For example, in this study, the participants actively engaged in Stringer's (2014) action research model, Look, Think, Act. As they cycled through each phase, they collected information, analyzed and explained what was happening during the intervention, and planned, implemented, and evaluated the effectiveness of their actions.

Educators are charged with preparing students to be successful. For this reason, this action research study provided curricular transformations to enhance student achievement in an educational setting. This study pursued outcomes that were acceptable to the stakeholders rather than their success being measured against a fixed set of criteria (Stringer, 2014). The constructivist theory of learning emphasizes that constructing meaning happens in the mind. Participants must be provided with activities that engage both their minds and their hands. Dewey (as cited in Hein, 1991) referred to this process as reflective activity. The participants readily transformed their instructional strategies as a result of collaboration, experiences and reflections, and success with the intervention.

It must be reiterated that learning is not instantaneous. Hein (1991) indicated that through constructivism, significant learning occurs when participants revisit ideas, think about the ideas, test and use them, and reflect upon the process. Therefore, Stringer's (2014) action research model parallels and supports the constructs paradigm. The participants in this action research study continued to spiral through each cycle of Look, Think, Act to develop a sustainable solution to including more integration into their instructional strategies. The participants are continuing to learn as they progress through each phase as they develop new integrated units of study Consequently, through active learning, the primary purpose of the research was accomplished.

Review of recent literature. This study addressed the lack of knowledge about the experiences of fourth-grade teachers at an intermediate school located in the southern United States regarding the use of integration of science and literacy to improve achievement in both content areas. According to recent research, the integration of literacy and science has become a new focus in literacy education (Hong, Keith, Moran, & Jennings, 2017; Nesmith, Ditmore, Scott, & Zhu, 2017). Hong et al. (2017) showed that integration opportunities in and through the reading process is one way to ignite student engagement in both literacy and science learning. Literacy instruction during science improves academic language for ELL through oral communication and science notebooks (Huerta, Tong, Irby, & Lara-Alecio, 2016). In addition to science notebooks, Huerta et al. (2016) included any type of science writing, including drawings, diagrams, charts, tables, descriptions, and reflections. After analyzing their data, Huerta et al. concluded that using literacy skills to promote science vocabulary had positive effects on the ELL students' achievement scores.

Integrating literacy and science can be challenging in this era of high-stakes testing and accountability (Edgington, Harrington, Minogue, & Walkowiak 2017). To engage in rigorous practices as the students learn content, Walkowiak et al. (2017) proposed that teachers develop standards-based practices that weaves literacy and science together during the day to unite the content areas. The authors further indicated that teachers need to examine the standards for science and reading to determine how connections are made between the content areas. The goal for educators is to prepare students for success in a society where the ability to think critically, problem solve, and communicate effectively is necessary. For students to be successful, connections need to be made (Walkowiak et al., 2017). Following their study, Walkowiak et al.

concluded that the integration of learning is a powerful approach to education. Integrating instruction highlights common practices throughout content areas and unifies instruction. This process helps students transform their new knowledge more effectively (Walkowiak et al., 2017).

According to Clark and Lott (2017), one reason science instruction is not emphasized in elementary school is that most instructional time is devoted to literacy instruction. Clark and Lott noted that at first glance science and ELA standards appear to be isolated and distinct from each other. However, the integration of science and literacy skills are complementary. Providing a cohesive instructional plan provides students with opportunities to hone literacy skills while learning about science content and processes that lead them to understanding the cause-and-effect connections in the real world (Clark & Lott, 2017).

Wright and Gotwals (2017) emphasized the importance of interdisciplinary learning in kindergarten. Their study focused on testing an integrated science and literacy curriculum that was aligned to kindergarten standards. With the progression of learning that is embedded in standards documents, it is critical to begin the integration process early (Wright & Gotwals, 2017). Wight and Gotwal (2017) concluded that the implemented curriculum increased time that science was taught. The additional time spent on an integrated approach to science provides support that student learning in both science and literacy increased.

Nesmith et al. (2017) focused on how preservice teachers view integration of content areas. The authors discovered that the majority of the participants did not want to invest in the time it takes to develop integrated plans for literacy and science. The preservice teachers' reluctance to create integrated plans led the researchers to propose changes to teacher educators at institutes of higher learning (Nesmith et al., 2017). They proposed that preservice teachers

should be purposefully taught the craft of integration because this methodology helps students apply skills across content areas. Integration of literacy and science increases student understanding of both literacy skills and science content (Nesmith et al., 2017).

Methodology and findings. This study was based on the action research method (Stringer, 2014). As the teacher and researcher, I worked alongside the participants to develop solutions to a specific problem by taking systemic action (Stringer, 2014). For example, we worked together during PLT meetings and after school to continually improve the intervention as the study progressed. Stringer's (2014) cyclical model of *Look, Think, Act* guided this study. The specific problem evaluated was the need for more integrated instruction with literacy and science. Results indicated that all participants grew from actively engaging in the study. The data indicated that the teachers' instructional methodology transformed from the beginning to the conclusion of the study. They progressed from teaching science and literacy in isolated chunks to integrating the two effectively.

Discussion of the Results

In this section, I first review the big picture results of the study. These were results that did not specifically answer the research questions posed for the study but provided important insights discovered through this action research. This section will then progress to a discussion of the results and how they answered the main research questions.

Big picture. Three big picture results emerged from this study: integrating social studies with ELA, lack of professional development in both science and integration, and accommodations for students with an Individualized Education Program (IEP). An IEP is a

document developed for a child who receives additional services to help him/her learn based on his/her abilities.

Integrating with social studies. During the interviews, three teachers indicated they had attempted to integrate ELA with social studies but not with science. Jess, a veteran teacher, stated, "Integrating in social studies is easier because students have textbooks they can read. Using the textbook makes the students read." Integration, as defined for this study, is an instructional strategy wherein content areas are taught simultaneously (McQuitty, 2016). I asked Jess to elaborate on how social studies was integrated with literacy skills. She replied, "The students read the information." There were no connections between teaching literacy skills with social studies. When Paula and Madea were asked the same question, their responses concurred with how Jess explained integrating literacy and social studies.

Lack of professional development in both science and integration. During their interviews and PLT meetings, the participants noted that the district or school does not provide professional development opportunities for science or integration. Madea suggested that the district has focused primarily on reading for the past several years and that this year's focus is mathematics because the state achievement scores are so low. The other teachers agreed and asked when they would receive professional development in best practices for teaching science through integration. This request is one for the school administrator to address. His goal is for our school to become a Science, Technology, Engineering, and Mathematics (STEM) school. Part of the process is that every classroom exhibits a seamless learning environment where it is difficult to identify which subject is being taught. The principal's future goal is what led to the purpose of this action research study. Teachers need more professional development focused on

science and integration. By observing modeling in the classroom and seeing how an integrated classroom, teachers will have explicit ideas of how they need to continue to learn in order to develop a totally integrated learning environment including all content areas.

Accommodations for students with individualized learning programs. Bee, a second-year teacher, wrote in her journal about the resource students who are mainstreamed in her classroom prior to the interview. She indicated that using the intervention as written did not help her special needs children remember the content for either science or ELA. She wrote that the instructional level of the intervention was too high for them and asked if accommodations could be included in the intervention. Inclusion of special needs students into the general education classroom is district policy. Bee's concern about students with special needs might be a topic to consider for future research. Will implementing an intervention that accommodates the needs of students with IEPs, in addition to the general education students, in the regular education classroom enhance achievement of all students?

Discussion of Research Questions

This action research study was guided by three questions.

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

The research questions will be interpreted and discussed based on Stringer's (2014) cyclical action research process. In this study, the participants cycled through five spirals.

The first spiral. When the study began, the participants indicated that they had not used strategies to integrate literacy skills and science content. According to Jess, "Trying to integrate science and literacy is difficult. Science involves reading and hands-on experiences." Madea and Charlie concurred with Jess. As the action began, the participants decided to begin with the initial intervention plan because they knew additional queries would arise as the study progressed. Due to the participants' inexperience with integrating science and literacy, I thought this was an acceptable way to begin the study.

The second spiral. As the second spiral began, the participants were discussing the intervention and how their ideas about integration were changing because of their experiences. During PLT meetings, teachers excitedly shared successes and challenges with the Principal, Reading Coach, and me. This practice helped teachers to better understand the process. They were reflecting upon their actions to determine what did or did not work. They began asking if they could include additional materials to the interventions. As a collaborative team, we discussed the materials to ensure they aligned to the standards for both ELA and science. Madea shared that she had a mini-book about the water cycle that she wanted to include. Jess shared additional informational text selections. Together, they discussed the integration process and how to make the process more effective through instructional strategies. Jess said, "We are working together as a team more than ever before. We are discussing, sharing, and trying to stay on the same page with instruction." During the second spiral, the participants engaged in constructivism as they began developing new knowledge from experiences and were learning

from each other. The participants added amendments to the intervention and acted upon them in their classrooms. Participating in this study helped the teachers to better understand how to integrate subjects. Through discussions, they were learning from others. The days of going into their individual classrooms and closing the door was coming to an end. Their new experiences led them to working together to benefit their learning as well as that of their students.

The third spiral. Through the action of implementing an integrated learning environment for science and literacy, the participants realized they were able to address more state standards in both content areas effectively and efficiently. During frequent conversations with the participants, they indicated that integration did not limit them to a specific schedule; nor, did they have to limit themselves to teaching the subjects in blocks of isolation.

They also realized that other content areas could be included with the science and literacy integration. Jen shared, "When we were learning about the explorers, it was easy to pull in climate during this era in history. This was perfect because in science we are learning about weather and climate." Even though the participants were focusing on the integration of science and literacy, their experiences with this process helped them realize that other content areas could be addressed. The participants were making connections through their own learning experiences. By constructing their own connections between content areas, they were better prepared to facilitate instruction to help students make connections as well. Jen summarized the importance of using integration as an instructional strategy when she stated, "We do not live in isolation. Therefore, we should not teach in isolation."

At the beginning of this action research study, the participants taught subjects in isolation. However, by the third spiral their experiences led to a transformation in how they

taught. Madea stated, “By using strategies that integrate science and literacy, it is like I have more time in the day.” As the participants worked toward integrating not only ELA and science, but also mathematics and social studies, the participants concurred that they were able to address more standards and felt more confident that their students were learning more because integration leads to more effective instruction and efficient use of instructional time.

The participants began to change their mindsets regarding classroom instruction during the second spiral. However, the actions involved during the third spiral provided the “ah-ha” moment for the participants. They realized that constantly collaborating, sharing resources, and focusing on an integrated curriculum was beneficial to all stakeholders, both participants and students. Madea said, “The students will do better because I have changed.” With high expectations that the scores on state mandated assessment testing will increase, the teachers now believe the students will perform better because of their transformation to integrating science content and literacy in addition to other content areas.

The fourth spiral. As noted earlier, the principal wanted to see more integration in the classrooms. During the fourth spiral, he became more involved in the process. During PLT meetings, common planning, and impromptu meetings in the hall, the participants continued to share their successes. The principal began to informally observe teachers during instructional time to witness how they were integrating science and literacy. He even began offering suggestions to the teachers as to how they could include social studies and mathematics. The principal stated, “I want to walk into classrooms and not know where one subject ends and another begins.” In addition to making this a common goal for the school, he requested that the school reading coach to work with fifth grade teachers to develop a similar intervention where

ELA and social studies would be integrated. The principal shared with me that my study brought much needed change to our school.

At this point in the study, the participants continued to cycle through each of Stringer's (2014) phases, Look, Think, Act, to amend and implement the intervention. The fourth-grade teachers became a cohesive team. A team that helped each other by sharing experiences, offering suggestions, and continually working to improve the intervention to increase the quality of their instructional strategies and methodologies through the craft of integration. In the beginning, the teachers were skeptical about making changes. Charlie said, "I just do not know if I can do this." As the intervention progressed, Charlie and the other five participants transformed their thinking.

The fifth spiral. The intervention for this action research study concluded with the fifth spiral. The participants readily identified the benefits of using integration: led to more efficient and effective instruction, helped make real world connections, enabled participants to address more state standards in less time, helped students connect ELA skills with science content to improve their achievement, and provided effective preparation for state achievement tests. As indicated earlier, the transformation for the teachers was during the third spiral. During the fifth spiral, they decided that integrated plans should be developed and used the remainder of the year. At the beginning of the second 9 weeks, the teachers were required to submit a focus plan to the principal. While meeting with the fourth-grade team during the focus planning meeting, the six participants unanimously agreed that integration should be the focus because of the many benefits both for them and their students. Therefore, instead of ending the cyclical experiences of the action research cycle, they would be continuing at the participants' request.

Throughout this action research study, the participants needed to understand how instruction was happening in their classrooms and what needed to change. As the participants cycled through each Look, Think, Act spiral (Stringer, 2014), they changed from teaching in isolation to using strategies to promote integration between science and literacy. Their mindset about instructional strategies transformed because of their continued engagement in the study.

Discussion of the Results in Relation to the Literature

The purpose of this action research study addressed the problem of needing more integration between content areas during classroom instruction. The results relate to the community of practice, to the literature, and to the community of scholars. In this section, I make connections to the literature and wider community, both practical and academic.

This study provides significance for teachers, students, and administrators. The results of this study provided evidence the integration of literacy and science was beneficial to the learning environment because it was both effective and efficient. According to Royce (2005), when science and literacy instruction is integrated, teachers can effectively address standards in both disciplines while maximizing efficiency during the school day. In addition, being literate in science requires the ability to use literacy skills. The intervention in this study integrated these skills. The National Research Council (2012) has emphasized that being literate in science requires the ability to read, understand, and communicate orally and in writing.

The participants' experiences of during this cyclical action research study transformed their mindsets about classroom instruction. They transformed their classroom settings from subjects taught in isolation to more integration between science and literacy as well as including addition content areas as they deemed appropriate. Their experiences helped them realize the

benefits of integration. Hong et al. (2017), who investigated the integration of literacy and science in first grade classrooms, concluded that connecting science and literacy was exciting and beneficial for student learning. When informational text and science instruction are integrated, students experience using scientific language while working as scientists. As students make connections with the text, they are constructing meaning. These experiences help students comprehend how scientists work and build claims and evidence from data (Clark & Lott, 2017; Enfield, 2014; Washburn & Cavagnetto, 2013). In addition, the participants' engagement in this process promotes positive interactions and collaboration between all teachers as they strive to meet the needs of all students (Siebert et al., 2016; Wright, Franks, Kuo, McTigue, & Serrano, 2016).

In this study, pre- and posttest averages demonstrated classroom growth following the intervention. After the completion of the intervention, the classroom averages increased. The students were able to read the test and make connections with and understand the science content. In classrooms where an integrated curriculum of science and literacy were implemented, pre- and posttests indicated the students achieved higher achievement in both content areas. Students showed growth in science conceptual understandings, vocabulary, and reading skills. Reading informational texts increased comprehension while developing science literacy (Brassell, 2007; Connor et al., 2010; Enfield, 2014; Fang & Wei, 2010; Hall & Williams, 2015; Mantzicopoulos & Patrick, 2011; McDonald et al., 2012; Plummer & Kuhlman, 2008). Science and literacy are not mutually exclusive.

The administrators and district officials are concerned with student performance on state achievement tests. The students' increased achievement from the pre- and posttests provided an

indication that the students would improve the scores on the yearly mandated state testing in ELA and science. Cervetti et al. (2002) found that fourth grade students who were taught through an integrated approach performed better on standardized tests. Cervetti et al. (2012) concluded that their work validates the notion that integrating science inquiry and literacy is reciprocally beneficial.

Limitations

The outcomes of this study were expected. One limitation was a slight modification during the implementation of the study. This adjustment was schedule changes to the intervention timeline. Additional limitations included the research setting, population affected by the study, and meeting with participants.

Schedule changes. The study was planned to extend over a 4-week period. However, because of inclement weather and school closures, the time frame changed from 4 weeks to 7 weeks. The participants agreed with the adjusted schedule. During this time frame, saturation of data collection was reached.

Research setting. I selected the site for convenience. I had previously established rapport with the participants; moreover, the principal had discussed his goal with me—that is, the need from more integration. Even though the study was site specific, the results of this action research study are provided to readers so they can determine how the findings might be beneficial to their settings, notwithstanding the site is not a Title I school and serves an upper socio-economic population. Should this study be replicated, I recommend it be implemented in a Title I school in fourth grade classrooms.

Population affected by the study. This action research study was implemented in six fourth-grade classrooms. Fourth grade was selected as the target group because this is the first year that students are required to complete state assessments in all content areas. If this research is replicated, this limitation should be expanded to include additional grade levels.

Meeting with participants. As the teacher/researcher, I conducted all interviews and informal observations during the school day. In addition, I met with the participants during PLT meetings and informally in the hall as time permitted. Even though my administrator provided me with release time, this comprised my other job responsibilities. Faculty members within the school were assigned to cover my classes. If this study were to be replicated, it would be beneficial to have two researchers engaged in the process.

Implication of the Results for Practice, Policy, and Theory

The results of this action research study are presented to the community of scholars or educational community. The results provide confirmation of the findings in existing literature. The findings can be transferred to transferred to different populations. Also, the results support the constructivist theory.

Practice. While I conducted this study in six fourth grade classrooms at a school serving a higher socio-economic population, the results could be applied to other environments. Fuhui Tong et al. (2014) implemented a similar study with ELL students wherein science and literacy were intertwined. Data were collected with classroom observations, benchmark tests, and the end-of-the-year sate achievement tests. After the analysis of data was complete, Tong et al. concluded that the integrated instructional model enabled the ELL students to outperform their English reading peers in both reading and science. In addition, they discovered that fifth grade

students who participated in an integrated approach from kindergarten to third grade made greater gains. Therefore, if this study were replicated in other environments, it might yield similar results.

Policy. During this action research study, the participants were informally observed, maintained reflective journals, and met frequently to discuss the intervention. Reflective journals were read weekly to ensure the participants were writing about their experiences during the study. We also met during PLT meetings, common planning, and after school to discuss successes, challenges, and how to improve their instructional strategies and resources to deliver integrated instruction. Engaging in these activities helped each participant remain committed to the study. They depended on each other as they continually transformed their instructional methodologies. These actions indicated that the teachers implemented the intervention and progressed through the study with fidelity.

Both past and present research support the effectiveness of implementing an interdisciplinary curriculum. This action research study adds confirmation to existing research regarding the benefits of integration. This study could impact policy regarding instructional strategies. For example, my principal told me that because of my study, the fourth-grade teachers were transforming their instruction and embracing an integrated approach. He felt so strongly about the impact of this study that he shared the successes with the district executive curriculum coordinator. Through this sequence of events, the executive curriculum coordinator now has evidence for implementing changes that could improve instruction in other schools.

Theory. The results of this study supported the constructivist theory. Constructivism refers to the idea that learners construct knowledge for themselves as they learn both individually

and socially (Hein, 1991). Constructivist theorist John Dewey (as cited in Abarbanel et al., 2006) called for learning to be based on real experiences. This theory helped to describe how the participants created meaning of their experiences. The participants learned through their experiences as they implemented the intervention. They communicated and worked collaboratively as a team to share reflections, provide feedback about what they learned, and offered suggestions to include amendments to the intervention to continually improve their instructional pedagogy.

Recommendations for Further Research

This research study should be replicated. Recommendations to expand and extend the existing research include replication in Title I schools, quantitative study of student scores, qualitative case studies of teacher experiences, professional development, and accommodations for special needs students. Each of these recommendations evolved from limitations and methodology.

Title I schools. The selected setting was not controllable in this study. The site was selected because I work at this school located in southern South Carolina. In addition, the principal wanted the teachers to improve their instructional strategies to create an integrated learning environment in each classroom setting. This school serves students from upper socio-economic families. For this reason, it is not classified as a Title I school. This action research study should be implemented to fourth grade classes at multiple sites to determine if the results would be the same.

Quantitative study of student scores. This action research study focused on pre- and posttest averages to indicate student growth following the intervention. For further research,

assessments would be developed that correlated with standards taught during each week of the intervention. Instead of looking at class averages, individual student scores would be compared and analyzed to determine growth during the course of the intervention.

Qualitative case studies. This action research study focused on participants' experiences with integration before and after the intervention was implemented. A recommendation to replicate this study would be to focus on case studies. The participants' individual experiences would be documented through interviews and journal reflections to determine how the experiences changed their thinking. Worth researching is if the intervention transformed each participant's ideas and knowledge regarding instructional strategies and methodologies.

Professional development. One of the big picture results that emerged from this study was lack of professional development in both science and the craft of integration. The participants in this study noted that professional development in both would have been beneficial to the process. A further recommendation for future research would be to include week professional development opportunities for participants. These sessions would help teachers experience how science content and literacy skills can be effectively integrated. Sessions such as these would enhance the participants' prior knowledge and help them glean more experiences from intervention.

Accommodations for special needs students. A second big picture that developed from this study was the lack of accommodations for special needs students. This study should be replicated using a revised intervention that addresses the needs of special needs students. A partnership with the special education teacher would be a valuable resource during the study. This person would help with accommodations before and during the intervention. An avenue for

further research is whether accommodations help the students with special needs retain the information through an integrated approach.

Conclusion

Throughout this action research study, three research questions were answered:

RQ1: What were the experiences of the fourth-grade teachers at an intermediate school in the southern United States regarding the integration of literacy and science?

RQ2: How did the fourth-grade teachers transform after the study?

RQ3: How did the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in the southern United States change after an intervention was implemented?

The six participants remained actively engaged throughout the study. Based on data collected from participant interviews and journal reflections, the participants' experiences from the beginning to the end of the intervention led them to transform their thinking about their personal instructional strategies. They moved from teaching science and literacy in isolation to using an interdisciplinary approach. Once the teachers recognized the benefits of an integrated curriculum, they realized that using an interdisciplinary curriculum seemed to be the best method to use to ensure instruction is both efficient and effective.

This action research study established significant benefits for both teacher and students through the implementation of integrated curriculum where science and literacy are taught simultaneously. Teachers had time for more efficient and effective instruction, helped students make real-world connections, taught more state standards in less time, improved student learning in both ELA and science, and provided effective preparation for state-mandated achievement

tests. Their success during this study inspired them to continue utilizing the Look, Think, Act cycles (Stringer, 2014) for the remainder of the year. They opted to continue the research as they worked together to develop new integrated plans for science and literacy as they moved into new science content. The teachers' enthusiasm and motivation signaled the answers to the research questions. This action research study transformed their mindsets from teaching in isolation to implementing an integrated approach. As Jen stated throughout the intervention, "We do not live in isolation. Therefore, we should not teach in isolation."

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Appendix A: Initial Interview Questions

After our initial meeting where the research problem is introduced and clarified, the following questions will be addressed in a focus group setting. Each of the eight participants will respond. The session will be recorded to ensure accuracy. Responses will also be posted on chart paper to use during the course of the study.

1. How would you describe your classroom-learning environment?

   RQ1: What are the experiences of the fourth-grade teachers at an intermediate school in southern South Carolina regarding the integration of literacy and science?

2. Could you please explain your instructional strategies?

   RQ3: How do the views, methodologies, and experiences of the fourth-grade teachers at an intermediate school in southern South Carolina change after an intervention has been implemented?

3. How would you describe a typical day in your classroom?

   RQ1: What are the experiences of the fourth-grade teachers at an intermediate school in southern South Carolina regarding the integration of literacy and science?

4. Could you please explain how your students engage in classroom activities?

   RQ1: What are the experiences of the fourth-grade teachers at an intermediate school in southern South Carolina regarding the integration of literacy and science?

5. How would you describe the curricula you utilize for instruction?

   RQ1: What are the experiences of the fourth-grade teachers at an intermediate school in southern South Carolina regarding the integration of literacy and science?

6. How would you describe literacy instruction and activities in your classroom?

   RQ1: What are the experiences of the fourth-grade teachers at an intermediate school in southern South Carolina regarding the integration of literacy and science?

7. How would you describe science instruction and activities in your classroom?

   RQ2: How will the fourth-grade teachers transform instructional strategies after the intervention?

8. Could you please explain why you choose to teach literacy and science based on your description of instruction?

RQ2: What are the fourth-grade teachers' comfort level with using informational text and inquiry-based science in the instructional setting?

Extension questions will be included as needed to elicit more information and clarity.

I included question 3. However, question three will be addressed within each question as experiences change the teachers' perspective of using integration as an instructional strategy.

Appendix B: Informal Classroom Observation Checklist

After completing the Literature Review, I used findings from various studies to create the Classroom Observation Checklist. Studies include White et al., 2014; Nixon & Akerson, 2004; McDonald, C. et al., 2012; Romance, N. R. & Vitale, M. R., 2012; Brassell, 2007.

Classroom:	**Content Area:**	**Date:**	**Time:**

Presentation	**Observation**		**Notes**
	Yes	**No**	
Organization			
Presents overview of lesson with connections to both ELA and Science			
Relates lesson to previous and/or future lessons			
Preplanned to ensure efficient use of time			
Presentation			
Activates students' prior knowledge			
Utilizes informational texts			
Uses strategies including student notebooks, student collaboration, facilitates student learning through questioning to promote critical thinking, inquiry-based learning, etc.			
Lesson strategies provide evidence of integration between ELA and science			
Teacher moves around classroom to facilitate learning			
Students are engaged in an integrated learning setting			
Physical Environment			
Supplies readily available			

Classroom arrangement is conducive to group learning and collaboration			
Assessment			
Formative assessment (open-ended questioning, exit slips, student work in student notebooks, etc.)			
Formative assessment strategies address integration of science and ELA			

Appendix C: Pre- and Posttest

This test will be used as a pretest prior to treatment. The same test will be used at the conclusion of the treatment as the posttest.

Fourth Grade – Weather and Climate Pretest

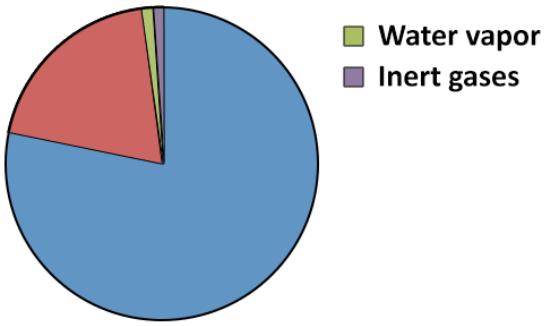
1.

The students in Mr. Black's class are studying about gases and Earth's atmosphere. Mr. Black placed a deflated soccer ball on the balance. The balance read 560 grams. Next Mr. Black took out a bicycle pump and pumped the soccer ball up until it was nice and round. He put the ball back on the balance and read 570 grams!

With this experiment, what is Mr. Black showing his students about air?

A) has mass.
B) has weight.
C) takes up space.
D) is made up of oxygen and nitrogen.

2. The circle graph represents the gases in the troposphere.



What gas is represented by the blue section of the graph?

A. oxygen
B. nitrogen
C. water vapor
D. carbon dioxide

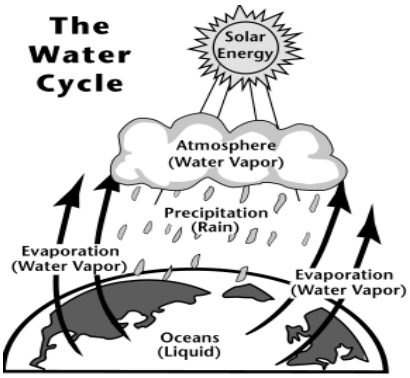
3. A combination of conditions in Earth's atmosphere causes weather. Pressure, humidity, temperature, and precipitation are some examples.

Which statement best describes the difference between temperature and humidity?

A. Temperature is caused by the sun's energy and humidity is caused by the rain.
B. Temperature can increase and decrease throughout the day, but humidity stays the same.
C. Temperature is a measure of how hot the air is and humidity is a measure of how cold it is.
D. Temperature is the measure of heat in the air and humidity is the amount of moisture in the air.

4. Weather is made up of a variety of conditions in the atmosphere. It includes temperature, or the amount of ____ in the air, as well as humidity, the amount of ____ in the air. Pressure is another factor of weather as it affects wind, or the motion of ____. Precipitation also affects weather, and includes ____ and other forms of water that falls from clouds.

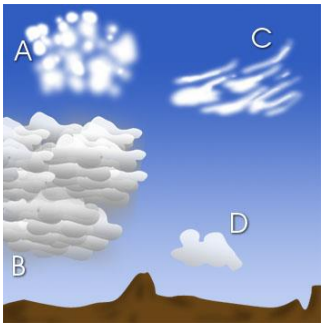
A. heat, moisture, air, rain
B. moisture, heat, waves, wind
C. heat, water, sunlight, moisture
D. sunshine, heat, coolness, oxygen

5. 

According to the diagram of the water cycle, what happens to the water in the oceans before it becomes water in the atmosphere?

A. It evaporates.
B. It becomes a liquid.
C. It is sent to the sun.
D. It turns into precipitation.

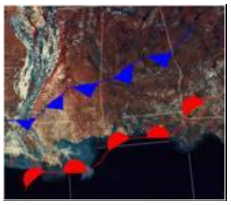
6. Observe the types of clouds.



Which of the clouds shown might indicate a possible future rain storm?

A.
B.
C.
D.

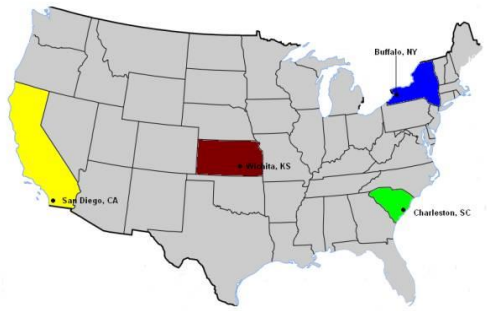
7. Analyze the weather map. Thunderstorms can be expected.



How does the meteorologists know that thunderstorms should be in the weather forecast?

A. A cold front is pushing into the south.
B. A cold front is pushing into the north.
C. A cold front is pushing into a warm front.
D. A cold front is pushing into another cold front.

8. Analyze the highlighted locations on the map.



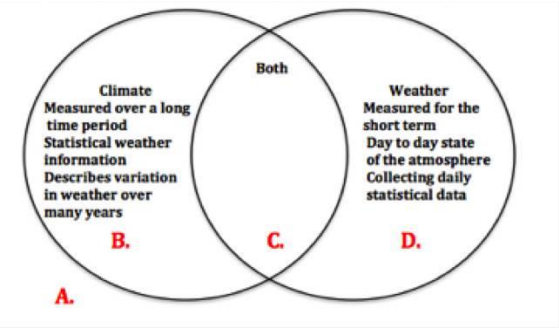
Which location is mostly to be hit by a hurricane?

A. Charleston, South Carolina
B. San Diego, California
C. Buffalo, New York
D. Wichita, Kansas

9. Carol's hometown of Fargo, North Dakota has just been hit with a winter snowstorm. What product would be least helpful in this type of severe weather?

A. sandbags
B. snow shovel
C. salt spreader
D. hand cranked light source

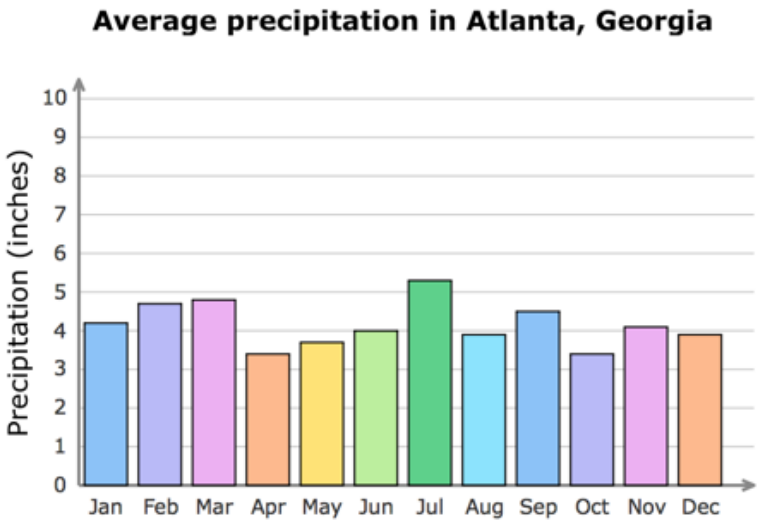
10. The Venn diagram is comparing climate and weather.



Where in the Venn diagram would you add daily precipitation and daily high and low temperatures?

A.
B.
C.
D.

11. Analyze and use the graph to answer the question.



Which statement best describes the average monthly precipitation in Atlanta?

A. Precipitation does not change significantly from month to month in Atlanta.
B. Precipitation changes significantly from month to month in Atlanta.
C. Atlanta has a rainy season and a dry season.
D. February had more precipitation than July.

12. Read the passage below.

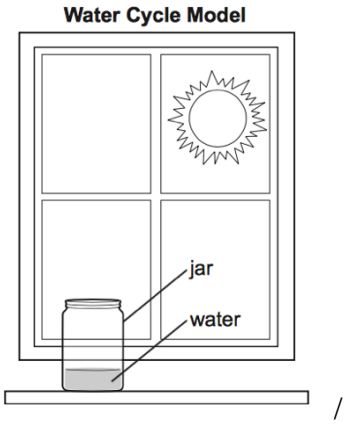
Washington, D.C.

The capital of the United States is Washington, D.C. Last winter, on January 13, the city received over six inches of snow. The snowfall was not too surprising. The winter months in Washington, D.C. are often cold and wet.

Select the sentence that supports the claim that weather is what the atmosphere is like at a certain place and time.

A. The capital of the United States is Washington, D.C.
B. Last winter, on January 13, the city received over six inches of snow.
C. The snowfall was not too surprising.
D. The winter months in Washington, D.C. are often cold and wet.

13. A student places an open jar of water on a sunny windowsill to show part of the water cycle.



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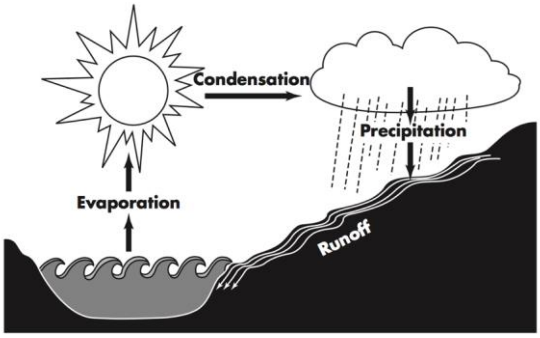
Which change can the student make to this model to better show condensation?

A. Add a lid to the jar.
B. Add more water to the jar.

C. Pour some water out of the jar.
D. Put a white piece of paper under the jar.

14. Analyze the diagram of the water cycle.



During which part of this cycle can it snow?

A. Evaporation
B. Condensation
C. Precipitation
D. Runoff

15. The table below contains data about the weather conditions for Trenton, New Jersey.

	Temperature	Wind Direction
Day 1	78°F	Southeast
Day 2		North
Day 3	82°F	Southwest
Day 4	87°F	South

As a meteorologist, predict the possible temperature for Day 2.

A. 70°F
B. 78°F
C. 83°F
D. 85°F

16. A student read the advertisement below in a science magazine.

Cloud-o-Matic

Use heat to create a real cloud! Simply heat the contents of **Cloud-o-Matic**. Heating changes water vapor inside into a puffball of liquid water droplets. With enough heating, you can make precipitation from a cloud in your own yard. Get your **Cloud-o-Matic** and make it rain today!

How is this advertisement incorrect in describing the water cycle?

A. Precipitation does not come from clouds.
B. A cloud is not made up of water droplets.
C. Heat changes liquid into vapor, not vapor into liquid.
D. Heat is not involved in the water cycle.

17. The diagram below shows a weather map for the United States.

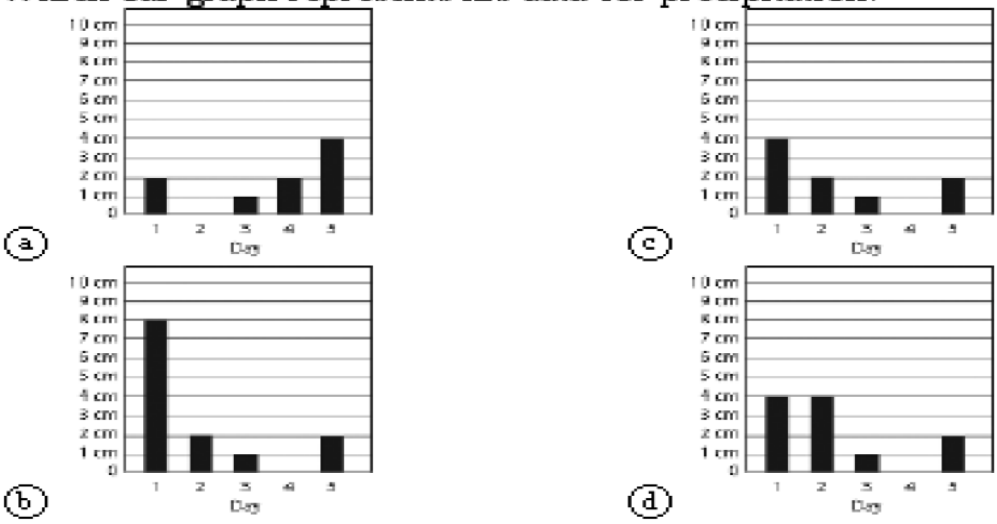
According to the map data, which statement is correct?

A. A cold front is heading toward Texas.
B. Texas will be experiencing warmer weather.
C. An area of high pressure is causing rain north of Texas.
D. The United States is experiencing three cold fronts.

18. Using a rain gauge, David recorded the amount of rainfall for five days. He recorded the daily rainfall in a table.

Day	Precipitation (cm)
1	4
2	2
3	1
4	0
5	2

Which bar graph represents his data for precipitation?



19. As part of a school weather project, Jesse needs to record the wind speed, wind direction, and precipitation for a week. Which weather instruments should she use?

A. anemometer, thermometer, rain gauge
B. rain gauge, wind vane, thermometer
C. wind vane, anemometer, rain gauge
D. barometer, anemometer, wind vane

20. Your family is watching television and the program is interrupted by a tornado warning. What action should your family take to be protected from the storm?

A. Move to the highest location in the building.

B. Move to the lowest floor of the building.
C. Get into a car and move away from the tornado.
D. Go out into an open field with no buildings around it.

Appendix D: Consent Form (Provided by Concordia University)

CONSENT FORM

Research Study Title:	Teachers' Perceptions of an Integrated Curriculum: An Action Research Study
Principal Investigator:	Derenda Marshall
Research Institution:	Concordia University - Portland
Faculty Advisor:	Dr. Heather Miller

Purpose and what you will be doing:
The purpose of this qualitative action research study is to gain an understanding about the experiences of eight fourth grade teachers at an intermediate school located in southern South Carolina regarding the benefits of implementing an integrated approach to literacy and science instruction. I expect approximately eight volunteers. No one will be paid to be in the study. I will begin enrollment on August 29, 2017 and end enrollment on September 2, 2017.

To be in the study, you will:

1. Be interviewed to determine your experiences about English Literacy (1 – 2 hours)
2. Asked to integrate ELA in science (30 hours – classroom instruction)
3. Plan, implement, and evaluate the implementation of ELA (10 hours – planning time both during and after school)
4. Be observed by me (4 times)
5. Be asked to consent to the observations being recorded and transcribed.
6. Administer a pretest prior to implementation of treatment (.5 hours)
7. Reflect daily about experiences in a journal (3 hours)

Doing these things should take less than 48.5 hours of your time. These actions are part of our normal everyday school procedures.

Risks:
There are no risks to participating in this study other than what you experience on a day to day basis in the educational setting. However, I will protect all information. Any personal information you provide will be coded so it cannot be linked to you. Any name or identifying information you give will be kept securely via electronic encryption. When I look at these data, none of these data will have your name or identifying information. I will assign a pseudonym to you. I will not identify you in any publication or report. Your information will be kept private at all times and then all study documents will be destroyed 3 years after I conclude this study.

Benefits:

Information you provide will help contribute to existing research about the benefits of integration. You could benefit this by participating in the development of an integrated intervention for science and literacy that will provide evidence where combining the two content areas are mutually beneficial to time management and student achievement.

Confidentiality:
This information you provide will not be distributed and will be kept private and confidential. The only exception to this is if you tell me about abuse or neglect that makes me seriously concerned for your immediate health and safety.

Right to Withdraw:

Your participation is greatly appreciated. You are free at any point to choose not to engage with or stop the study. You may skip any questions you do not wish to answer. This study is not required and there is no penalty for not participating. If at any time you experience a negative emotion from answering the questions, I will stop asking you questions.

Contact Information:
You will receive a copy of this consent form. If you have questions you can talk to the principal investigator, Derenda Marshall. My doctoral studies chair's name is Dr. Heather Miller. She supervises me at Concordia University. You can contact her at heathmiller@cu-portland.edu. If you want to talk with a participant advocate other than me or my chair, you can write or call the director of our institutional review board, Dr. OraLee Branch (email obranch@cu-portland.edu or call 503-493-6390).

Your Statement of Consent:
I have read the above information. I asked questions if I had them, and my questions were answered. I volunteer my consent for this study.

_____ _____
Participant Name Date

_____ _____
Participant Signature Date

_____ _____
Investigator Name Date

_____ _____

Investigator Signature Date

Investigator: Derenda Marshall
c/o: Professor Dr. Heather Miller
Concordia University – Portland
2811 NE Holman Street
Portland, Oregon 97221

Appendix E: Fourth-Grade Classrooms Prior to Intervention

The fourth-grade teachers follow a weekly pacing guide for each of the four 9-week grading periods. The curriculum coach creates and provides the pacing guides for the teachers. She types the standards that must be addressed during the first 9 weeks in red. The first 9 weeks pacing is located in Appendix F. All fourth-grade teachers are expected to adhere to the schedule below.

Master Schedule 2017-2018

4th Grade

Time	Subject
7:45 - 8:00	Health
8:00 - 9:40	ELA
9:40 - 10:40	Special Area
10:40 - 11:00	ELA
11:00 - 12:10	Math
12:10 - 12:30	Recess
12:35 - 1:00	Lunch
1:00 - 1:45	Social Studies
1:45 - 2:30	Science
2:30 - 2:35	Closure

The teachers meet twice a week for common planning and collaborate daily regarding plans. Plans are based on the state standards in all content areas. The teachers are confident when implementing ELA standards in an isolated block of time. They teach all subjects in isolation.

The intervention for this action research study began on September 5, 2017, and concluded on October 6, 2017. The intervention is located in Appendix F. During the intervention, the principal approved the following changes to the daily schedule. Science and social studies times were switched. The principal permitted the change to ensure that dismissal

would not interfere with the study. The intervention was designed to be modified in the event of inclement weather and student field trips.

4th Grade	
Time	**Subject**
7:45 - 8:00	Health
8:00 - 9:40	ELA
9:40 - 10:40	Special Area
10:40 - 11:00	ELA
11:00 - 12:10	Math
12:10 - 12:30	Recess
12:35 - 1:00	Lunch
1:00 - 1:45	Science
1:45 - 2:30	Social Studies
2:30 - 2:35	Closure

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Appendix F: Weekly Pacing for First 9 Weeks

The school curriculum coach develops a weekly pacing guide for each of the four 9-week periods during the school year. Pacing is used to ensure that teachers address all standards prior to mandated state achievement tests. I used the 4th Grade Pacing Guide for the first nine weeks to guide the creation of the proposed intervention for the study.

4th Grade Pacing- Week 1

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states	**NSBT.1 Place Value** Understand that, in a multi-digit whole number, a digit represents ten times what the same digit represents in the place to its right. **NSBT.2** Recognize math periods and number patterns within each period to read and write in standard form large numbers through 999,999,999. (suggested goal 999,999)	**4.E.2A. 1** Obtain and communicate information about some of the gases in the atmosphere (including oxygen, nitrogen, and water vapor) to develop models that exemplify the composition of Earth's atmosphere where weather takes place. **Science and Eng. Practices** **4.S.1A.1** Ask questions that can be (1) answered using scientific investigations or (2) used to	**1.1** Summarize the spread of Native American populations using the Landbridge Theory.

of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives***		refine models, explanations, or designs. **4.S.1A.2** Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others **4.S.1A.3** Plan and Conduct scientific investigations to answer questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety	

W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations.		procedures . **4.S.1A.4** Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation or graphing) to (1) reveal patterns and construct meaning or (2) support explanations, claims, or designs. **4.S.1A.5** Use mathematical and computational thinking to (1) express quantitative observations using appropriate English or metric units, (2) collect and analyze data, or (3) understand patterns, trends and relationships between variables. 4.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models,	

W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of action		(2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams. **4.S.1A.7** Construct scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts. **4.S.1A.8** Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using	

for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions,both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.		the conventions and expectations of oral and written language. **Engineering** **4.S.1B.1** Construct devices or design solutions to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the devices or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results	

4th Grade Pacing- Week 2

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning.	**NSBT.3** Use rounding as one form of estimation and round whole numbers to any given place value.	**4.E.2A.2.** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). **SEPS**	**1.2** Compare the everyday life, physical environment, and culture of the major Native American culture groupings, including the Eastern Woodlands, the Plains, the Southwest, the Great Basin, and the Pacific Northwest.

RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events			

precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **<u>Standard 1</u>**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **<u>Standard 2</u>**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical			

questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 3

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text	**NSBT.4** Fluently add and subtract multi-digit	**4.E.2A.2**	**1.2** Compare the everyday life,

RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases.	whole numbers using strategies to include a standard algorithm.	Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff).	physical environment, and culture of the major Native American culture groupings, including the Eastern Woodlands, the Plains, the Southwest, the Great Basin, and the Pacific Northwest.

RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according			

to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of			

action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 4

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning.	**NSBT.5** Multiply up to a four-digit number by a one-digit number using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using rectangular array, area models and /or equations. **ATO.1 (mastery not expected until 2nd nine weeks)** Interpret a multiplication equation as a comparison (e.g. interpret 35=5x7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.) Represent verbal statements of multiplicative comparisons as multiplication equations.	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time.	**1.3** Explain the political, economic and technological factors that led to the exploration of the new world by Spain, Portugal, France, the Netherlands, and England, including the competition between nations, the expansion of international trade, and the technological advances in shipbuilding and navigation.

RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events			

precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical			

questions; build knowledge; generate possible explanations; consider alternative views. **<u>Standard 3</u>**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **<u>Standard 4</u>**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **<u>Standard 5</u>**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 5

Language Arts/Writing	Math	Science	Social Studies

Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases.	**NSBT.6 (mastery not expected until 2nd nine weeks).** Divide up to a four-digit dividend by a one-digit divisor using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time.	**1.3** Explain the political, economic, and technological factors that led to the exploration of the new world by Spain, Portugal, France, the Netherlands, and England, including the competition between nations, the expansion of international trade, and the technological advances in shipbuilding and navigation.

RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according			

to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of			

action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 6

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning.	**ATO.2 (mastery not expected until 4th nine weeks)** Solve real-world problems using multiplication (product unknown) and division (group size unknown, number of groups unknown). **ATO.3 (mastery not expected until 4th nine weeks)** Solve multi-step, real-world problems using the four operations. Represent the problem using an equation with a variable as the unknown quantity.	**4.E.2B.2** Obtain and communicate information about severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) to explain steps humans can take to reduce the impact of severe weather phenomena.	**1.4** Summarize the accomplishments of the Vikings and the Portuguese, Spanish, English, and French explorers, including Leif Eriksson, Columbus, Hernando de Soto, Magellan, Henry Hudson, John Cabot, and La Salle.

RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events			

precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views.			

Standard 3: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 7

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text	**ATO.4 (mastery not expected until 2nd nine**	**4.E.2B.3**	**1.4** Summarize the

RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases.	**weeks)** Recognize that a whole number is a multiple of each of its factors. Find all factors for a whole number in the range 1-100 and determine whether the whole number is prime or composite.	Construct explanations about regional climate differences using data from the long term weather conditions of the region	accomplishments of the Vikings and the Portuguese, Spanish, English, and French explorers, including Leif Eriksson, Columbus, Hernando de Soto, Magellan, Henry Hudson, John Cabot, and La Salle.

RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according			

to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of			

action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 8

Language Arts/Writing	Math	Science	Social Studies
Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning.	**ATO.5 (mastery not expected until 2nd nine weeks)** Generate a number or shape pattern that follows a given rule and determine a term that appears later in the sequence.	**Review and Reteach; Prepare for Common Assessment**	**2.1** Summarize the cause-and-effect relationships of the **Columbian Exchange.** **2.2** Compare the various European settlements in North America in terms of economic activities, religious emphasis, government, and lifestyles.

RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events			

precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical			

questions; build knowledge; generate possible explanations; consider alternative views. **<u>Standard 3</u>**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **<u>Standard 4</u>**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **<u>Standard 5</u>**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

4th Grade Pacing- Week 9

Language Arts/Writing	Math	Science	Social Studies

Reading Literary Text RL.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RL.9.1 Identify and explain how the author uses imager, hyperbole, adages, or proverbs to shape meaning and tone. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. RL.10.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RL.10.6 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. ***Reading Informational Text*** RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases.	**Review and Reteach; Prepare for Common Assessment.**	**Common Assessment**	**2.3** Explain the impact of the triangular trade, indentured servitude, and the enslaved and free Africans on the developing **culture** and economy of North America.

RI9.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. RI9.5 Acquire and use general academic and domain-specific words or phrases that signal precise actions, emotions, and states of being; demonstrate an understanding of nuances and jargon. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. RI11.2 Explain how an author uses reasons and evidence to support particular points. ***Writing-Narratives*** W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. W.4.1 When writing, a. use relative pronouns and relative adverbs; b. form and use the progressive verb tenses; e. order adjectives within sentences according			

to conventional patterns; f. use relative pronouns and relative adverbs. W.5.1Capitalize names of magazines, newspaper, works of art, musical compositions, organizations, and the first word in quotations. W.5.4 Use spelling patterns and generalizations. ***Communication*** C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. ***Inquiry Based Literacy Standards-on-going*** **Standard 1**: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated. **5-I.1.1** Formulate questions to focus thinking on an idea to narrow and direct further inquiry. **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**. 5-I.3.1** Develop a plan of			

action for collecting relevant information from primary and secondary sources. **5-I.3.2** Organize and categorize important information; collaborate to validate or revise thinking; report relevant findings. **Standard 4**: Synthesize information to share learning and/or take action. **5-I.4.1** Draw logical conclusions from relationships and patterns discovered during the inquiry process. **5-I.4.2** Reflect on findings to build deeper understanding and determine next steps. **5-I.4.3** Determine appropriate tools and develop plan to communicate findings and/or take informed action. **Standard 5**: Reflect throughout the inquiry process to assess metacognition, broaden understanding, and guide actions, both individually and collaboratively. **5-I.5.1** Acknowledge and value individual and collective thinking. **5-I.5.2** Employ past learning to monitor and assess current learning to guide inquiry. **5-I.5.3** Assess the process and determine strategies to revise the plan and apply learning for future inquiry.			

Appendix G: Proposed Intervention Plan

Timeline: September 5 – October 6, 2017

Teachers will have flexibility to use reading strategies to address the needs of individual students during this process. The intervention is a prepared guideline consisting of informational text and science investigations. The goal is to demonstrate a seamless connection between ELA and Science in order to enhance achievement in both areas.

Week 3		
Date	**ELA**	**Science**
Tuesday, September 5	Students will complete pretest prior to beginning intervention. Pretest will be completed online in Google Docs. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. C.1.1 Explore and create meaning by formulating questions, engaging in purposeful dialogue with peers and adults, sharing ideas and considering alternate viewpoints. C.1.2 Participate in discussion; ask and respond to questions to acquire information concerning a topic, text, or issue. (C.1.1 and C.1.2 will be used daily). -Students will read pages 6-7 in *Water, Air, and Weather*. -Read with a partner. -Close reading (whole group) – identify meaning of evaporation, condensation, storage (accumulation), precipitation, and runoff. Use illustration of water cycle. -Formative Assessment – teacher questioning	**4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). -Students will describe each step of the water cycle in interactive science notebooks (ISN). -Draw a detailed model of the water cycle. Label with vocabulary words – evaporation, condensation, precipitation, storage (accumulation), and runoff. -Share 2D models. -Formative Assessment – teacher questioning and completed water cycle model

Wednesday, September 6	RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RL.9.2 Explain how the author's choice of words, illustrations, and conventions combine to create mood, contribute to meaning, and emphasize aspects of a character or setting. -Students will read pages 6-7 in *Weather and the Water Cycle - How Water is Recycled?* -Using the author's choice of words and illustration, students will explain how water is recycled. -Write a concise explanation in ISN.	RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. **4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). -Students will personify the Water Cycle to experience how water is recycled. Students will simulate the paths that water takes in the water cycle and describe the importance of the water cycle. -Lab Directions – Water Wonders -Prepare stations in advance (approximately 30 minutes) -Formative Assessment – teacher questioning, completion of lab sheet. Questions might include: What makes water move through the cycle? (sun, gravity, physical properties of water) What would happen if the sun's energy were blocked from Earth? ■ What might happen if all of Earth's water stayed in the oceans? In the clouds? ■ How is the water cycle important to plants and animals? (It moves water to them; it makes water available at different times.)

Thursday, September 7	RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. **4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). -Students will continue discussion of Water Wonders. -Students will be encouraged to ask questions to lead to understanding beyond the text read Wednesday. -What was it like to be a water droplet? How would you explain the water cycle through the eyes of a water droplet? **Standard 4**: Synthesize information to share learning and/or take action. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of	**4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). **Standard 4**: Synthesize information to share learning and/or take action. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events.

	characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. -Students will write a narrative describing the journey of a water droplet in the water cycle. -Draft, revise, edit, publish (Final publication will be completed in Microsoft Word.	-Students will continue narratives. -Students will engage in peer editing prior to meeting with the teacher. -Publish final story
Friday, September 8	**Continuation of narrative.** **4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). **Standard 4**: Synthesize information to share learning and/or take action. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of	**4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). **Standard 2**: Transact with texts to formulate questions, propose explanations, and consider alternative views and multiple perspectives. **5-I.2.1** Explore topics of interest to formulate logical questions; build knowledge; generate possible explanations; consider alternative views. **Standard 3**: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis**.** -The teacher will read the poem *To Water – Recycled* to the class (Appendix _). -After each stanza, they will toast to water.

	transitional words, phrases, and clauses to manage the sequence of events; g. use imagery, precise words, and sensory details to develop characters and convey experiences and events precisely; and h. provide a conclusion that follows from the narrated experiences or events. -Students will continue narratives. -Students will engage in peer editing prior to meeting with the teacher. -Publish final narrative -Share -Summative Assessment – Completed narrative	-Following poem, students will explain how water is truly recycled on Planet Earth. -Summarize how water is recycled in ISN -Formative Assessment – summary in ISN
Week 4		
Date	**ELA**	**Science**
Monday, September 11	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Introduction to predicting/forecasting the weather like a meteorologist. Read and discuss pages 16-19 in *Water, Air, and Weather*. -Read a model weather map of North America. Analyze cold fronts and warm fronts. Identify symbols for each. -Discuss how fronts affect weather conditions. -Summarize information in ISN.	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. **NOTE:** Teachers will use the Delta Kit – Weather Instruments. This kit provides materials for students to construct weather instruments. Students will begin collecting weather data Monday, September 11. They will add a component to their data collection each day in order to begin making predictions for changes in weather overtime. *Temperature* ● Air temperature is measured using a *thermometer*.

		● The scale may be read in degrees Fahrenheit or Celsius. -First instrument. Students will read thermometers using both scales, Degrees Fahrenheit and degrees Celsius. -Whole group – students will review how to read thermometers. -Students will be assigned groups to collect weather data. -Students will go outside to measure and record temperature on data sheet that will be taped into their ISNs. -Data will be collected at the same time each day. Formative Assessment – teacher questioning, observation of students using thermometers correctly and recording daily temperature.
Tuesday, September 12	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Read discuss informational text *Rain Gauge* -Students will engage in close reading to understand how a rain gauge is used to measure both rain and snow. -Teacher will ask questions to elicit information from students how author uses evidence to support particular points.	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. *Precipitation* ● Amount of precipitation is measured in a *rain gauge*.

	-Students will explain how the instrument is used for gathering data for both rain and snow in ISN. (Snow is extended learning.) They will also make real world connections. -Formative Assessment – Teacher questioning, ISN entries.	● Markings on the side show how much rain has fallen. ● A rain gauge measures rainfall in centimeters or inches. -Working in teams, students will construct rain gauges, one per team. -Teacher will model each step of the process. To ensure safety, teacher will cut tops off bottles. -  www.education.com **Instructions** 1 Using a plastic disposable water bottle, make a simple rain gauge. 2 1-liter plastic water bottle 3 Invert the top to make a funnel 4 Using your ruler and pen, place a mark every 1/2 inch on the bottle. 5 Place small pebbles in bottle. An empty plastic bottle, being light, will fall down or fly away breeze.

		-Students will place their rain gauges outside the classroom. -In addition, a "real" rain gauge will also be added. -Students will record both temperature and precipitation data on lab sheet. Formative assessment – teacher questions, connections to text, completion of rain gauge.
Wednesday, September 13	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Students will review weather instruments. In their ISNs, they will draw a model of the rain gauge and label parts. They will explain instrument's purpose. -Students will read the article *Predicting the Weather*. This informational text selection provides facts about instruments meteorologists use to predict future weather conditions. -Students will annotate text in ISN using dash (field) notes. -Vocabulary used will be reiterated during science. Formative Assessment – teacher questioning, responses in ISNs	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. Key Facts: *Wind Speed* ● Wind speed is measured with an *anemometer* as the wind causes the cups to spin. ● As the cups spin, the anemometer counts how many times they spin in a given period of time. ● The more turns, the faster the wind speed. ● An anemometer measures wind speed in kilometers and miles per hour. -Teams of students will follow provided instructions to construct an anemometer. -Teacher will facilitate and provide assistance as needed. -Directions for constructing anemometer -Teachers will model how to count revolutions to determine wind speed.

		-Students will go outside and measure wind speed, temperature, and precipitation. Data will be recorded on lab sheet. -Students will also be able to use an "inexpensive" model of an anemometer. Formative Assessment: Teacher questioning; using anemometer correctly, and participation.
Thursday, September 14	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Students will read *When the Wind Blows*. -Using text features, students will glean a better understanding of how an anemometer works. -Students will read with a partner. Engage in Think, Pair, Share prior to whole group discussion. -Draw and label model anemometer in ISNs. -Explain how it works. Formative Assessment – teacher questioning, responses in ISNs	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. Key Information: *Wind Direction* ● Wind direction is determined with a *weather vane*. ● Wind direction is described by the direction from which the wind is blowing. -Students will follow directions to construction wind vanes/weather vanes (Information is found on pages 37-42 in Weather Instruments Kit Teacher Guide. -Teacher will help students understand how to determine wind direction – the direction from which the wind is blowing. -Today, students will add wind direction to data collection lab sheet. -After gathering data for Thursday, students might begin to see patterns.

		-Time permitting, teacher will engage student teams in dialogue about possible patterns.
Friday, September 15	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -If not completed Thursday, teacher will engage student teams in dialogue about possible patterns. -Students will analyze data and begin formulating possible daily predictions. This process will continue through the end of Week 5. -Students will read closely pages 10-11 in *Water, Air, and Weather*. -Through close reading, they will develop an operational definition for humidity. -Living along the coast, the students will be able to make connections with their environment and humidity. Formative Assessment – teacher questions, student responses in ISNs	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. -In fourth grade, students only need to understand that humidity is the amount of water vapor in the air. The use of a hygrometer is extended learning and will not be included. -To understand humidity, each team of students will engage in an investigation to observe humid conditions. The investigation is on pages 67-73 in Weather Instruments Teacher Guide. -After determining the effect of moisture on cobalt paper, students will use cobalt paper to measure humidity in their daily observations. -To record humidity, students will use blue for dry (no humidity), pink for high humidity, and faint pink or violent for moderate humidity.
Week 5		
Date	**ELA**	**Science**

Monday, September 18	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Introduction to types of clouds -Read pages 14-15 in *Water, Air, ad Weather*. -In ISN, students will draw models of the three main types of clouds: cumulus, stratus, and cirrus. This will also include cumulonimbus and altostratus. -Students will describe each type of cloud by paraphrasing from reading. Formative Assessment – teacher questioning, models of clouds (ISN)	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. -Each student will construct a cloud viewer. -Beginning today, students will add the types of clouds observed in the sky to weather data collection. -When going outside, students are now using instruments to record temperature, precipitation, wind direction, wind speed, humidity, and types of clouds and predict changes in weather over time. -Students will construct a cloud viewer that will help them to identify cloud types. -Record daily observations.
Tuesday, September 19	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points.	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. -For the remainder of the week, students will use instruments to record temperature, precipitation,

	RL.10.2 Determine the meaning of an unknown word using knowledge of base words and Greek and Latin affixes. -Students will read mini-book – *Clouds, Wind, and Storms*. -Working in small groups, students will discuss connections between clouds, wind, and storms -Record connections (dash notes) in ISN -Whole group discussion – connections and real-world connections with weather forecasting Formative Assessment – teacher questioning	wind direction, wind speed, humidity, and types of clouds. Each day, they will analyze data collected overtime to identify any patterns. They will begin adding a daily prediction for future weather. -Whole group lab. Teacher will use cloud maker to demonstrate how a cloud forms. -Students will use knowledge gleaned from informational text to explain how the cloud forms. -Draw a model in ISN and explain process of how clouds are formed. Formative Assessment – teacher questions, ISN entry
Wednesday, September 20	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Students will read informational text passage *Clouds*. -This passage will enable students to use poetry as a form of informational text. Formative Assessment – teacher questioning	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. -For the remainder of the week, students will use instruments to record temperature, precipitation, wind direction, wind speed, humidity, and types of clouds. Each day, they will analyze data collected overtime to identify any patterns. They will begin adding a daily prediction for future weather. -Team Investigation: Create a cloud. -Directions: Weather Instruments Manual page 9.

Thursday, September 21	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Vocabulary and reading game: Students will construct a cloud "four corner" viewer. The goal is to read and eventually get the cloud in the center. -Formative Assessment: student participation, use of vocabulary, getting the cloud in the center	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. -Students will continue to use instruments to record temperature, precipitation, wind direction, wind speed, humidity, and types of clouds. Each day, they will analyze data collected overtime to identify any patterns. They will begin adding a daily prediction for future weather.
Friday, September 22	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -Read *Predicting the Weather with Bob*. -Students will engage in Think, Pair, Share to explain how meteorologists forecast the weather. -Write explanation providing evidence from informational text to explain the forecasting process (ISN). -Share with class	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. -Students will continue to use instruments to record temperature, precipitation, wind direction, wind speed, humidity, and types of clouds. Each day, they will analyze data collected overtime to identify any patterns. They will begin adding a daily prediction for future weather.

	Formative Assessment – teacher questioning, completing of explanation in ISNs, student participation	
Week 6		
Date	**ELA**	**Science**
Monday, September 25	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. -Students will read informational text selection *Predicting the Weather* -Closely read to determine how to meteorologists predict future weather conditions and changes overtime. -Students will work in teams and analyze weather data collected. -They will create a PowerPoint presentation to share their findings to explain changes overtime and end with a future forecast. -As part of PowerPoint, students will graph, compare, and interpret the weather data. -Summative Assessment will be PowerPoint and presentation to class.	**4.E.2B.1** Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; -Continue PowerPoint presentation to share their findings to explain changes overtime and end with a future forecast. -Summative Assessment will be PowerPoint and presentation to class.

Tuesday, September 26	W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. -Students will complete PowerPoints and sharing. -Summative Assessment will be PowerPoint and presentation to class.	**4.E.2B.2** Obtain and communicate information about severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) to explain steps humans can take to reduce the impact of severe weather phenomena. -Introduction to Severe Weather. Students will view video https://www.youtube.com/watch?v=QVZExLO0MWA -Group discussion about video about the types of severe weather. -Summarize types of severe weather in ISN. Formative Assessment – Teacher questioning, responses in ISN
Wednesday, September 27	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. -Students will read *Being Safe in a Thunderstorm* -Working in small groups, students will identify how a thunderstorm forms and how to stay safe during the event.	**4.E.2B.2** Obtain and communicate information about severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) to explain steps humans can take to reduce the impact of severe weather phenomena. Lab: Make a Thunderstorm (Follow Directions Provided) -Students will use ice to simulate what happens with fronts to create a thunderstorm. -Extended learning – if the word convection is used, that will be extended learning. -Class discussion – What happened? Why?

	-Students will write dash notes in their ISNs identifying important content and/or annotate on the informational text document -Engage in whole group discussion to explain phenomena and how to stay safe Formative Assessment – teacher questioning, entries in ISNs.	-Students will draw a model and explain the model in ISN. Formative Assessment: Teacher questioning, student participation, responses in ISN
Thursday, September 28	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. -Divide students into reading clubs. One club will read *Hurricanes* and the other group will read *Inside a Hurricane.* -Clubs will collaborate and identify the main ideas from each passage. -They will use field notes (dash notes) to record passages.	**4.E.2B.2** Obtain and communicate information about severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) to explain steps humans can take to reduce the impact of severe weather phenomena. -Students will use the following sites to create hurricanes and identify the weather conditions that must exist for a strong hurricane to develop. https://scied.ucar.edu/make-hurricane https://scied.ucar.edu/make-hurricane -Students will identify conditions that create the strongest hurricanes after engaging in the simulation. -Summarize the conditions in ISN Formative Assessment: teacher questioning, student participation, responses in ISN
Friday, September 29	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text.	**4.E.2B.2** Obtain and communicate information about severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) to explain steps humans

	RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. -Students will work with a partner to identify weather conditions that need to be in place to create a tornado. -They will read informational text online *Forces of Nature – Tornados.* https://www.nationalgeographic.org/interactive/forces-nature/ -Using knowledge gleaned from reading, students will create online models of tornadoes ranging from F1 to F5. -Whole group – students will share findings Formative Assessment: teacher questioning, ability to create model tornadoes and explain process	can take to reduce the impact of severe weather phenomena. -Each student will construct a model tornado (2-liter bottles, tornado connector, tape, water, blue food coloring, "houses") -Teachers will invite parent volunteers in to help with this investigation. -Students will measure water and food coloring to create the ocean in one empty two-liter bottle. Drop a "house" into the water. -Empty two-liter bottle will be connected to first bottle using connector. -Once completed, students will use the model to simulate a tornado in action. -Students will draw and label model in ISN. Explain how the tornado forms in the bottle. Formative Assessment: teacher questioning, ability to create model tornadoes and explain process
Week 7		
Date	**ELA**	**Science**
Monday, October 2	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning.	**4.E.2B.2** Obtain and communicate information about severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) to explain steps humans can take to reduce the impact of severe weather phenomena. RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning.

	W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. -Students will use Microsoft Office Publisher to create a Severe Weather Safety Brochure. -Students will have the choice of creating a brochure for thunderstorms, hurricanes, tornadoes. (To extend learning, teachers have the option of allowing students to select other natural disasters such as blizzard or flooding). -Students may work alone or with a partner (teacher choice) -Site for research include (These sites will be bookmarked and/or located on the teacher website). http://www.floodsafety.noaa.gov http://www.weatherwizkids.com/weather-safety.htm https://weather.com/safety/tornado/news/tornadoes-safety-during-20120330 -Students will research information, save pictures for brochure. -Students will use two screens to collect field notes and/or record in ISN.	RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive -Continue research and creation of Safety Brochures -Teacher will facilitate and help as needed
Tuesday, October 3	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text.	**4.E.2B.3** Construct explanations about regional climate differences using data from the long-term weather conditions of the region.

	RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive -Complete brochures. Print. (Printing will require teacher assistance due to color printing) -Students will engage in a Gallery Walk to read and view brochures. -Students will leave post it notes commenting on what they like about the brochures. Summative Assessment – completed brochures	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. -To understand the difference between weather and climate, students will read *Weather or Climate.* -Think, pair, share. After reading the text, students will discuss with a partner the difference between weather and climate. They will use text evidence to support their claims.
Wednesday, October 4	RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. -Review Weather and Climate	**4.E.2B.3** Construct explanations about regional climate differences using data from the long-term weather conditions of the region RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning. RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text. RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases.

	-Teacher will model how to use Weather Underground to compare local weather with another state. Ensure student understanding prior to beginning. Site: http://www.ciese.org/curriculum/weatherproj2/en/lesson2.shtml -Students will work in pairs. Select a state to compare local weather. Record data for both locations in ISNs. Formative Assessment: teacher questioning, written comparisons in ISNs.	RI11.2 Explain how an author uses reasons and evidence to support particular points. RI11.1 Apply knowledge of text structures to describe how structures contribute to meaning. -Students will continue making comparisons using Weather Underground. -Prepare report for class. Summative Assessment: Comparison Reports
Thursday, October 5	W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive. -To review all science and communication standards, a local meteorologist will visit fourth grade. -Students will prepare questions prior to the visit to collect data during the presentation. -During question/answer time, students will have the opportunity to ask questions that they would like answered. -Following visit, students will write and/or use Microsoft Word to write thank you letters to the meteorologist containing information learned and/or reinforced during the presentation. -Students will use correct letter writing skills. Summative Assessment – Thank you letter correctly formatted containing weather information. (Thank you letters come from the heart, inventive spelling will be accepted).	Continuation of morning following visit from local meteorologists. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive. -To review all science and communication standards, a local meteorologist will visit fourth grade. -Students will prepare questions prior to the visit to collect data during the presentation. -During question/answer time, students will have the opportunity to ask questions that they would like answered. -Following visit, students will write and/or use Microsoft Word to write thank you letters to the meteorologist containing information learned and/or reinforced during the presentation. -Students will use correct letter writing skills.

		Summative Assessment – Thank you letter correctly formatted containing weather information. (Thank-you letters come from the heart, inventive spelling will be accepted).
Friday, October 6	Students will complete Science Posttest.	RI.9.1 Use definitions, examples, and restatements to determine the meaning of words or phrases. RI11.2 Explain how an author uses reasons and evidence to support particular points. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive. -To conclude study of weather, teacher will read *The Important Book.* -Discuss text features. -Using the text format as a guide, each student will write what they think is most important about the study of weather. -They will write claims (facts) of what they have learned and support claims with evidence from learning. -Students will use Microsoft Word to publish narrative. -Share. Summative Assessment – Completed writing with claims and supporting evidence.

The references listed on this page were used to locate informational texts, investigations, and identifying correlating standards to include in the intervention.

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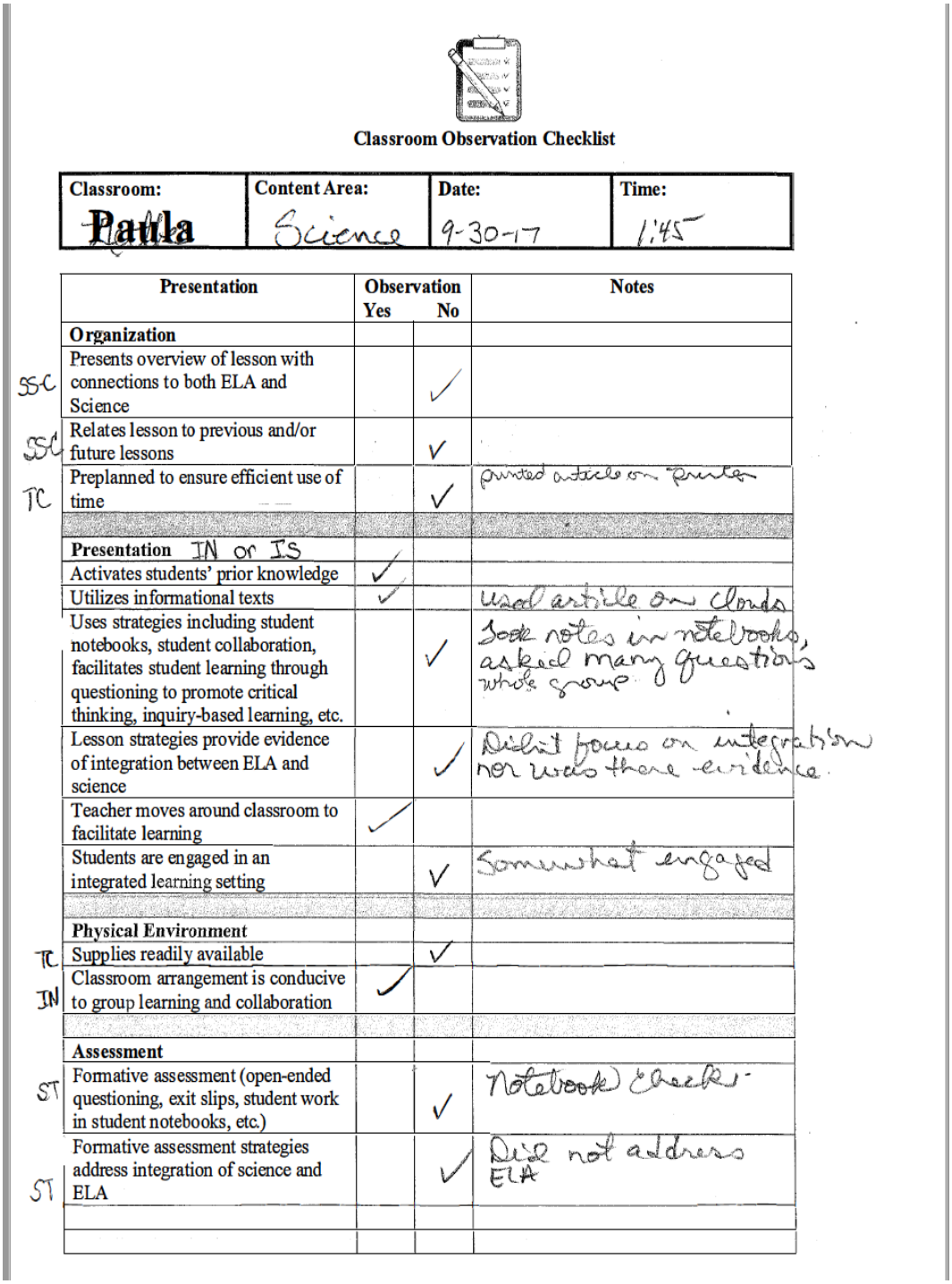
Appendix H: Sample Data Pre- and Posttest Data Collection

	A	B	C	D
1	Timestamp	Score	Enter your identification number.	1.
2	10/25/2017 14:20:04	35 / 100	101	has weight.
3	10/25/2017 14:18:24	65 / 100	102	has weight.
4	10/25/2017 14:14:46	70 / 100	103	has weight.
5	10/25/2017 14:29:13	70 / 100	104	has weight.
6	10/25/2017 14:23:19	60 / 100	105	has weight.
7	10/25/2017 14:18:34	55 / 100	106	has mass.
8	10/25/2017 14:23:02	65 / 100	107	takes up space.
9	10/25/2017 14:19:42	60 / 100	108	takes up space.
10	10/25/2017 14:21:59	75 / 100	109	has mass.
11	10/25/2017 14:24:06	60 / 100	110	takes up space.
12	10/25/2017 14:20:37	65 / 100	111	has weight.
13	10/26/2017 8:31:35	70 / 100	112	has weight.
14	10/25/2017 14:20:50	55 / 100	113	has mass.
15	10/25/2017 14:19:03	70 / 100	116	has weight.
16	10/25/2017 14:19:24	55 / 100	117	takes up space.
17	10/25/2017 14:22:47	70 / 100	118	has weight.
18	10/25/2017 14:23:39	40 / 100	120	has weight.
19	10/25/2017 14:14:57	75 / 100	121	has weight.
20	10/25/2017 14:19:52	75 / 100	122	has weight.
21	11/1/2017 13:56:18	35 / 100	123	takes up space.
22	10/25/2017 14:12:38	35 / 100	124	takes up space.
23	10/18/2017 8:46:35	70 / 100	201	has weight.
24	10/18/2017 8:46:07	65 / 100	202	has weight.
25	10/18/2017 8:46:16	80 / 100	203	has weight.
26	10/18/2017 8:58:23	60 / 100	204	has mass.
27	10/18/2017 8:46:09	80 / 100	205	has weight.
28	10/18/2017 8:48:38	60 / 100	206	has weight.
29	10/18/2017 8:44:01	75 / 100	207	has weight.
30	10/18/2017 8:51:53	80 / 100	208	has weight.
31	10/18/2017 8:42:09	85 / 100	209	has mass.
32	10/18/2017 8:52:15	45 / 100	210	has mass.
33	10/18/2017 8:47:47	80 / 100	211	has weight.
34	10/18/2017 9:11:26	75 / 100	212	has weight.
35	10/18/2017 8:45:51	65 / 100	213	takes up space.
36	10/18/2017 8:45:41	65 / 100	214	has weight.
37	10/18/2017 8:44:18	70 / 100	215	has weight.
38	10/18/2017 8:48:37	75 / 100	216	has weight.
39	10/18/2017 8:48:57	30 / 100	217	takes up space.
40	10/18/2017 8:44:25	55 / 100	218	has weight.
41	10/18/2017 8:44:21	75 / 100	219	has weight.
42	10/18/2017 8:50:45	65 / 100	220	has mass.

Appendix I: Sample Classroom Observation Checklist

The participants' pseudonyms were typed over their last names on the Classroom Observation Checklists.



Classroom Observation Checklist

Classroom:	Content Area:	Date:	Time:
Patla	Science	9-30-17	1:45

	Presentation	Observation Yes	Observation No	Notes
	Organization			
SSC	Presents overview of lesson with connections to both ELA and Science		✓	
SSC	Relates lesson to previous and/or future lessons		✓	
TC	Preplanned to ensure efficient use of time		✓	printed article on printer
	Presentation IN or IS			
	Activates students' prior knowledge	✓		
	Utilizes informational texts	✓		Used article on clouds
	Uses strategies including student notebooks, student collaboration, facilitates student learning through questioning to promote critical thinking, inquiry-based learning, etc.		✓	Took notes in notebooks, asked many questions whole group
	Lesson strategies provide evidence of integration between ELA and science		✓	Didn't focus on integration nor was there evidence.
	Teacher moves around classroom to facilitate learning	✓		
	Students are engaged in an integrated learning setting		✓	Somewhat engaged
	Physical Environment			
TC	Supplies readily available		✓	
IN	Classroom arrangement is conducive to group learning and collaboration	✓		
	Assessment			
ST	Formative assessment (open-ended questioning, exit slips, student work in student notebooks, etc.)		✓	Notebook checks.
ST	Formative assessment strategies address integration of science and ELA		✓	Did not address ELA

ELA - infor text struc.
Sci - Measuring weather data

Classroom Observation Checklist

Classroom:	Content Area:	Date:	Time:
Madea	ELA	9-28-17	8:00

	Presentation	Observation Yes	Observation No	Notes
	Organization			
SS-C	Presents overview of lesson with connections to both ELA and Science	✓		Connected to ELA infor text features + Science weather concept of measuring data
SS-C	Relates lesson to previous and/or future lessons	✓		Connected to what class did yesterday - structure of the text yesterday
TC	Preplanned to ensure efficient use of time	✓		
	Presentation IS or FN	✓		
	Activates students' prior knowledge	✓		How do we read? Underline, talk discuss w/ partner
	Utilizes informational texts	✓		Sheet on Measuring Data
	Uses strategies including student notebooks, student collaboration, facilitates student learning through questioning to promote critical thinking, inquiry-based learning, etc.	✓		Student collaboration on reading of text, questioning, inquiry-based - students were reading/questioning together.
	Lesson strategies provide evidence of integration between ELA and science	✓		Using the ELA standards with science reading.
	Teacher moves around classroom to facilitate learning	✓		Brought group to back table - differentiated instruc.
	Students are engaged in an integrated learning setting	✓		All engaged + you could tell they're used to working in groups together.
	Physical Environment			
TC	Supplies readily available	✓		Papers ready to go.
IN	Classroom arrangement is conducive to group learning and collaboration	✓		groups of [illegible], groups moved to [illegible] of room; set aside [illegible] to work [illegible] with tools
	Assessment			
ST	Formative assessment (open-ended questioning, exit slips, student work in student notebooks, etc.)	✓		
ST	Formative assessment strategies address integration of science and ELA	✓		Referred to what type of text struc their article was - why do you think he chose this type?

☺ Students were expected to be independent learners so those that weren't able to do this yet were pulled w/ teachers

Appendix J: Participant Reflection Journal

Sept. 27, '17

Student Wrote Haikus poems to Connect What they learned in Science into Literacy. The information was amazing! I didn't realize the amount of information they were learning until I read the haikus.

Sept. 28

Began reading/writing w/ Measuring and Predicting Weather Vocabulary words - definition right in the text. Had to pull small group. Comprehension difficult for them. I had to read w/ two students so they could get the info - went on to create rain gauges in lab next door. Re-taught measurement to ½ inch they marked water bottles and placed in buckets. I made connections to - variable, prediction in context of whole reading - getting easier to make Connections Reading - science - writing

Appendix K: Sample Classroom Observation Research Protocol (Harding, 2013)

When I entered Madea's classroom, the students were sitting in groups of four. All the materials needed to do the lesson were prepared and easily retrievable by the teacher. The teacher had the objective handwritten on the board as well as the standard printed just as it's worded from the state department on a piece of chart paper. This was easily read by all students in the room. It was clear to the students what the learning objective was for the class period. The teacher referred back to the standards (curricula) twice during the lesson. There were multiple anchor charts in the room for students to use as a reference when completing work including one on informational text structures and features that was the objective of her lesson. Behavior expectations were previously established as evidenced from the rapport between the teacher/students and student/student interactions. On each student group was a collection of books and articles on weather that the students were to use for the ELA lesson on using informational text features and structures. She started the lesson as a whole group mini-lesson then divided students into their small groups. They were placed around the room on the floor. The students the teacher had identified as having learning difficulties were pulled to the back table to work with her. This lasted 40 minutes. All students were engaged on what they were to do. The teacher was teaching her students how to be independent learners because they did most of the work themselves with only limited directions from the teacher. When time was up, the teacher brought the class back together and told them how this lesson was going to help them as they moved into their science Investigation lesson that was to follow. Students shared from the chart they were filling out some of the text structures they discovered in their work together and then the class moved into the next classroom to begin their investigation.

Appendix L: Researcher's Sample Journal Page

Selected Journal Reflections – October 5, 2017

Reflective Journal Entries/Quotes were copied verbatim. I selected entries that answered the research questions. Research questions are identified at the end of each entry.

Jess:
I am applying reading strategies and TDA writing to science texts and Social Studies whereas originally, I only integrated SS. I have found more "in-depth" science texts to use to teach reading strategies. I am not sure if I am actually ending up with more time, but my students are getting double the reading through the science texts I am using. RQ3

Charlie:
I would say that I am using more of a variety of science texts during science and language arts. I am finding that it is easier to integrate more subjects such as mathematics into science.

I would also say I am asking more questions now, reflecting upon my practices are more frequent now. RQ3

Jen:
I have discovered that I am now connecting literacy and science! Before the intervention, I taught each of the content areas in isolation.

I am realizing that I am integrating A LOT of literacy with science and searching for more ways to do so with my fourth-grade team. I have used reading mini-books, writing cloud haikus, research, and note taking with my students.

I realized the importance of making the science and literacy connections with the students is crucial for them to understand that reading and writing are everywhere and they are connected. It is important to make learning fun and enjoyable. Integration leads students to making connections, allowing their creativity to flow, and provides ownership of their learning. I am beginning to create a more student0centered classroom because of the intervention.

My teaching strategies are the same. However, I verbally help the students understand the connection between literacy and science is the heart of instruction. "We do not live in a world of isolation. Therefore, content area instruction should not be taught in isolation." RQ3

Madea:
I not only integrate reading/writing more efficiently and effectively during both science and ELA, I also incorporate experiments with reading and writing. Somehow before, I thought that needed to be isolated or done with the science teacher.

I have found that through integrating the content areas, I have more time during the day. I seem to be able to get it all in ow without to much of a struggle. This intervention has definitely changed how I teach science. I now understand how to connect literacy and science. In addition,

I have discovered how to pull individuals aside who need additional assistance with both literacy and science. RQ3

Bee:
I find that I am more confident integrating science and literacy. I have always liked teaching science, but I did not know how to make connections with literacy. Now my students are reading, writing, and researching during both science and ELA. It is amazing because they do not know which subject is being addressed.

My concern is my IEP kids. If there was a way to teach this content but with first grade reading level materials, they might understand the vocabulary and concepts better. They have had difficulty remembering the content and they have not been able to apply knowledge to models and investigations. RQ3

Paula:
No Reflection Journal submitted.

Appendix M: Summative Data Collected During Classroom Observations

The five themes are identified in each section of the checklist using an abbreviation. The abbreviations are time constraints (TC), isolation (IS), state standards (SS-C), integration (IN), and state testing (ST). Number of teachers exhibiting the identified actions were recorded in either the yes or no column.

Classroom Observation Checklist – Beginning of Intervention

Classroom:	**Content Area:**	**Date:**	**Time:**

Presentation	**Observation** **Yes**	**No**	**Notes**
Organization			
Presents overview of lesson with connections to both ELA and Science **SS-C**		**6**	
Relates lesson to previous and/or future lessons **SS-C**	**2**	**4**	
Preplanned to ensure efficient use of time **TC**	**4**	**2**	
Presentation IS or IN Yes-IN NO-IS			
Activates students' prior knowledge	**6**		
Utilizes informational texts	**6**		
Uses strategies including student notebooks, student collaboration, facilitates student learning through questioning to promote critical thinking, inquiry-based learning, etc.	**4**	**2**	
Lesson strategies provide evidence of integration between ELA and science	**4**	**2**	
Teacher moves around classroom to facilitate learning	**6**		

Students are engaged in an integrated learning setting	**4**	**2**	
Physical Environment			
Supplies readily available **TC**	**4**	**2**	
Classroom arrangement is conducive to group learning and collaboration **IN**	**6**		
Assessment			
Formative assessment (open-ended questioning, exit slips, student work in student notebooks, etc.) **ST**	**1**	**5**	
Formative assessment strategies address integration of science and ELA **ST**	**1**	**5**	

Classroom Observation Checklist – Middle to End of Intervention

Classroom:	**Content Area:**	**Date:**	**Time:**

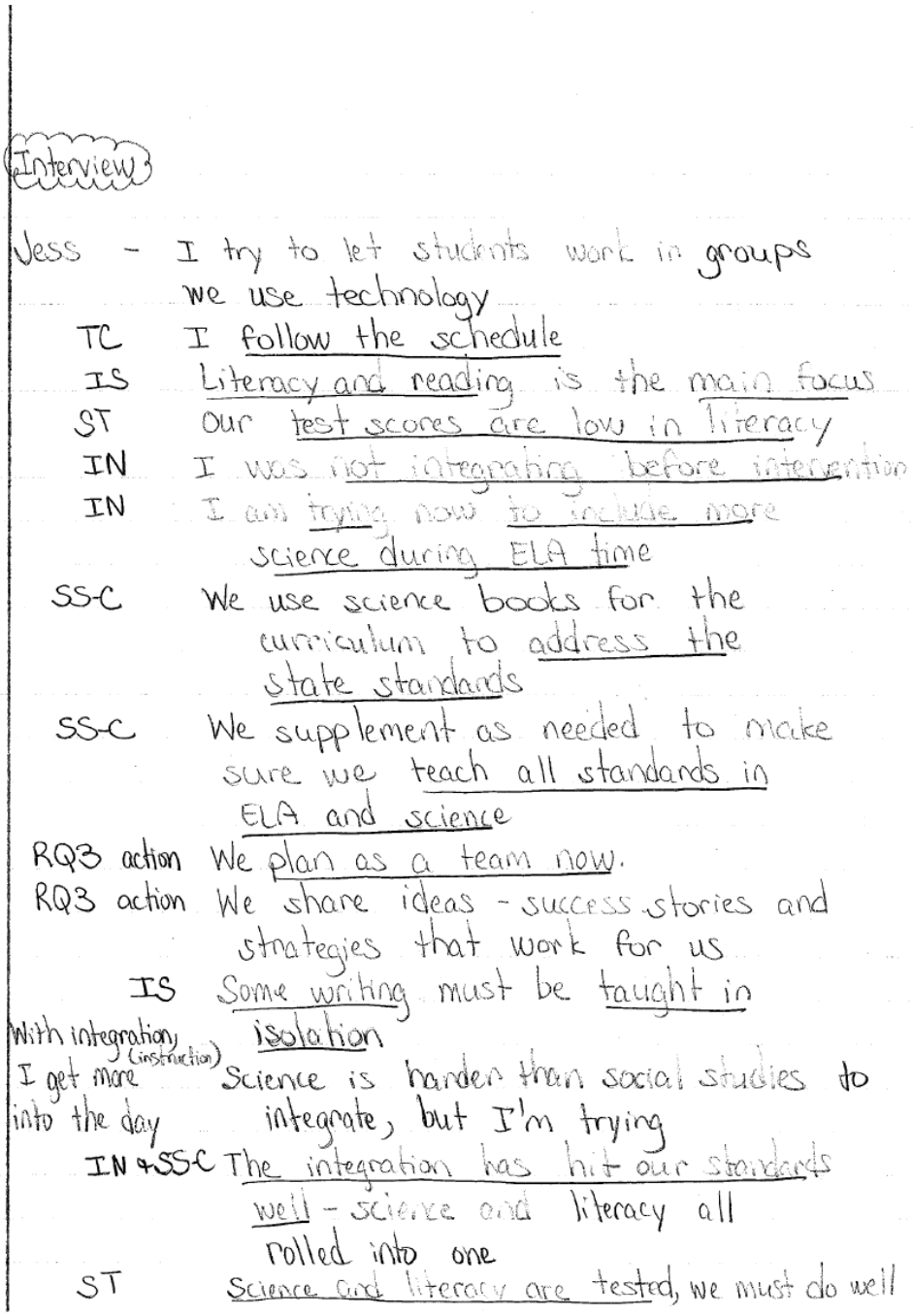
Presentation	**Observation** **Yes**	**No**	**Notes**
Organization			
Presents overview of lesson with connections to both ELA and Science **SS-C**	**5**	**1**	
Relates lesson to previous and/or future lessons **SS-C**	**5**	**1**	
Preplanned to ensure efficient use of time **TC**	**5**	**1**	
Presentation IS or IN Yes-IN			

NO-IS			
Activates students' prior knowledge	**5**	**1**	
Utilizes informational texts	**5**	**1**	
Uses strategies including student notebooks, student collaboration, facilitates student learning through questioning to promote critical thinking, inquiry-based learning, etc.	**6**		
Lesson strategies provide evidence of integration between ELA and science	**5**	**1**	
Teacher moves around classroom to facilitate learning	**5**	**1**	
Students are engaged in an integrated learning setting	**5**	**1**	
Physical Environment			
Supplies readily available **TC**	**5**	**1**	
Classroom arrangement is conducive to group learning and collaboration **IN**	**6**		
Assessment			
Formative assessment (open-ended questioning, exit slips, student work in student notebooks, etc.) **ST**	**4**	**2**	
Formative assessment strategies address integration of science and ELA **ST**	**4**	**2**	

Appendix N: Sample of Coded Interview

The five themes are identified in each section of the checklist using an abbreviation. The abbreviations are time constraints (TC), isolation (IS), state standards (SS-C), integration (IN), and state testing (ST).

Teacher pseudonym was used.



Interview 3

Jess - I try to let students work in groups we use technology

TC I follow the schedule

IS Literacy and reading is the main focus

ST Our test scores are low in literacy

IN I was not integrating before intervention

IN I am trying now to include more science during ELA time

SS-C We use science books for the curriculum to address the state standards

SS-C We supplement as needed to make sure we teach all standards in ELA and science

RQ3 action We plan as a team now.

RQ3 action We share ideas - success stories and strategies that work for us

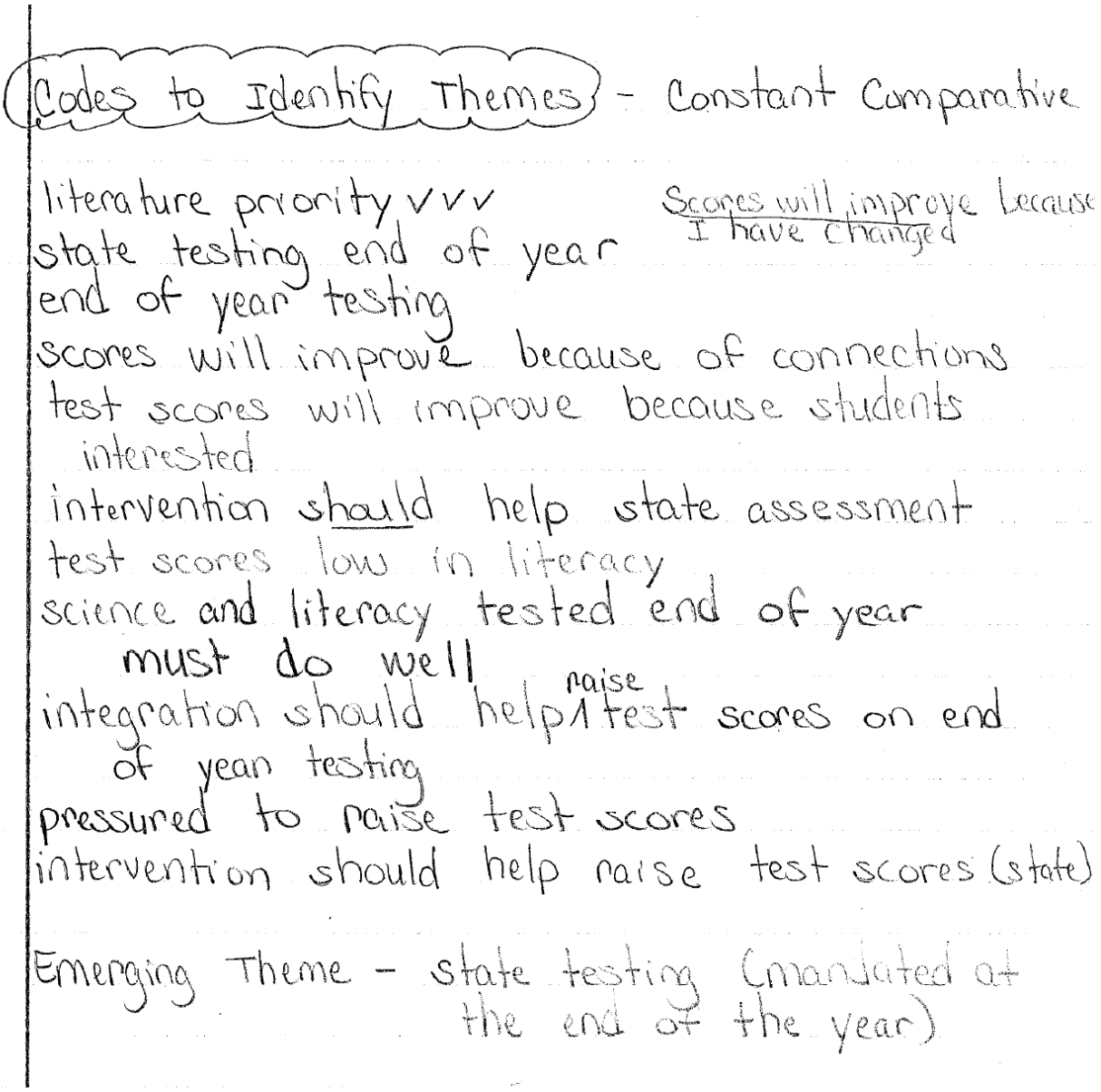
IS Some writing must be taught in isolation

IN With integration (instruction) I get more into the day Science is harder than social studies to integrate, but I'm trying

IN + SS-C The integration has hit our standards well - science and literacy all rolled into one

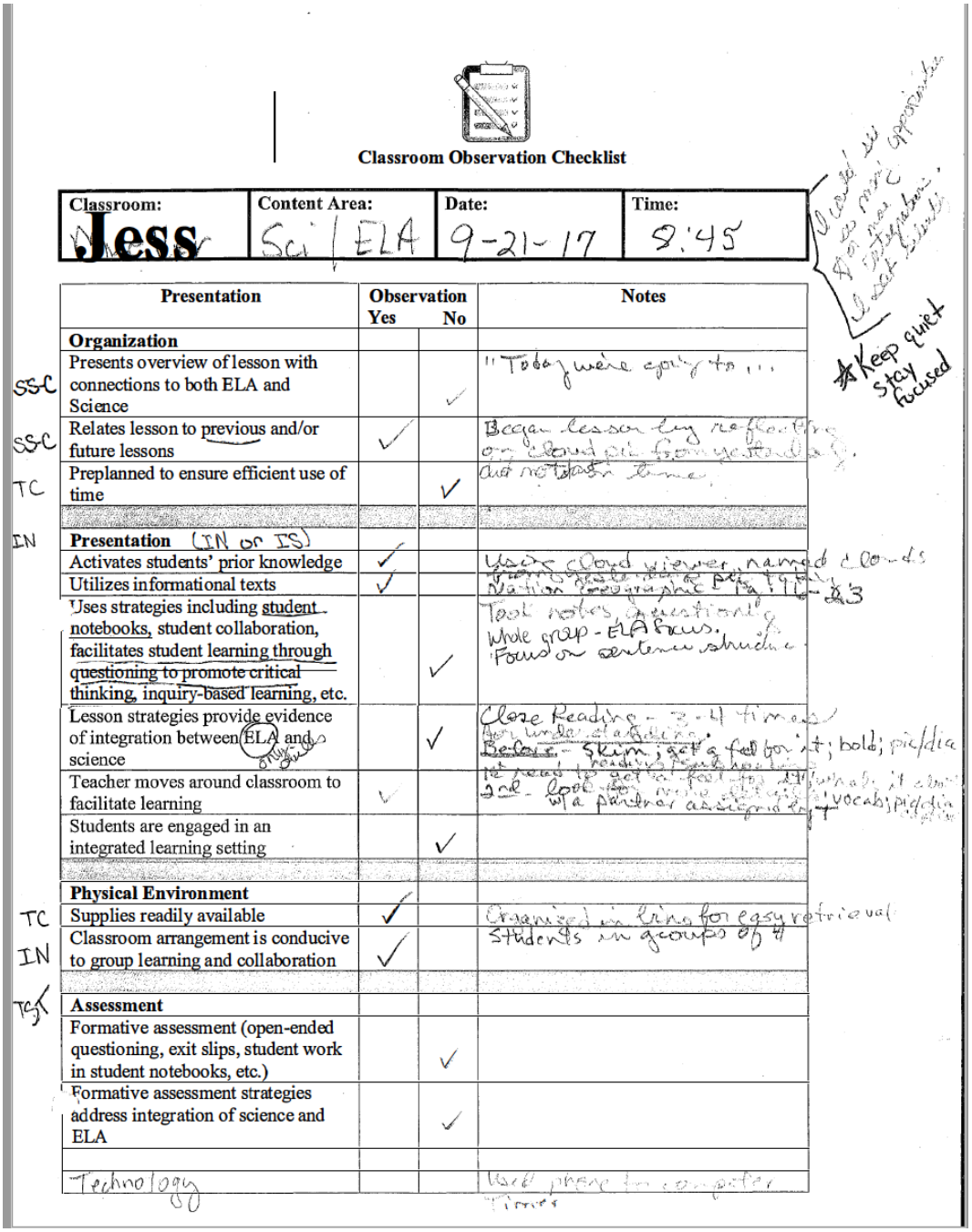
ST Science and literacy are tested, we must do well

Appendix O: Sample Constant Comparative Word and Phase List Used to Determine Themes From Interviews



Appendix P: Classroom Observation Checklist With Bracketing

During observations, bracketing consisted primarily of notes to keep me focused on what was happening in the classroom setting because I observed numerous opportunities for integration during each classroom visit.



Classroom Observation Checklist

Classroom:	Content Area:	Date:	Time:
Jess	Sci / ELA	9-21-17	9:45

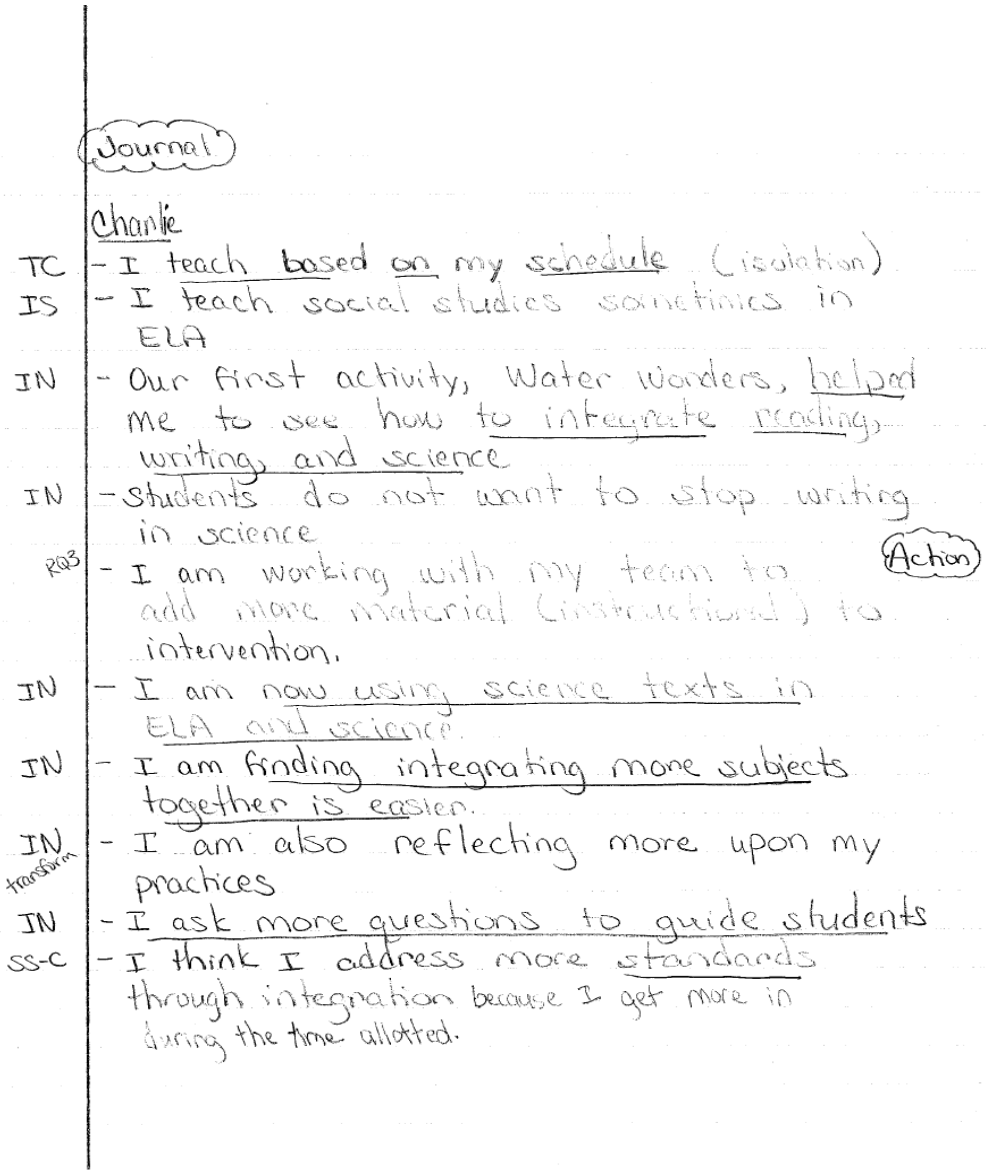
	Presentation	Observation Yes	Observation No	Notes
	Organization			
SSC	Presents overview of lesson with connections to both ELA and Science		✓	"Today we're going to..."
SSC	Relates lesson to previous and/or future lessons	✓		Began lesson by reflecting on Cloud pic from yesterday.
TC	Preplanned to ensure efficient use of time		✓	but not enough time
IN	**Presentation** (IN or IS)			
	Activates students' prior knowledge	✓		Used cloud viewer, named clouds
	Utilizes informational texts	✓		Nation Geographic Pg 1 to 23
	Uses strategies including student notebooks, student collaboration, facilitates student learning through questioning to promote critical thinking, inquiry-based learning, etc.		✓	Took notes, questions, Whole group - ELA focus. Focus on sentence structure
	Lesson strategies provide evidence of integration between ELA and science		✓	Close Reading - 3-4 times for understanding. Before - skim, get a feel for it; bold; pic/dia 1st read to get a feel for it 2nd - look for main ideas w/a partner assigned by 4 vocab; pic/dia
	Teacher moves around classroom to facilitate learning	✓		
	Students are engaged in an integrated learning setting		✓	
	Physical Environment			
TC	Supplies readily available	✓		Organized in bins for easy retrieval
IN	Classroom arrangement is conducive to group learning and collaboration	✓		Students in groups of 4
TCH	**Assessment**			
	Formative assessment (open-ended questioning, exit slips, student work in student notebooks, etc.)		✓	
	Formative assessment strategies address integration of science and ELA		✓	
	Technology			Used phone to computer Timer

Keep quiet stay focused

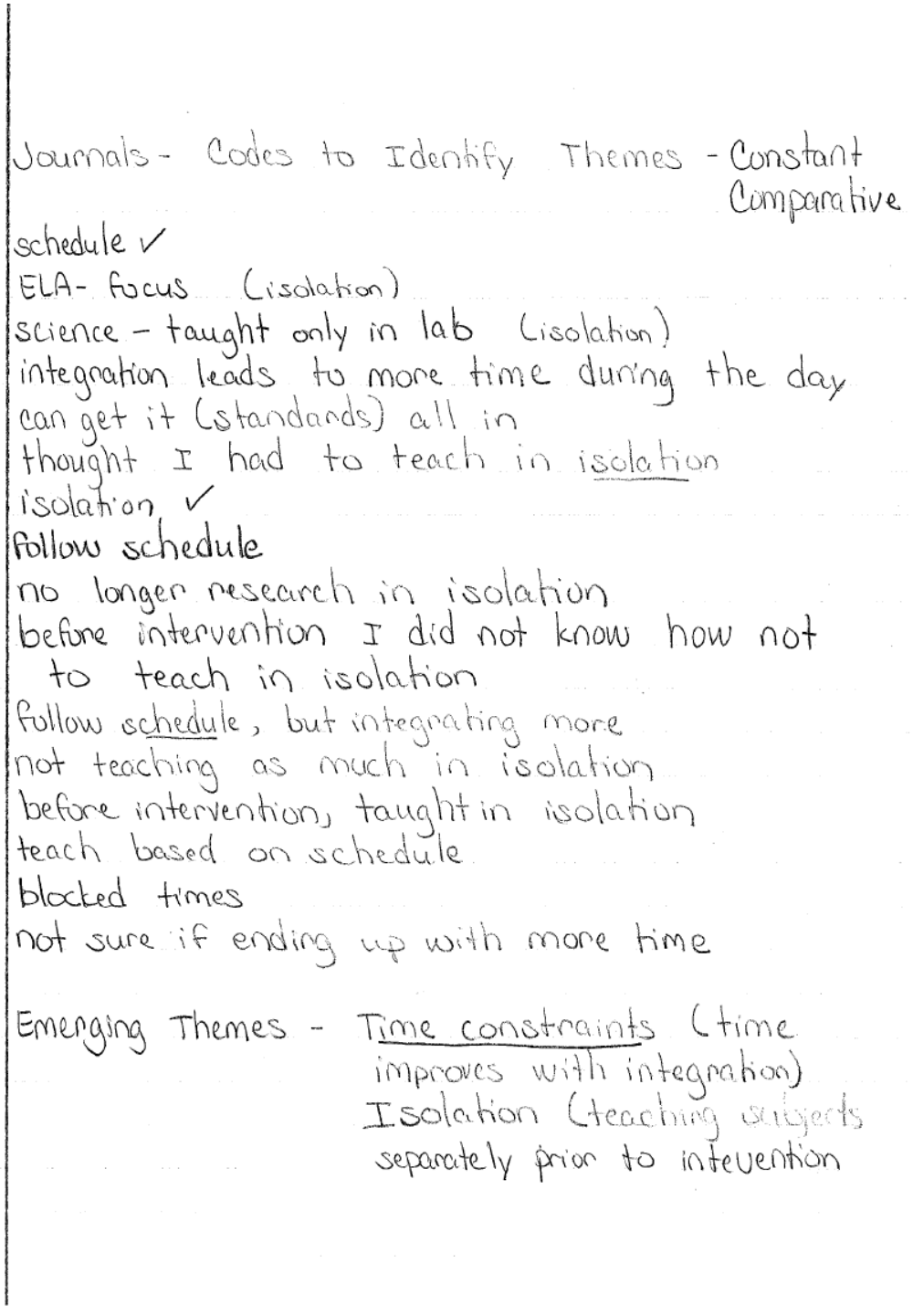
Appendix Q: Sample of Words and Phrases Extracted from Journal Entry

The five themes are identified in each section of the checklist using an abbreviation. The abbreviations are time constraints (TC), isolation (IS), state standards (SS-C), integration (IN), and state testing (ST).

Teacher pseudonym was used.



Appendix R: Sample Constant Comparative Method Word and Phrase List Used to Determine Themes



Journals - Codes to Identify Themes - Constant Comparative

schedule ✓
ELA- focus (isolation)
science – taught only in lab (isolation)
integration leads to more time during the day
can get it (standards) all in
thought I had to teach in isolation
isolation ✓
follow schedule
no longer research in isolation
before intervention I did not know how not to teach in isolation
follow schedule, but integrating more
not teaching as much in isolation
before intervention, taught in isolation
teach based on schedule
blocked times
not sure if ending up with more time

Emerging Themes - Time constraints (time improves with integration)
Isolation (teaching subjects separately prior to intevention

Appendix S: Sample Amendments to Intervention

You-tube cool Water cycle song lyrics
Shows cycle + clouds ↑

Pull in Clouds ↗ Tomorrow - observe outside to id clouds then make clouds - cotton ball + construction paper - haiku is good nature poem - to do w/clouds -		Water Dance - models how to write this
Thursday, September 7 mini books "Wondering about Water Cycle" * "I am" use books Atlantic and Majave to show personification	RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions. **4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). -Students will continue discussion of Water Wonders. -Students will be encouraged to ask questions to lead to understanding beyond the text read Wednesday. -What was it like to be a water droplet? How would you explain the water cycle through the eyes of a water droplet? **Standard 4**: Synthesize information to share learning and/or take action. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or	**4.E.2A.2** Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff). **Standard 4**: Synthesize information to share learning and/or take action. W.3.1 Gather ideas from texts, or multimedia, and personal experience to write narratives that: a. develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences; b. orient the reader by establishing a situation and introducing a narrator and/or characters; c. organize an event sequence that unfolds naturally; d. use dialogue, pacing, and manipulation of time to develop experiences and events or show the responses of characters to situations; e. develop and strengthen writing as needed by planning, revising, and editing building on personal ideas and the ideas of others; f. use a variety of transitional words,

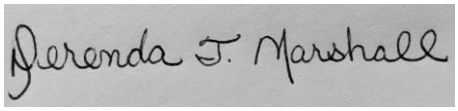
Water Dance shows Personification

Appendix __: Statement of Original Work

Statement of Original Work

I attest that:

1. I have read, understood, and complied with all aspects of the Concordia University- Portland Academic Integrity Policy during the development and writing of this dissertation.
2. Where information and/or materials from outside sources has been used in the production of this dissertation, all information and/or materials from outside sources has been properly referenced and all permissions required for use of the information and/or materials have been obtained, in accordance with research standards outlined in the *Publication Manual of The American Psychological Association*



Digital Signature

Derenda T. Marshall

Name (Typed)

December 13, 2017

Date