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EXPLORING THE INFLUENCE OF DIGITAL WRITING ON PRIMARY
STUDENTS' REVISIONS OF INFORMATIONAL TEXT:
A FORMATIVE EXPERIMENT

by

Alayne Leavitt Jorgensen

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Education

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2019

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ABSTRACT

Exploring the Influence of Digital Writing on Primary Students' Revisions of
Informational Text: A Formative Experiment

by

Alayne Leavitt Jorgensen, Master of Education

Utah State University, 2019

Major Professor: Kathleen A. J. Mohr, Ed.D.

Department: School of Teacher Education and Leadership

The purpose of this study was to investigate the use of explicit revision instruction and digital writing during writing workshop with early writers, and the influence of this intervention on students' revisions and the overall quality of early writers' informational texts. The theoretical framework for this study included sociocognitive theories for learning and writing. The participants in this study were 21 students in a mainstream second-grade classroom.

This study was designed as a formative experiment, following an embedded, concurrent, mixed-methods design. The pedagogical goal guiding this study was to improve second-grade students' revisions in their informational writing. Baseline data were collected through an informational writing assessment, which was administered again at the end of the experiment as a post-assessment. Students' informational writing quality scores significantly improved from pre- to post-assessment.

The experiment also included the collection and analysis of data throughout the intervention. These data included tallies of the types and amount of revision in student writing samples, the overall quality of student informational writing prior to and after revision, and teacher journal entries. Students were able to revise their informational writing independently. Students' informational writing scores were higher post-revision, indicating that revision improved the overall writing quality. The addition of words was correlated with higher post-revision scores. However, the sample size was insufficient to determine a relationship between the quantity or type of revisions and the overall score of the writing. Teacher journal entries were coded for recurring themes to understand the effectiveness of instruction and progress toward the pedagogical goal.

The intervention implemented in this study provided students with instruction that enabled them to utilize revision independently to improve the overall quality of their informational writing. The digital application lent itself to easier manipulation of the text, encouraging students to revise by lowering the cognitive load of transcription and heightening motivation. Findings from this study revealed that students' informational writing moved from below grade-level competency to at or above grade-level competency in three iterations across six weeks. Moreover, the formative changes implemented throughout the study were integral in facilitating students' independence with writing and revising informational text.

PUBLIC ABSTRACT

Exploring the Influence of Digital Writing on Primary Students' Revisions of Informational Text: A Formative Experiment

Alayne L. Jorgensen

This study investigated the use of explicit revision instruction and digital writing during writing workshop with 21 students in a mainstream second-grade classroom. The pedagogical goal guiding this study was to improve revisions in informational writing and overall writing quality. Students' informational writing quality scores significantly improved from pre- to post-assessment.

Throughout the intervention, collected data included tallies of the types and amount of revision in student writing samples, the overall quality of student informational writing prior to and after revision, and teacher journal entries. Students were able to revise their informational writing independently. Students' informational writing scores were higher post-revision, with the addition of words correlating with higher scores. The sample size was insufficient to determine the relationship between the number or type of revisions and increased writing scores.

The intervention implemented in this study provided students with instruction that enabled them to utilize revision independently to improve the overall quality of their informational writing. The digital application lent itself to easier manipulation of the text, encouraging students to revise. Findings from this study revealed that students' informational writing moved from below grade-level competency to at or above grade-level competency in three iterations across 6 weeks.

DEDICATION

Dedicated to my two children, Ellery and Scotty, who patiently shared their mama with her research. I love you to the moon and back.

ACKNOWLEDGMENTS

To my advisor, Dr. Mohr, thank you for stretching me through your questions and constructive criticism; for being one of the first to push me to prove myself and reach higher than ever before; and for tirelessly reading draft after draft, supporting me, encouraging me, and allowing me to benefit from your expertise and mentorship.

To my committee, thank you for reading hundreds of pages, many helpful comments and suggestions, encouragement, and your overwhelming support.

To my husband, Greg, thank you for pushing me when I needed it, listening to both excitement and complaints, taking on an extra share of housework and childcare, and being my partner in this journey. I love you.

To my students in the study, thank you for your hard work and allowing me to use your writing samples. I am so proud of your progress and successes. Your teacher finally completed her “unfinished work” and can go to “Fun Friday.”

To my fellow doctoral students, including those who have moved on, those who led the way, those in the quagmire, and those just beginning, thank you for your support, feedback, and friendship—Critical Friends Forever.

To my family and friends, thank you for being my village. For taking care of my children, providing constant moral support, and your faith that I would someday finish.

Last, to Grandma B, who did not live to see me graduate: Thank you for always asking about my schooling. I miss you, but I imagine that you are cheering me on from the other side.

Alayne L. Jorgensen

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CHAPTER 1

INTRODUCTION

In the literacy world, writing instruction traditionally takes a backseat to reading instruction. Furthermore, for decades the teaching of writing in the younger elementary grades has focused on narrative texts (Purcell-Gates, Duke, & Martineau, 2007). However, in the last few years, there has been an increasing focus on writing instruction across grade levels and formats, encouraging educators to provide daily time for students to write, and to use best practices for the teaching of writing (Graham, Bollinger, et al., 2012). National and state standards have called for students to write in multiple genres beginning in primary grades, including production of informational text. Roberts (2012) outlines three reasons why teaching students to write informational text is important and relevant. One reason is that many students are motivated to learn about informational topics; therefore, a deeper focus on those types of texts can give them the motivation to read and write both in and outside of school (Roberts, 2012). Teaching students to write informational text is also important because college courses and careers require informational text literacy in both reading and writing (National Commission on Writing, 2003). Last, to be a contributing member of society, adults need to be able to read and write informational text (Labbo, Reinking, & McKenna, 1998). By preparing students to be effective producers of informational texts, educators empower them to be more academically prepared and fully participate in society.

Elementary Writing Achievement in America

Despite an increased focus on writing instruction in education, recent national measures of writing achievement such as the National Assessment of Educational Progress (NAEP) writing assessment, which measures writing achievement for different purposes, show many students are not proficient writers (National Center for Education Statistics [NCES], 2012). On the 2011 NAEP computer writing assessment, national samples of eighth graders wrote in response to prompts to persuade, to explain, or to convey experience. The scale for scoring ranged from 0-300, with students being classified as basic, proficient, or advanced writers. Only 27% of students in eighth grade performed at or above the proficient level in writing, and 20% performing below even a basic level. Several researchers since then have cited statistics from this assessment as a call to focus more on writing achievement. However, one item to note is that the 2011 NAEP assessment was given on the computer for the first time. Prior administrations of the assessment were given using paper and pencil. On the 2007 paper and pencil NAEP, 33% of eighth graders performed at or above the proficient level in writing, and only 12% performing below the basic level (Salahu-Din, Persky, & Miller, 2008). While still dismal, average scores were better for eighth-grade students on the 2007 NAEP paper and pencil writing assessment than the 2011 NAEP computer writing assessment.

A NAEP paper and pencil writing assessment was also given to fourth graders in 2002, with less than 25% of them performing at proficient level or beyond (NCES, 2003). In 2012, NAEP researchers did a pilot study to administer the writing assessment to fourth graders on computers. Students responded to two 30-minute prompts and

responses were scored using a 6-point rubric depending on the testing condition. Results indicated that 39% of student responses showed little to marginal writing skills with a score of 1 or 2, and 47% of student responses showed developing or adequate writing skills with a score of 3 or 4. A mere 14% of student responses demonstrated competent or effective writing skills with a score of 5 or 6 (NAEP, 2014). When writing for different purposes on the NAEP 2012 fourth-grade computer assessment, 17% of students scored a 5 or 6 on narrative responses, and only 15% scored a 5 or 6 on explanatory responses. Thus, younger writers have consistently evidenced a need for stronger writing development.

NAEP researchers have also analyzed how much fourth-grade students wrote on the assessment and how often they used editing tools. These results indicate that higher scoring responses contained more words than the lower scoring responses, with an average of 179 words compared to 60 words on the lowest scoring responses. About 70% of the highest-scoring responses used over 1,001 keystrokes, and 47% of the highest-scoring students used the editing tools (back space and spell check), compared to 9% and 30% (respectively) of the lowest-scoring students. These statistics show a correlation between the amount of words written and the use of editing tools with higher-scoring responses (NAEP, 2014).

The reported scores on the computer assessments for fourth and eighth graders indicate that in general, students are not performing at a high level of writing achievement when using a computer. When asked to write for the purpose of explaining or persuading, the scores are even worse than when students are asked to convey

experience (NAEP, 2014; NCES, 2012). Performing at the basic level of writing skill or below should not be acceptable, especially with our increasingly technological and global world where higher level thinking and writing are essential skills.

Teaching students to read and write informational texts early in their education is essential because writing proficiency takes considerable time to develop. It can take as long as 20 years to become an expert writer (Kellogg, 2008). The National Commission on Writing (2003) has emphasized the importance of keeping writing at the center of school reform for over a decade. In order to help students develop strong writing skills and increase writing achievement in diverse genres such as those within the scope of informational text, teachers must use effective writing instruction practices. Yet, research on effective writing instruction has traditionally been neglected in comparison to other areas of literacy instruction such as reading and vocabulary (Miller, McCardle, & Long, 2014) especially with younger writers.

Purpose of the Intended Study

This research study contributes to the need for more research in the critical field of teaching informational writing in the primary grades. It focused on writing instruction for informational text, in the context of a writing workshop in which second-grade students used digital tools to aid in the revision process. To better understand the revisions that students make in their informational text and the developmental processes of second-grade writers, this study used a formative experiment research design (Reinking & Bradley, 2008; Reinking & Watkins, 1998, 2000). A formative experiment

affords the multiple variables that are found in a classroom setting to be embraced, while the researcher examines an intervention within an authentic context. It also allows the researchers to examine the data throughout the study and adjust the intervention as needed to continue toward the identified pedagogical goal while continually evaluating the effectiveness of the intervention (Bradley & Reinking, 2011a).

Rationale

Given the challenge of becoming a proficient writer, educators need to be aware of the various skills involved, including higher level processing skills such as those used when writers revise. The myriad skills needed when producing informational text is a challenge when teachers are not as comfortable teaching, or writing, informational genres compared with narrative genres (Ness, 2011). Teachers can easily give writing assignments, but helping students improve their writing is much easier said than done. Researchers have found that teaching the planning and revising components can significantly improve students' written text quality (Graham, McKeown, et al., 2012; Graham & Perin, 2007; Limpo, Alves, & Fidalgo, 2014). Revision is a key component of the writing process, and research suggests that even young writers can develop the skills needed to revise when given appropriate instruction. However, research also suggests that revision is often neglected in writing instruction, especially in the elementary grades (Saddler, Saddler, Befoorhooz, & Cuccico-Slichko, 2014). Although there is a call for more emphasis on revision in the early school years (Limpo et al., 2014), the research regarding effective methods to teach and foster effective revision with early writers is

alarmingly sparse. Only a few of the studies that have examined revision in elementary grades utilized technology as part of an intervention and measured the effects on student revision: the impact of using word processing (Grejda & Hannafin, 1992), and using a wiki during collaborative revision (Pifarre & Fisher, 2011). Using technology as a tool to aid in writing and effective revision for elementary students is an area of research that has not been well explored.

Technological tools are becoming more readily available in schools for student use, and the majority of state and national testing is now being administered via computer, including writing tests. Technology is becoming prevalent as a writing tool, and students are required to use computers to write when taking standardized tests as early as third grade throughout the U.S. (Partnership for Assessment of Readiness for College and Careers [PARCC], 2014; Smarter Balanced Assessment Consort [SBAC], 2014). The Common Core State Standards (CCSS) writing standards for younger grades also call for students to “use a variety of digital tools to produce and publish writing” (Council of Chief State School Officers & National Governors Association, 2014, ELA-Literacy Standard W.2.6). Examining the use of technology with writing is important because to be college and career ready, students need to be able to write using computers and digital devices. Understanding the impact of technology on writing in the early grades is pertinent then not only for students and teachers, but also lawmakers, educators, parents, and researchers.

Significance of the Study

Because of the strong impact that writing revision has on overall writing quality, one of the approaches to help students improve writing quality may be through interventions that instruct and improve writing revision. Some research exists on interventions to improve writing revision, but the majority of studies have been done with older elementary students (Brakel Olson, 1990; Fitzgerald & Markham, 1987; Grejda & Hannafin, 1992). Much less writing research has been done with younger students. This study outlines an instructional intervention to aid in student revision, examines the influence of revision on overall informational writing quality, and also examines how digital tools can be used to aid in young writers' revisions. Conducted in an in vivo classroom, the study informs teachers of instructional options that could be exported to other educational settings.

Unlike traditional research methods that begin with a question, a formative experiment focuses on achieving a pedagogical goal. A formative experiment framework outlined by Reinking and Watkins (2000) guides the content and organization of this study:

1. What is the pedagogical goal of the experiment, and what pedagogical theory establishes its value?
2. What is an instructional intervention that has potential to achieve the identified pedagogical goal?
3. As the intervention is implemented, what factors enhance or inhibit its effectiveness in achieving the pedagogical goal?
4. How can the intervention and its implementation be modified to achieve more effectively the pedagogical goal?

5. Has the instructional environment changed as a result of the intervention?
6. What unanticipated positive or negative effects does the intervention produce?

This study enacted writing instruction to influence the revisions that second-grade students made to informational texts using a digital application, with a pedagogical goal of improving second-grade students' revisions in their informational writing. In order to produce quality pieces, students must plan, transcribe, and revise their work. This can be a particular challenge when the cognitive load of transcription is still fairly high for some students (Bereiter & Scardamalia, 1987; Kellogg, 2008; McCutchen, 2006). It is also challenging when students are still developing content knowledge about the informational topics they are writing about (Purcell-Gates et al., 2007). Although research has shown that young students are capable of revising (Cutler & Graham, 2008; Dix, 2006), little is known about the impact of technology on this revision process. This study also explored how the focus on revision during writer's workshop mini-lessons influenced students' overall writing achievement with informational text. Writer's workshop is a model for writing instruction focused on student choice, authentic purposes for writing, extensive writing time, and sharing of teacher and student writing. It typically includes a mini-lesson focused on an aspect of writing, a time for students to write, and sharing of writing (R. Fletcher & Portalupi, 2001).

Some research studies have examined different instructional strategies that can promote proficient writers (Graham, McKeown et al., 2012). However, only a handful of studies have examined effective instructional strategies to be used with students in the primary grades. Therefore, an examination of effective instructional strategies to support young elementary students in writing informational texts is needed to meet the higher

expectations set by the CCSS and support young students in developing as proficient writers. The main purpose of this study is to examine how revision digital tools can support students' revision of their written informational text, and how the revision instruction and use of digital tools affects their revisions and the overall quality of their writing.

Definition of Terms

Digital tools and digital applications: Technological tools with word processing capabilities, such as computers, iPads, tablets, and the applications involved. In this study, iPads were used with the applications Explain Everything, Google Docs, and Google Slides.

Formative experiment: A research methodology designed with the purpose of developing, testing, and refining theory within the authentic context. It is also aimed at determining what inhibits or enhances a particular intervention's effectiveness at achieving a pedagogical goal and how the intervention could be implemented more effectively (Reinking & Bradley, 2008).

Informational writing: The genres of writing factual information about content-area subjects is referred to throughout research using several terms such as: informative writing, expository writing, explanatory writing, and content area writing. Informational writing commonly conveys information accurately to increase readers' knowledge, understanding, or comprehension of the topic or subject. Throughout this research study, the term *informational writing* will be used to be consistent with the term currently used

in schools.

Intervention: An activity or process that aims to address a problematic area of instruction or positively transform instruction (Reinking & Bradley, 2008).

Writing workshop: A model for writing instruction focused on student choice, authentic purposes for writing, extensive writing time, and sharing of teacher and student writing. It typically consists of a mini-lesson focused on an aspect of writing, a time for students to write, and sharing of writing (R. Fletcher & Portalupi, 2001).

CHAPTER 2

REVIEW OF LITERATURE

This chapter will review the literature related to the pedagogical goal at the focal point of the study, addressing the first two questions in the formative experiment framework (Reinking & Watkins, 2000).

1. What is the pedagogical goal of the experiment, and what pedagogical theory establishes its value?
2. What is an instructional intervention that has potential to achieve the identified pedagogical goal?

The pedagogical goal of this study was to improve second-grade students' revisions in their informational writing. The value of this goal and rationale for the intervention are found in the literature, documenting that providing time for students to revise and instruction dedicated to revision are powerful yet neglected components of elementary writing instruction (Saddler et al., 2014). There is limited research highlighting interventions and tools to improve middle to upper elementary students' revisions, yet a dearth of research regarding revision instruction and tools for early-grade writers.

To examine the current literature and provide a background for the study, I first discuss the theoretical foundations of the study based on a sociocognitive perspective of early writing development, including the cognitive process model (Flower & Hayes, 1981) and social cognitive theories including the construct of self-efficacy (Bandura, 1986; Pajares, 2003). Then, I outline the existing literature on revision, including a definition of revision, its importance to writing quality, documented young writers' revisions, and revision instruction. In this chapter, I also review scholarship regarding

digital writing and digital revisions and literature related to the analysis of revision and writing quality.

In order to examine the empirical research on digital writing and revision instruction with elementary students, I searched several electronic databases: *Academic Search Premier*, *Education Full Text*, *Education Source*, and *ERIC*. For this review, I searched using the terms ‘elementary writing revision,’ ‘primary grade revision,’ ‘elementary revision instruction,’ ‘elementary revising,’ ‘elementary peer revision,’ and ‘elementary writing technology.’ In this review, I discuss studies that met the following criteria: (a) empirical studies from peer-reviewed journals, (b) studies focusing on revision instruction for writing or digital writing in mainstream classrooms, and (c) studies in the elementary grades (see Appendix A for a literature review table of these studies). In addition, this chapter will discuss research regarding the formative experiment methodology that was used in the study.

Theoretical Foundations

Writing involves cognitive, motoric, and social processes. The cognitive processes are what occur in a student’s brain as s/he writes; motoric processes are those involved when a student transcribes letters or words, and the social processes include environmental factors that influence writing such as motivation, engagement, and social/cultural influences (Faigley, 1986). Much of writing research looks at writing through either cognitive process theory or sociocultural theory. This study is grounded in the socio-cognitive theory with attention given to both social and cognitive aspects of

writing achievement.

Cognitive Process Model

From an early cognitive perspective on writing, learning takes place within individuals, and information is stored in long-term memory and accessed through working memory (Flower & Hayes, 1981). Writing is a very complex cognitive task, and students have multiple processes occurring in their thoughts while writing, such as planning, transcribing, and revising (Flower & Hayes, 1981). To make sense of these processes, Flower and Hayes developed a cognitive process theory of writing that is widely used in writing research. According to this model, writers go through three main steps to create a text: planning, transcribing, and revising. During the planning phase, writers set goals, generate ideas, and organize their thoughts. In the transcribing phase, writers generate text by selecting the content, forming letters, writing words, and using spelling and grammar rules. Revision occurs when writers compare the text produced to their writing goals (Flower & Hayes, 1981).

Revised Cognitive Process Model

Years later, Hayes (1996) proposed a revised cognitive process model, adding some key features based on the writing research of the time. Within this newer model, working memory is recognized as having a central role in the writing process. Working memory is what allows students to remember their ideas long enough to get them from thought to transcription. A visual-spatial variable was added because researchers had discovered that students use visual-spatial reasoning to translate thoughts and speech into

text. This variable also recognizes the use of images and visual representations of ideas. The updated Hayes model also recognizes motivation and affect as key components for their influence on writers, and portrays the writing process in a cyclical model. Finally, the revised model proposed by Hayes (1996) also considers the motoric processes involved in writing with the addition of the visual-spatial variable, and visually represents the process more acutely with the portrayal of the writing process as a recursive cycle and not merely a linear process. According to Hayes (2006), writers can move through the phases of the writing process in an iterative fashion, jumping in or out of each of the phases at any point as they write.

During the writing process, students' working memory can be overloaded, which can limit their ability to write well (McCutchen, 2000). Young writers are often not yet fluent in lower-level skills for writing, such as letter formation and spelling patterns. This can take up much of their attention and working memory, not allowing for as much higher level thinking, such as is needed for revision (Hayes & Berninger, 2010). Writing quality is significantly impacted by writing fluency and spelling for students up to fourth grade (McCutchen, 2006).

Cognitive Load of Transcription

Research has demonstrated that writing quality and students' transcription abilities are directly related. In a large study including 300 primary-grade students, Berninger and Swanson (1994) found that idea generation occurs before students master transcription skills. Students were given five minutes to write about a topic and then reread their text. When asked to reread their work, some students read a different text

than that which was actually written. This provided evidence that students could use memory to create the ideas, but they were not able to accurately put them on paper due to lack of transcription skills. Olinghous (2008) conducted a study involving transcription skills with 120 third graders by measuring handwriting fluency and spelling skills and then measuring students' narrative-writing quality. The students who wrote faster were able to write more in their narrative writing because the increased handwriting fluency left more memory available to generate ideas. In this study, handwriting fluency was one of several factors that predicted narrative writing quality (Olinghous, 2008). The following year, Olinghous and Leaird (2009) conducted a study with second and fourth graders to examine the correlation between spelling and writing quality. They found that writing fluency and spelling explained 31-53% of the variance in writing quality.

These studies provide evidence that when less working memory is needed for basic transcription skills, more is freed up for writers to devote to higher-level tasks such as focusing on ideas, content, and revision. Early writers can be overwhelmed by the demands of transcription, and by measuring and controlling for differences in these areas researchers can better understand the effect transcription skills can have on higher-level writing skills, such as revision. More research is needed in this area with informational writing because the majority of these studies were conducted with narrative writing tasks. Writing informational text may take up more working memory because rather than rely on story grammar, students have to recall content, vocabulary, concepts, audiences, genres, and purposes that are most likely new or unfamiliar to them. Paquette and Fello (2002) explain that "for many children, writing expository information can be

cumbersome and tedious. The task often seems overwhelming, as evidenced by many students” (p. 236). Disciplinary-based written tasks and genres are often less familiar and more linguistically complex and cognitively demanding than personal narratives (Christie & Derewianka, 2008). When young writers compose informational text, all of these factors affect working memory, making it difficult for students to think about revision.

Revision

As outlined by Flower and Hayes (1981), text production consists of planning, translating, and revising. Writers work through these processes, planning or pre-writing their ideas, transcribing those ideas into text, and then evaluating the text and making changes to improve it. True and meaningful revision is much more than a “hunt for errors” and involves clarifying the text with the goal of creating a final version of the text that is most closely aligned with what the writer intended to say. Fitzgerald and Markham (1987) offered the following definition of revision.

Revision means making any changes at any point in the writing process. It is a cognitive problem-solving process in that it involves detection of mismatches between intended and instantiated texts, decisions about how to make the desired changes, and making the desired changes. Changes might or might not affect the meaning of the text, and they might be major or minor. Also, changes might be made in the writer’s mind before text is written on paper, while text is written, and/or after text is written. (p. 4)

To be effective at revising, a writer makes changes not only on the word and sentence level, but also on the macrostructure of the text, considering content, structure, and voice (Flower, Hayes, Carey, Schriver, & Stratman, 1986; Saddler et al., 2014).

Anderson and Dean (2014) argue that, “To become fluent writers brimming with possible

decisions, students need to take on writing behaviors—especially the flexibility and creativity of revision, recasting and reordering, deleting and expanding, deciding and evaluating” (p. 4). Thus, teaching revision as a general concept such as “fixing errors” or “making it better” may not help students become effective at revision and fluent writers.

Successful revision requires many skills, such as goal setting, knowledge of grammar and spelling, reading comprehension skills, critical analysis, problem solving, and being able to compare the written text to its intended message (Bereiter & Scardamalia, 1987). Thus, revision can be a difficult process for all levels of writers, requiring both skill and motivation, yet it is considered crucial for the overall quality of writing produced. In fact, Flower et al. (1986) suggested that the ability to make effective revisions is a defining attribute that separates skilled writers from less-skilled writers. The revising portion of the process is extremely critical to writing. Many scholars believe that revision holds the key to writing improvement overall (Graves, 1994), and some say that writing *is* revising (Murray, 1978).

Analyzing Revision

Revision as a dynamic cognitive process is very difficult to capture. To scrutinize the thought processes of writers during revision, researchers have used think-alouds, which involve writers speaking what they are thinking while writing and revising (McGinley, 1992). However, this method of capturing revision can only be used with older students and adults because it requires highly developed metacognitive skills in order to be a reliable method (Joram, Woodruff, Bryson, & Lindsey, 1992). Think-alouds also require cognitive attention, which may interfere with the actual revision process

(Berninger & Swanson, 1994; McCutchen, 1996). Other researchers have utilized interviews after revision, but writers may forget what they were thinking or reasoning while revising (Bisaillon, 2007; Dix, 2006). Although these methods may reveal information about the revision process, they may also inhibit the quality of the revisions and text produced because they can take attention away from the task at hand and focus it on the recording method instead.

To address the challenges with recording revision processes, researchers (Allal, Lopez, Lehraus, & Forget, 2005) focused on the artifacts that writers produce and examined the transformations across them. These transformations are the actual written changes that appear from one draft of a text to the next. Researchers can look at these to gain insight into revision without distracting from the actual cognitive process.

Transformations are an indicator that revision has occurred, but the absence of transformations does not necessarily imply an absence of revision. When an author reads a passage, finds it satisfactory and leaves it unchanged, the revision process is nonetheless present. Learning to revise entails learning when and how to make transformations, as well as learning when not to make transformations. (Allal et al., 2005, p. 73)

These transformations are not the entire picture of the revision in which a writer may engage, but they are indicators that revision has happened and they provide a glimpse into the revision process without sacrificing the integrity of the process.

Young Writers' Revisions

With revision holding such an important place in the writing process, young writers often lacking the skill to carry it out effectively, and research suggesting children can develop the skills when given appropriate instruction, one may suppose that much of

writing instruction in the elementary classroom would be aimed at teaching students how to revise effectively. However, the research demonstrates otherwise. In a national survey of revising practices in the primary classroom conducted by Saddler et al. (2014), researchers collected data from a random sampling of 232 primary-grade teachers in the United States to determine how they taught revision in the elementary grades. The findings indicate that there is little time dedicated to writing instruction in general (on average, 28 minutes per day), and even less to revision instruction (on average, 6 minutes per day). The majority of teachers in the study did not believe that more time spent revising would lead to better revisions, but 82% of the teachers indicated that the revisions their students made “somewhat improved” their writings. None of the participants in the study indicated any specific program or strategy that directly taught revising. Over half of the teachers said they designed or used a rubric to help guide revision, with students typically using the rubric while working with a peer to revise. Van Gelderen (1997) suggested that to teach revision, teachers should give students time dedicated to revision, hold conferences with students, use rubrics, and teach explicit strategies for revision.

In a meta-analysis of writing instruction for elementary students, researchers concluded that teaching planning and revising strategies is one of the most effective interventions to improve writing (Graham, McKeown, et al., 2012). This meta-analysis examined quasi-experiments in writing intervention literature, reviewing 115 articles and computing an effect size (*ES*) for each type of writing intervention that was tested in four or more studies. Strategy instruction for planning and revising had a statistically

significant effect ($ES = 1.02$) on the quality of students' writing (Graham, McKeown, et al., 2012). It is relevant to note that of the 20 studies included in the category of strategy instruction for planning and revising, only two were specific to revision only (i.e., Fitzgerald & Markham, 1987; MacArthur, Graham, & Schwartz, 1991), with effect sizes of 1.26 and 0.31, respectively. However, one of these studies was conducted with sixth graders (Fitzgerald & Markham, 1987) and the other with special education students in seventh and eighth grade (MacArthur et al., 1991). There were no studies included in this meta-analysis regarding teaching revising for students younger than sixth grade.

Despite the important place revision holds in the writing process, the literature repeatedly suggests that early writers rarely revise their work, and when they do revise, their revisions do not always improve the quality of the text (Beretier & Scardamalia, 1987; Van Gelderen, 1997; Hooper, Wakely, de Kruif, & Swartz, 2006). This may be because young writers assume that readers will understand their writing and they see no need to change it. Young writers have been described as "random drafters," who often do not reread their texts or if they do reread they may not attempt to make revisions (Flower et al., 1986). Many students have trouble identifying what they need to change (Fitzgerald & Markham, 1987). Some students may lack sufficient knowledge of the topics they are writing about, familiarity with the writing format, or feel that writing and rewriting are too tedious (Graves, 1994). The cognitive load of transcription itself affects the quality of students' writing up through fourth grade, and if students struggle with transcription it can limit their ability to plan and revise texts (McCutchen, 2006). Other students may learn specific revision strategies but not know how to apply them to their

text in effective ways (von Koss Torkildsen, Morken, Helland, & Helland, 2015). Some young writers do revise, but their revisions are mainly surface level and may not actually improve the quality of the writing as a whole (Chanquoy, 2001; Dix, 2006).

A study conducted with writers in grades 4-9 by Limpo et al. (2014) found that students' abilities to plan before writing and to revise for meaning were both lacking. They determined that planning and revising had a larger impact on writing quality above any other observed variables, including gender, school achievement, age, handwriting skill, spelling, and text structure. In this study, planning and revising were predictive of the writing quality for students in grades 7-9 but not in grades 4-6, where students were using the skills but not in an effective way to improve their texts. The researchers concluded that, "the poorly developed high-level writing skills of novice writers do not seem to be only a question of maturation of executive functions. They might also signal that younger students are not benefitting from appropriate instruction" (p. 189). Based on the research that both older students can be taught to use these skills successfully to improve written text quality, Limpo et al. (2014) call for researchers to devote effort to providing teachers with evidence-based practices that can be used to teach and support young writers' skills with planning and revising. Both planning and revising are important to the writing process, but planning gets more attention in the current literature (Graham, McKeown, et al., 2012). A focus on revision is needed in order to increase the research base that informs instruction for teaching writing to elementary students.

Revision Instruction

Seven articles met the criteria for peer-reviewed empirical studies focused on

revision instruction in mainstream elementary classrooms, and all were conducted with students in Grades 3 and above. The majority of the other studies that resulted from the database search were either descriptive or evaluative reports, suggestions for classroom practice based on theory, research focused on secondary students or adults, or studies that examined elementary students' revision, but not specific instructional teaching practices. These studies can inform instruction but for the purposes of this study will not be discussed in detail. Although there is a call for more emphasis on revision in the early school years (Limpo et al., 2014), there is a paucity of empirical research regarding effective methods to teach and foster effective revision with early writers.

The seven research studies regarding interventions for writing revision in elementary classrooms were similar in several ways (see Table 2.1). First, two of the studies examined an intervention that involved peer collaboration and measured student revision (Brakel Olson, 1990; Zammuner, 1995). Three of the studies examined an intervention related to the writing process itself and the effects on revision, such as different methods of prewriting (Reynolds & Hart, 1990), direct instruction in the process of revision (Fitzgerald & Markham, 1987), and providing a delay between writing and revising (Chanquoy, 2001). Two of the studies utilized technology as part of an intervention and measured the results on revision, including the impact of using word processing on revision (Grejda & Hannafin, 1992), and using a wiki during collaborative revision (Pifarre & Fisher, 2011).

Peer Collaboration in Revision

In my review of the literature, two studies utilized peer collaboration in the

Table 2.1

Research Studies Regarding Revision Instruction in the Elementary Grades

Title	Authors	Key focus	Subjects	Methods
The Revising Processes of Sixth-Graders With and Without Feedback	Brakel Olson (1990)	Effect of peer feedback and revision direct instruction on the revision behavior and quality of the writing	Sixth grade students in the U. S. $N = 93$	Measured type and amount of revision behavior in four instructional situations over 4 ½ months.
Individual and Cooperative Computer-Writing and Revising: Who Gets the Best Results?	Zammuner (1995)	Examined whether cooperative writing and revising significantly influence text quality.	Ages 9-10 in Italy. $N = 34$	Students wrote a draft of a narrative text using a word processor, then revised in 3 different conditions, with no time limit.
Cognitive Mapping and Word Processing: Aids to Story Revision	Reynolds & Hart (1990)	Examined the effect of three methods of prewriting organization on the revision or compositions	Fourth grade students in the U. S. $N = 36$	Random assignment to 1 of 3 groups using a different type of prewriting organization.
Teaching Children About Revision in Writing	Fitzgerald & Markham (1987)	Investigate whether direct instruction in revision would affect student knowledge of revision, ability to make revisions on paper, and effect on writing quality.	Sixth grade students in the U. S. $N = 30$	Experimental group received 13 revision lessons over a month, wrote a story, were interviewed about revisions, then revised and wrote a final draft.
How to Make it Easier for Children to Revise Their Writing: A Study of Text Revision from 3 rd to 5 th Grades	Chanquoy (2001)	Examined if a delay between the initial drafting and the revising stages could improve frequency and nature of revisions.	Third, fourth, and fifth grade students in France. $N = 60$	3 conditions that all students participated in, writing a personal narrative.
Effects of Word Processing on Sixth Graders' Holistic Writing and Revisions	Grejda & Hannafin (1992)	Examined the effects of word processing on overall writing quality and revision patterns.	Sixth grade students in the U. S. $N = 66$	Word processing and revision instruction, then different conditions to write and revise either paper-pencil or computer.
Breaking Up The Writing Process: How Wikis can Support Understanding the Composition and Revision Strategies of Young Writers	Pifarre & Fisher (2011)	Explored how a wiki on the computer could be used to support the composition and revision processes.	Ages 9-10 in Spain. $N = 25$	Students assigned to groups of 6 students for collaborative activities on and off the wiki. They worked in pairs with the computer.

elementary classroom and measured its effects on student revision (Brakel Olson, 1990; Zammuner, 1995). Brakel Olson (1990) conducted a quantitative study with 93 sixth graders from four different middle-class suburban schools in a district in the United States, measuring the type and amount of revision behavior in four different instructional situations. One situation included specific revision strategies taught and students had peer partners to revise (RI/PP). In the second situation, no revision instruction was provided but students revised with peer partners (PP). For the third situation, revision strategies were taught and students worked alone to revise (RI), and in the fourth situation there was no revision instruction and students worked alone to revise (C). Data were collected from students' rough drafts before and after formal revision sessions, as well as from final drafts. Revisions were classified using Bridwell's (1980) categories: single word level, multiple word level, and sentence level, and first and final drafts were compared. The results from this study indicated that all students did most of their revising at the word level and produced surface structure revisions. Twenty of 24 (83%) students in the RI group revised more while drafting than they did between the rough and final drafts, in all of the other groups the majority of the students made the most revisions on their final drafts. As far as writing quality, the PP (revising with peers) group's scores correlated positively with overall writing quality. The RI group (revising on their own) did revise more, but their overall writing quality declined between the rough and final drafts. The author concludes that sixth-grade students are able to significantly improve their writing quality both with and without peer feedback, but that instruction in specific revision strategies does not result in improved quality of writing when students revise alone.

Zammuner (1995) used a repeated measures design to examine whether cooperative writing and revising significantly influenced text quality produced by 34 “normal” range students ages 9-10 from four different schools in Italy. The researcher also examined the micro- and macro-level changes to the texts after revision. Participants wrote a draft of their texts and revised in three different conditions: (1) independent writing and independent revising, (2) independent writing and collaborative revising, and (3) collaborative writing and collaborative revising. The students were directed to write a narrative text on a word processor, using predefined characters and setting. When completed, the participants were asked to go back to the draft and revise, with no time limit. Revision instructions were simply to reread the text, make it better, and correct mistakes. These texts were analyzed using a coding scheme to assess general and syntactic text features, text correctness, and story content and structure. The researcher found that when students wrote and revised independently and when students wrote and revised collaboratively, there were improvements in some areas of the texts. However, the most significant condition was when students wrote independently and revised collaboratively because there was a significant improvement in almost all of the measured areas of the text. The researcher concluded that overall, revision did improve text quality, and worked independently or collaboratively did influence the quality of the texts produced.

These two studies indicate that working with a peer during revision can be an effective way to improve revisions and writing quality with elementary students over age 9. There have also been a few research studies examining the use of peer revision with

special education students. Peer collaboration has been researched as a method of increasing the quantity of revisions with students who have emotional and behavioral disorders and learning disabilities (Kindzierski, 1997; Saddler & Asaro, 2008), improving the quality of rough drafts and finished pieces after revising with special education students (MacArthur et al., 1991), and promoting clarity and cohesiveness after revising with low-achieving students (Wong, Butler, Ficzero, & Kuperis, 1996). However, none of these peer revision studies included writers younger than 9 years old. More research is needed to examine whether peer revision is effective for students in the primary grades or in which configuration.

Revision Within the Writing Process

A few of the studies in my search of the literature examined an intervention related to the writing process itself and the effects on revision, such as different methods of prewriting (Reynolds & Hart, 1990), direct instruction in the process of revision (Fitzgerald & Markham, 1987), and providing a delay between writing and revising (Chanquoy, 2001). In a study with 36 fourth-grade students, Reynolds and Hart (1990) examined the effect of three methods of prewriting organization on the revision of compositions. Students were randomly assigned to one of three groups each using a different type of prewriting organization (i.e., brainstorming, outlining, and cognitive mapping—a method of prewriting involving making a visual representation of the connections between concepts). Students were then instructed on the prewriting method and worked on some examples prior to their own revising. Researchers collected a first and second draft, and scored the compositions with a 9-point organization evaluation.

Findings from this study showed a significant difference between the cognitive mapping group and each of the other two groups, with the mapping group scoring higher on the second draft. No other significant differences were found in analysis. The researchers acknowledged that the teacher was not blind to condition, and may have prejudiced the outcome in favor of the cognitive mapping. They also concluded that although word processing programs may reduce the tedium of revision and make revision more likely, it needs to be combined with the knowledge of what revisions to make in order to actually improve the compositions. Cognitive mapping may have helped the students focus on the organization and structure of their writing, which led to better quality of writing in this study. Combining specific instruction in revision along with the use of technological tools, and including a prewriting step in the instructional protocol are suggested by the Reynolds and Hart study.

A landmark study in revision instruction was conducted by Fitzgerald and Markham (1987) using post-test only design with 30 sixth graders to investigate whether direct instruction in revision would affect student knowledge of revision, their abilities to make revisions on paper, and writing quality. They implemented four 3-day cycles of 45-minute lessons over the span of one month with an experimental group, and a control group spent the same amount of time reading “quality literature.” After a month of instruction, each student was given 30 minutes to write a story (with a pen) for someone else to read. They were given three minutes at the beginning of the writing time to jot down ideas, words, and phrases. Then they were told to plan and organize their stories on the same page. On the following day, students were interviewed and asked to identify

potential spots for revision in their stories. The next day, students were given 40 minutes and a different color of pen. They were told to reread the story, make changes on the page, and write another draft on a new clean page. These different stages were separated for purposes of data analysis and classifying the revisions as “in-process” or “between draft,” depending on the color of pen used and on which draft the students made the changes to their written texts. Researchers determined students’ knowledge of the revision process through the interviews by counting the number of spots students suggested for revision per 100 words. The researchers used Faigley and Witte’s (1981) classification scheme for revision to analyze the total number of revisions per 100 words each student used.

Findings from this study indicate that the knowledge of revision was typically linked to the amount of revision carried out, and the majority of students revised their writing more times than they had suggested in the interview. There was a significant treatment effect on the total number of revisions made per 100 words across the writing and revising process administered at the end of the study, with 23.19 revisions per 100 words for the revision group and 16.29 for the literature group. This was more revision than the researchers anticipated from either group. Across the two groups there was no significant correlation between the knowledge of revision and the quality of the final writing, or the amount of revision and the quality of the final writing. However, the revision group had improved quality of writing from the first draft to the last draft, while the control group produced approximately the same quality across drafts.

As a conclusion to the study, Fitzgerald and Markham suggest that direct

instruction in the process or revision holds promise as a method to help young writers acquire knowledge about revision, improve their revision, and has the potential to positively affect the quality of their writing. The researchers noted that the revision instruction did not affect students' abilities to specify goals for revision, but that the writing task used did not have a "real life" purpose or audience. Young writers may find goal identification easier in authentic writing tasks with a specified or self-selected audience and purpose that is more relevant to them so that the goals for revision would be clearer (Fitzgerald & Markham, 1987). They recommend future research with direct instruction in revision encased inside a program including instruction in what are "good text" and what text characteristics students should revise.

In another study conducted with revision instruction, Chanquoy (2001) sought to examine if a delay between the initial drafting and the revising stages could improve the frequency and nature of revisions with 60 third to fifth graders at a school in France. The researcher implemented three different experimental conditions—online revision, after-writing revision, and postponed revision—and all students participated in each of them, writing about a personal experience. The findings indicate that postponing the revising process seemed to help students increase the frequency and depth of their revisions. Also discussed in this study is that younger students produced shorter texts but generally revised more than older students. In addition, Chanquoy's finding that younger students can revise, and in fact revised more than older students, lends more validity to pursuing a revision-focused writing instruction protocol with younger students.

Explicit instruction with revision strategies with students who have learning

difficulties, and has also been found to be effective in increasing knowledge of and implementation of revision (Graham, 1997; Graham & Harris, 2003), time spent revising (MacArthur et al., 1991), and the overall number of and quality of revisions (Graham, 1997). Elementary and primary-grade students may initially lack the knowledge required for revision, but when that is improved through direct and explicit instruction, the amount of and quality of revisions may increase (Fitzgerald & Markham, 1987).

Technology and Revision

Two of the studies reviewed related to elementary writing revision instruction utilized technology as part of an intervention to aid revising. This research sought to determine the impact of using word processing on revision and overall writing quality (Grejda & Hannafin, 1992), and using a wiki during revision of collaborative texts (Pifarre & Fisher, 2011). To examine the effects of word processing on revision and holistic writing quality, Grejda and Hannafin targeted 66 sixth-grade students from three different classrooms over 3 weeks. Researchers predicted that word processing would improve revision accuracy and overall writing quality, due to the reduction of tediousness of rewriting with paper and pencil. The participants received one hour of training with word processing each day for 5 days, and an hour of daily revision instruction for 10 days. One group used word processing for all writing, one used paper and pencil for all writing, and another used word processing to revise daily writing but paper and pencil to revise compositions. There were no spell check or grammar functions on the word processor used in the study. Researchers found that the group who used word processing

for all writing corrected a higher percentage of mechanical and organizational errors on both compositions. They also found that regarding overall writing quality, the word processing group and the word processing/paper-pencil group scored marginally higher than the group that only used paper-pencil. One item of note from this study is that the combined word-processing and paper-pencil group tested the transfer of revision skills developed with technology to traditional writing methods. The results indicate that going back and forth between word processing and paper-pencil writing did not improve or impede transfer of revision skills. This last finding indicates that revision skills can be carried out digitally and still transfer to paper-pencil writing without being impeded by the different writing method.

A more recent study utilizing technological tools was a case study conducted by Pifarre and Fisher (2011) with a classroom of 25 students ages 9-10 in a lower socio-economic area in Spain. The researchers' main purpose was to explore how a wiki on the computer could be used to support the composition and revision processes. Throughout the study, the students worked in pairs with the computer, and were assigned to groups of six students for collaborative activities on and off the wiki. Students wrote a collaborative informative text about setting up a colony on Mars, by going through three phases during seven class sessions. First, they worked on collaborative talk, then they researched the topic, and finally joined a wiki to write in pairs for the final text. Any changes to the group text were discussed on a "negotiation" page on the wiki. Researchers analyzed the data using an adaptation of Faigley and Witte's (1981) taxonomy of revisions with an added category for 'personal content knowledge'. Results indicate that the students

revised using both surface level and text-based changes, with slightly more text-based changes, and only a few changes to macrostructure. The researchers noted that not all of the student pairs contributed equally to the group text, but that the wiki space did allow for students to explain reasoning, provided insight for the teacher on their thinking, and provided an opportunity for students to be simultaneously writers and readers engaged in a peer-review process.

As previously discussed, there is a limited amount of literature documenting the use of technology to aid with writing and specifically revision (Grejda & Hannafin, 1992; Pifarre & Fisher, 2011) although the use of technology in writing in general has been studied more. Goldberg, Russell, and Cook (2003) conducted a meta-analysis of 126 studies focused on the comparison between using computers to write versus paper and pencil for K-12 students in the previous decade. This meta-analysis concluded that using computers led to greater quantity and quality of writing. There were also six studies included in the meta-analysis that employed a revision measure, and all of these studies reported that when using word processors, students made more changes to their writing between drafts than when using paper-and-pencil. In these six studies, students using word processors to revise had overall higher quality writing than did students using paper and pencil to revise. Overall, the meta-analysis researchers concluded that when students use computers to write, they are more engaged, collaborative, write more and generate better quality text (Goldberg et al., 2003). Understanding how digital writing affects students' writing and revision is important because digital devices are used to type texts in more and more educational and professional settings. Some recent research has

examined the impact of digital writing on text with elementary students. To examine the difference in writing fluency and quality between typing and handwriting, Connelly, Gee, and Walsh (2007) gave 300 elementary (Grades 1-6) students who had no explicit keyboarding instruction a sentence-copying task to copy with paper-pencil and with typing. Researchers found that although children's typing and handwriting speeds significantly increased each year; handwriting was faster than typing in each grade level. Second-grade students were given a sentence-copying task and within two minutes, students averaged 66.8 handwritten letters and 24.1 typed letters. A subset of 48 participants (Grades 5 and 6) from this study were used in a second study to determine if the lower typing speed had an impact on the quality of typed compositions. Students were asked to respond to one prompt with handwriting, and another prompt with typing. They were given 15 minutes to write in each condition. The researchers found that handwritten texts were higher quality than the typed texts, with keyboarded scripts being 18-24 months behind handwritten texts in development on average. The researchers conclude that writing using typing does not necessarily lead to higher quality writing, and that elementary students need explicit keyboarding instruction in order to produce as high of quality digital texts as they can with handwritten texts.

Digital writing involves more than mere keyboarding fluency. The majority of digital devices have supports that can help students self-monitor their writing and revising, such as spell check. Research with elementary school writers has shown spell check features to be beneficial. Using spell check, fourth- and fifth-grade students were able to identify all of the spelling errors in a research-created text in a study done by

Jinkerson and Baggett (1993), and correct 78% of them. When using a dictionary, they were only able to identify 56% of the errors and correct 80% of the identified errors in the text. In another study with fourth and fifth graders, Walter and Connelly (2010) found that when students used spell check, they had fewer spelling, grammar, and usage errors than when handwriting or using the computer without spell check. This research suggests that spell check features can support elementary writers. These studies give us information about how students can correct errors and make changes in their writing digitally to improve it.

To examine the revisions of pairs of students using a computer, Nuvoli (2000) conducted a study with 56 second to fifth graders in Italy. Each pair rewrote the ending to a fairy tale, revising three drafts on the computer. The use of the computer had a positive impact on student revisions and their overall writing quality. The researcher found that the students added more words overall, more adjectives, and corrected more errors each time they revised, using the computer to improve the descriptions of the characters in their text, and the quality of their spelling and content. However, using the computer did not significantly improve the quality of other descriptions besides characters, such as the environment or situation.

Another study examined differences in the quality and revisions of students' handwritten and typed texts. Seawel, Smaldino, Steele, and Lewis (1994) conducted a descriptive study with 14 third- and fourth-grade students for four weeks and counted the number of revisions between drafts and the number of words on the final draft. Results indicated that 100% of third-grade students and 83% of fourth-grade students wrote

longer texts on the computer than on paper, and participants indicated that their hands did not get tired when typing like they did when handwriting. A majority (71%) of the students also said that they liked to revise on the computer more than on paper. The researchers did not assess writing quality beyond the number of words, nor did they assess the quality or types of revisions. One other study utilizing computers and writing revisions (D. C. Fletcher, 2001) was a small study with eight second-grade students who handwrote three book reviews and then revised them on the computer, using either word processing alone or word processing with editing software. He found that the students corrected more errors when using the word processing alone. In both of the Seawel et al. (1994) and D. C. Fletcher studies, making conclusions is difficult due to the small sample sizes, lack of analysis of the types and quality of revisions, and lack of analysis of the overall quality of the writing produced.

An important note to consider is that these last three studies (D. C. Fletcher, 2001; Nuvoli, 2000; Seawel et al., 1994) regarding revision and technology were all conducted more than 10 years ago, and current technology is much different and more user-friendly than what was available a decade ago. Students today are often “digital natives,” much more familiar with and adept at using technology (Prensky, 2001). The small number of studies and limited research quality begs for more research to determine how digital writing can aid in the revision process for younger writers. This is not only a gap in the literature, but also may be a product of the lack of computer and technology use with lower elementary students. Some schools may not have funding for all of their students to access computers regularly, and typically more computer time is allotted for the older

students. Cutler and Graham (2008) reported that 42% of primary-grade teachers never use computers for students to write, and only 25% use them several times a year for this purpose.

In Norway, children today use computers to write narratives and informational texts starting in first grade (von Koss Torkildsen et al., 2015). In a recent study conducted in Norway with 42 Norwegian-speaking third graders, researchers investigated the connection between writing process measures and the final written product, using key stroke logging to record the process measures while students typed their compositions (von Koss Torkildsen et al., 2015). Key stroke logging programs record the typing behavior of the writer, and researchers can replay and analyze the writing process dynamics such as transcription fluency and revisions. The students were given a narrative writing task and their writing behaviors and final products were analyzed via multiple regression, which revealed that transcription fluency and the number of revisions were significant factors in the quality of their narrative writing ($p > 0.001$) and story length ($p > 0.019$). Almost all the students revised their writing, and students who typed faster and had more revisions wrote longer stories with higher overall quality. The results showed that elementary writers' ability to make online revisions in writing tasks is related to the quality of the final product. This finding contradicts those found by Limpo et al. (2014) that the number of revisions did not contribute to overall writing quality for students in Grades 4-6. This difference in results may be because of the differences in the methods and design of each study. Von Koss et al. examined spontaneous online revisions in the full context of composing a story, and Limpo et al. examined revisions students made to a

pre-written text. Therefore, it may not be the ability to revise itself that leads to higher quality writing, but the ability to execute revisions within the actual writing process.

As part of a doctoral dissertation, Lisy (2015) examined the impact of digital writing on 74 second graders' revisions and whether revising on paper or the computer significantly impacted revisions the students made. After quantitative analysis of two written and revised stories, the results indicated that students made twice the number of revisions on the computer as they did on paper. Revisions made across the study were primarily low-level revisions (word additions and substitutions), and it is important to note that the analysis classified changes to spelling as substitutions. The word count increased when students revised on either medium, but increased more when students revised on paper, perhaps because typing was significantly slower than handwriting. Overall, the author concludes that students were able to effectively revise texts both using paper and the computer, and that computers can be a beneficial writing tool for second-grade students.

Digital Revision with Early Writers

As students use computers and other digital devices to write and revise, it is important to note the differences in the transcription itself but also the unique ways digital devices can support revision or place different demands on the revision process (Daiute, 1983; Daiute & Kruidenier, 1985; MacArthur & Graham, 1996; McCutchen, 2006). While typing texts can slow down transcription rates for young writers, using digital writing to revise the text may aid in some of the roadblocks young writers face while revising. Young writers often do not want to make revisions on paper because it

will look messy (Daiute, 1983), and digital writing eliminates that problem. When writing digitally, students can move, insert, copy, and delete text much more easily than on paper. Students do not have to worry about running out of room, adding ideas in the middle of their writing, and they can create legible characters quickly. There are also several applications and computer programs that have built-in support for revision, such as spell check, grammar checks, text-to-speech and speech-to-text tools, options to share and collaborate with others, and more. Writing can be shared quickly and easily with others via the Web, email, or collaborative applications. Using technology can also motivate reluctant writers to engage more readily with their writing, and technology such as key stroke logging programs can allow educators and researchers a deeper investigation into the writing process of young writers. However, to gain a greater understanding of how digital devices can be used during the revision process and how they can affect overall writing quality, more research is needed. The majority of the studies available were conducted with students in third grade and beyond, and it is difficult to generalize findings to younger students because of the differences in familiarity with technology, transcription fluency, and overall writing development.

Revision Analysis and Formative Experiments

Many studies on the topic of revision fail to examine the effect of the revisions or transformations on the overall writing quality or how the instruction of revision can be improved. Counting the number of revisions or even assessing the types of revisions alone does not capture the revision in a way that lends to understanding the process as

well as the final product. Often studies do not address the effect these revisions have on the quality of the piece, which is the goal of revision—to make writing better. Analyzing and measuring both revision and writing quality are difficult tasks, with limited tools and standardized measures available. The complexity of analyzing student revisions and revision instruction within a classroom setting and lack of rigorous research on the topic, call for a unique research methodology. This study sought to gain a fuller understanding of revision process that young writers engage in using digital tools, and how that revision influences overall writing quality, using a formative experiment design.

Formative experiments have several defining characteristics, drawn from the work of Cobb, Confrey, diSessa, Lehrer, and Schauble (2003), as well as Bradley and Reinking (2011a). The characteristics are as follows:

1. Formative experiments take place in authentic educational settings, centered on an intervention.
2. The rationale for the implementation of the intervention must be theory-based.
3. Specifying a pedagogical goal is central to the research and guides data collection, analysis, and every step of the process.
4. The way the intervention is implemented may be modified, in an iterative process of data collection and data-driven adaptation.
5. Consequences of the intervention may include an influence or transformation on the educational environment, both positive and negative.
6. Researchers use both qualitative and quantitative methods for collecting and analyzing data during a formative experiment.
7. This type of experiment is usually aligned with the philosophy of pragmatism.

This particular method of research is considered to be formed from diverse sources, with the work of Ann Brown (1992) on design research being most significant.

She found limitations of experimental methods when she conducted quantitative experiments in her lab and then found it difficult to implement the interventions in the classroom. Other researchers have also been “dissatisfied to some degree with the limitations of conventional methodologies when applied to classroom research” (Bradley & Reinking, 2011a, p. 311). Up to this point, the majority of formative experiments have been done in the field of engineering education, but Reinking and Bradley (2008) have presented several ways that this methodology can be used for research in elementary schools.

A key component of formative experiments is to take environmental factors, such as those that may inhibit or enhance the intervention into consideration during the research process, and adapt instruction with them in mind (Bradley & Reinking, 2011a). These factors are not typically revealed or addressed in traditional quantitative and qualitative studies, and a strength of the formative experiment is that it does allow the researcher to consider the multiple variables that make up the complexities of a classroom and embrace them. Accepting this intricacy allows for an examination and understanding of the intervention’s effectiveness and feasibility in a specific context. It also allows for teachers to examine the data throughout the study and work through roadblocks and address problems that arise during the study, adjusting the intervention to continue toward the pedagogical goal. This recursive analysis of data and adjustment of the intervention is a defining feature of formative experiments, enabling the researchers to continually evaluate the effectiveness of the intervention (Bradley & Reinking, 2011a).

Another important aspect of formative experiments is that theory has a different

role than in other types of research. In most types of research studies, experiments are designed to test and/or develop broad theories. However, formative experiments aim to develop theories that are targeted at a specific learning process, and these theories may not be overarching and explanatory (Cobb, et al., 2003). Theory is used to guide instructional practice and how it can be implemented in the classroom, which also keeps the relationship between theory and practice very close, with the goal of improving learning.

As previously stated, this methodology is relatively new, and has not yet been used extensively in educational research. However, there are a few educational studies that have effectively employed this methodology, most of which directly apply to literacy (see Table 2.2).

Table 2.2

Examples of Previous Formative Experiments

Author(s)	Focus of the formative experiment
De Corte, Verschaffel, & Van De Ven, 2001	Improving reading comprehension through explicit strategy instruction
Duffy, 2001	Literacy instruction in summer school
Ivey & Broaddus, 2007	Bilingual literacy
Gersten, Baker, Smith-Johnson, Dimino, & Peterson, 2006	Teaching social studies to middle school students with learning disabilities
Reinking & Watkins, 2000	Enhancing independent reading with multimedia book reviews
Neuman, 1999	Access to books for low-income children
Bradley & Reinking, 2011b	Increasing quality and quantity of teacher-child language interaction in preschool
Baumann, Ware, & Edwards, 1997	Improving vocabulary appreciation and development for fifth graders
Tracy & Headley, 2013	Focusing on nonfiction text in a fourth-grade writing workshop

All of the studies outlined in Table 2.2 utilized a formative experiment framework to guide research in the context of an authentic classroom setting. Each study began with a pedagogical goal related to student learning and/or teacher instruction. An intervention was then implemented in a real-life classroom setting, in collaboration with the teachers. These interventions were carefully planned and designed, using previous research and instructional techniques to guide the implementation. In each study, several factors emerged that inhibited intervention effectiveness, such as teachers' beliefs, practical issues, and teaching logistics. There were also factors that enhanced intervention effectiveness, such as teacher's awareness of students, a teacher's sense of self-efficacy, and student receptiveness and engagement. In all of the previously discussed formative experiments, mixed methods were used for data collection, via interviews, observations, journals, pre- and post-tests, standardized tests, surveys, or field notes. Several of the studies described above have been published in prestigious journals and have been recognized as part of the established methodology of mixed-methods research (Bradley & Reinking, 2011b).

A formative experiment was selected as the method for this study for several reasons, mainly because of the serious lack of quality research on the topic of revisions with young writers, revisions in elementary school using digital tools, and the production of informational text with young writers. The very small amount of existing literature on the topic made it difficult to establish an intervention based on solid research, and a formative experiment allows for modifications based on what is inhibiting or promoting progress toward the pedagogical goal in an authentic classroom setting. A formative

experiment allowed for an examination of both the process and the product involved in writing across several weeks within organic teacher-student interactions. Collecting both qualitative and quantitative data throughout enabled a deeper examination of the revision process, capturing much more information than a mere tally of revisions could provide.

Research-Based Design Decisions

The existing research regarding elementary revision instruction was mainly conducted with older students. However, these studies substantially informed the design of this formative experiment. First, the evidence base strongly suggests that elementary students can improve their writing quality through revision (Chanquoy, 2001; Saddler et al., 2014), which lent itself to the pedagogical goal of improving students' revisions in their writing. Second, the design of this study incorporated strategies that have correlated with improvements in older elementary students' revisions such as providing time dedicated to revision (Chanquoy, 2001), doing prewriting prior to drafting (Reynolds & Hart, 1990), utilizing peer revision (Brakel Olson, 1990; Zammuner, 1995), and specific instruction focused on revision (Fitzgerald & Markham, 1987). Third, the incorporation of technology in the revision process for this study was guided by the research indicating that early writers' lack of keyboarding fluency may inhibit their writing quality (Connelly et al., 2007) but that students can transfer writing and revision skills between paper-pencil and word processor without significant roadblocks (Grejda & Hannafin, 1992). Students wrote their initial drafts on paper and then revised digitally after their compositions were transcribed for them. Last, transformations between writing drafts served as the indicators of revision, similarly to many of the previous studies with

elementary students' revision. These revisions were tallied to collect data on both the number of revisions and also the type of revision, according to the Saddler et al. (2014) revision coding system, as previous research suggests that it is not necessarily the quantity of revision but the type of revision that is important to writing quality (Fitzgerald & Markham, 1987; Lisy, 2015). Last, an exploration of suggestions for practice from Fitzgerald and Markham (1987) was included in the research design, especially the use of "real-world" writing tasks with a specific purpose and audience, and instruction within a specific genre addressing specific text characteristics students could examine and revise to bring the text closer to fitting the demands of the task.

CHAPTER 3

METHODOLOGY

The purpose of this study was to determine how second-grade students' use of digital devices during writing workshop supported the revision that occurred in students' writing, and affected the quality of students' informational writing. This study was a formative experiment, following the framework established by Reinking and Watkin (2000). Their formative experiment framework is comprised of the following questions:

1. What is the pedagogical goal to be investigated; why is that goal valued and important and what theory and previous empirical work speaks to accomplishing that goal instructionally?
2. What instructional intervention, consistent with a guiding theory, has the potential to achieve the pedagogical goal and why?
3. What factors enhance or inhibit the effectiveness, efficiency, and appeal of the instructional intervention in regard to achieving the educational goal?
4. How can the instructional intervention be adapted to achieve the pedagogical goal more effectively and efficiently and in a way that is appealing and engaging to all stakeholders?
5. What unanticipated positive and negative effects does the instructional intervention produce?
6. Has the instructional environment changed as a result of the intervention?

Formative Experiments

A formative experiment utilizes mixed methods to examine the effectiveness of a specific intervention targeting an explicit and worthwhile pedagogical goal (Reinking & Bradley, 2008). The pedagogical goal is at the core of all formative experiments and drives the research. A formative experiment aims to achieve the pedagogical goal through

an intervention based on theory while examining the other factors that enhance or inhibit the effectiveness of the particular intervention. Theory drives the research and is also informed by it. Throughout the intervention, components can be modified as the enhancing and inhibiting factors are identified, moving towards maximum effectiveness and achieving the primary goal.

Formative experiments are a relatively new methodology that falls under the umbrella of action research, as they are done in the school, with educators as researchers. Researchers who have used this approach conclude that formative experiments directly address some of the limitations of other experimental or naturalistic studies (Reinking & Bradley, 2008). The purpose of formative experiments “is to generate research that is more directly relevant to practice, to inform theory development, and to identify factors that might be investigated through conventional experimental or naturalistic approaches” (Bradley & Reinking, 2011a, p. 307). With an educational goal at the center rather than a research question, a formative experiment can improve instruction while also closing the gap between research and instructional practice. Teaching-learning challenges are often complex, and a formative experiment can improve instruction when targeting these complex educational goals. Although this method, and other similar design-based methods, are relatively new, they are nonetheless well established in the literature as a means to develop, test, and refine pedagogical theory and to align research more closely to instructional practice (Hoadley, 2004).

A formative experiment was selected as the design for this study for multiple reasons. First, this study was centered on a pedagogical goal: improving students’

revisions in their informational writing. An intervention centered on that goal was implemented during writing workshop, which is based on the theory of the process writing approach (Atwell, 1987; Calkins, 1983; Graves, 1983). Second, writing workshop allows for daily fluctuation as students engage in cyclical routines of planning, translating, and reviewing while writing for real purposes and audiences. A formative experiment allows for an examination of what is really happening in the classroom and can consider these fluctuating factors in an attempt to understand which factors are enhancing or inhibiting the achievement of the pedagogical goal. Third, this study centered on a pragmatic approach, focusing on a goal and an intervention aiming to achieve that goal. Formative experiments are consistent with pragmatism, as they focus on developing knowledge that will allow one to move from a condition that may not be ideal to a more satisfactory condition. The formative experiment design also enables researchers to select the most appropriate methods for data collection and analysis based on the goal.

Overview of Design

Pedagogical Goal

The main pedagogical goal driving this study was to improve second-grade students' revisions in their informational writing. Two sub-goals accompanied this main goal: increasing the amount of revision students do with their writing, and using revision to improve the overall quality of students' informational writing.

Research Site

This investigation was conducted in a second-grade classroom in a suburban school in a western school district. Based on state demographic information (Utah State Board of Education [USBE], 2018) there were 877 students enrolled in the school at the time of the study in grades PK-6, with 452 females and 425 males. Just under 40% of the students were economically disadvantaged, 11% were English learners (ELs), and 18% were enrolled in special education services. Approximately 73% of the population was White, 19% Hispanic, and 8% other. In the 2016-2017 school year, the State Board of Education gave the school a “B” grade based on state testing proficiency and growth. As a teacher at this same school for the nine years prior to and during the study, I was familiar with the school prior to beginning this study.

Participants

As the teacher of record, I conducted the experiment as a teacher-researcher. As such, I was able to provide an insider view into the writing workshop process with the digital revision protocol from both a teacher and researcher perspective. I had taught writing to first- and second-grade students following a writing workshop model for 9 years, and studied theory and research on early literacy development extensively in graduate school for 6 years.

The classroom was a mainstream second-grade classroom. There were 26 students in the classroom between ages 7-8, with ethnicity and gender demographic ratios similar to that of the school. Consent forms were sent home to all students’ parents/guardians in a process consistent with the Institutional Review Board (IRB)’s recommendations, and 21

students gave consent to participation in the study. The classroom was an inclusion classroom, but students with an Individualized Education Plan (IEP) for writing, or who were limited English proficient—as determined by their ACCESS (WIDA, 2018) English proficiency scores, were not included in the data collection of the study. These subgroups were excluded because this study looked at practices for mainstream classroom instruction, not specifically for those with identified learning disabilities or students with limited English proficiency.

Procedures

The procedures for this study occurred in five phases: preparation, gathering baseline data, implementing the revision protocol with on-going data collection, collecting post-protocol data, and retrospective data analysis (see Figure 3.1).

Experiment Protocol

In this study, writing workshop was focused on science informational writing. The units of study during this investigation were selected following school district requirements and state core standards for second grade. This investigation included three writing prompts for units of study with science informational texts (Purcell-Gates, et al., 2007). Each prompt lasted approximately two weeks, for a total of six weeks for the investigation. This timeline allowed for an adequate amount of time to spend a significant time on the genre, and also allowed time during the school year for the instruction of other genres.

The general revision protocol I followed in this study is outlined in Table 3.1.

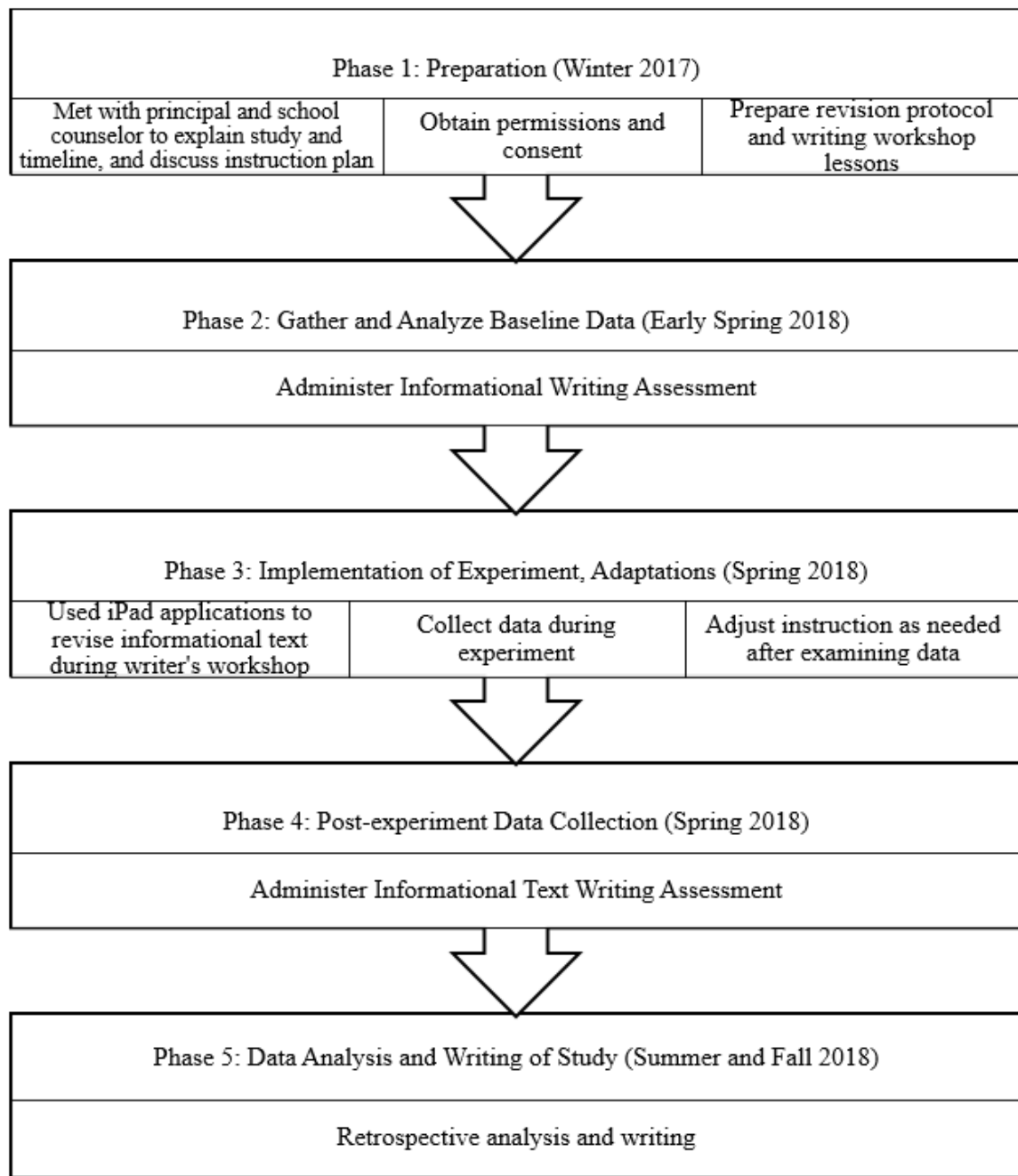
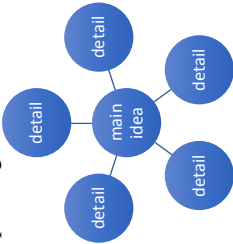


Figure 3.1. Phases of the study.

Table 3.1

Science Informational Text Revision Protocol Outline for Prompt 1

Day/writing process focus	Text feature focus/anchor chart and writing resources	Teaching procedures
<p>Prompt 1 – The owner of the city petting zoo needs some help. Kids coming to the petting zoo always want to know more about the animals while they are there. He wants you to be on his expert animal team and write important information to go on flyers to put by the different animals’ pens so visitors can read and learn. Choose one of his animals and write interesting and important facts to create a science informational text, so the kids can read to learn about the animal.</p>		
1 –Reading and analysis of mentor text	<p>Genre: science informational text (Purcell-Gates et al., 2007)</p> <p>Features of Science Informational Text:</p> <ul style="list-style-type: none"> - Author clearly states the main idea. - The author includes supporting details that describe the main idea to provide a lot of information. - Author writes facts using “expert talk.” - Author uses specialized vocabulary and definitions. - Author organizes the text in a way so that the reader learns a lot about the topic. - Author includes realistic visuals like photographs. 	<ul style="list-style-type: none"> - BACKGROUND: Name and define the genre and its purpose. Display anchor chart with text features. - TO: Read mentor text as an example of the genre. Ask students to pay attention for what the author does to help inform the reader. - WITH: Ask, “What does the author do in this text to help inform the reader?” Go back through the text and have students identify the text features of science informational text. - BY: Give students copies of science informational texts to look through with a partner and find examples of the features listed on the anchor chart.
2 – Planning	<p>Overall structure</p> <p>Graphic organizer</p> 	<ul style="list-style-type: none"> - BACKGROUND: Review mentor text from day 1. Introduce graphic organizer and review what main idea and details are. - TO: Challenge students to do what science writers do. Introduce writing prompt. Model thinking about ideas to answer the prompt and organizing them onto the graphic organizer. - WITH: Continue planning, asking students for input on ideas and organization and guiding them. - BY: Students create plans for their texts using their own graphic organizers.

(table continues)

Day/writing process focus	Text feature focus/anchor chart and writing resources	Teaching procedures
3 – Drafting	<p>Expert talk and main idea</p> <p>Expert Talk Tips</p> <ul style="list-style-type: none"> - Speak like a reporter. - Tell facts, not opinions. - Use declarative sentences. - Don't use "I," "you," or "we." - Use specific vocabulary. 	<ul style="list-style-type: none"> - BACKGROUND: Review mentor text and discuss the main idea. Reread a section and have students listen for the "expert talk" that the author uses. Write expert talk tips. - Provide examples (text and video) of expert talk along with examples of other types of sentences, and have students sort them into an "Expert Talk" category and "Other Types" category. - TO: Model writing sentences from the ideas on the graphic organizer using "expert talk" to start the draft of the prompt. - WITH: Students contribute phrases or sentences to the draft that are using expert talk. Guide them in using the tips. - BY: Students use the plans and ideas on their individual graphic organizers to draft their informational text with paper-pencil. <p><i>Note: After students complete their drafting on day 3, the teacher collected and typed their drafts so they were ready to revise digitally on day 4.</i></p> <ul style="list-style-type: none"> - BACKGROUND: Review what a "detail" and adjective are. Review the mentor text and identify a few details and adjectives together and discuss how they are used to inform the reader. - TO: Reread the modeled draft from day 3 (now typed), one sentence at a time, identifying any adjectives and descriptive details. If the sentence is missing adjectives and details, highlight it and model visualizing to add more details. - WITH: Using the highlighted sentences on the modeled draft, guide students in helping to add descriptive details to better inform the reader about the topic. - BY: Students reread their drafts from day 3, which are typed. They read each sentence, visualize, and add any more details or adjectives digitally to better inform the reader.
4 – Revising	Elaborations and adding details, including adjectives	

(table continues)

Day/writing process focus	Text feature focus/anchor chart and writing resources	Teaching procedures
5 – Revising	<p>Specialized vocabulary and definitions</p> <ul style="list-style-type: none"> - Vocabulary words and definitions specific to the topic of the prompt - Students' online dictionary 	<ul style="list-style-type: none"> - BACKGROUND: Review the mentor text and identify vocabulary words that are specific to this topic. Explain that informational text uses specific vocabulary. In case readers don't know the meaning, the author often writes the definitions (in the text, in a word box, or in a glossary). Brainstorm with them vocabulary and use the kid's online dictionary to find definitions specific to the topic of the prompt (examples for animals: habitat, life cycle, predator, weight, etc.) and make an anchor chart list. - TO: Reread the working draft. Identify any specific vocabulary. Model adding definitions to any words that are specific to this topic. Model adding specific vocabulary if a more common word is used. - WITH: Guide students in adding more specific vocabulary and definitions to the model text. - BY: Students reread their individual texts and revise adding specific vocabulary and definitions.
6 – Revising	<p>Considering organization and use of visuals</p> <p>Types of Visuals in Science Informational Text:</p> <ul style="list-style-type: none"> - Photographs - Drawings - Maps - Diagrams - Charts - Captions 	<ul style="list-style-type: none"> - BACKGROUND: Review mentor text and have students pay attention to what helps the reader organize and understand all of the information in the text (headings, visuals, table of contents). Explain that having realistic visuals in informational text is important for the reader to fully understand. Make a list of visuals that are helpful with this topic. - TO: Point out that there are no visuals or headings in our working texts yet. Reread modeled draft and section it, adding headings to each section. Write which type of visual could be added next to each section. Model finding an online visual to add into the text. - WITH: Students help in revising model text to be organized into sections, adding headings, and helping to choose visuals to add. - BY: Students work on revising their own informational text by rereading, organizing into sections, adding headings, and adding visuals.

(table continues)

Day/writing process focus	Text feature focus/anchor chart and writing resources	Teaching procedures
7 – Revising	<p>Peer revision and feedback</p> <p>Peer Revision Procedures.</p> <ol style="list-style-type: none"> 1. Read your texts aloud to your partners while they follow along. 2. Partners give at least three items of feedback including: one positive, and two things to make the writing better. 3. Repeat steps 1 and 2 with your partner's text. 	<ul style="list-style-type: none"> - BACKGROUND: Discuss how authors often get feedback from other people to make their writing better. Discuss and model peer revision guidelines and procedures. - TO: Model peer revision procedures. - WITH: Students model peer-revision procedures and teacher gives feedback. - BY: Students are in partners and follow peer revision procedures, then apply revisions based on the feedback they received from their partner.
8 – Editing and Finalizing	<p>Conventions</p> <p>Capitalization rules</p> <p>Punctuation marks</p> <p>Spelling word wall</p>	<ul style="list-style-type: none"> - BACKGROUND: Review spelling, punctuation, and capitalization rules on the editing checklist. - TO: Model rereading text and editing. - WITH: Students reread model text and continue editing. - BY: Students reread individual texts and edit then finalize their work.

This protocol contained a reiterative sequence of instructional support that targeted familiar science topics and focused on descriptive writing. In a formative experiment, the instruction can and should change in response to the data collected throughout the study. Adaptations to this outline were made as warranted, in order to achieve the pedagogical goal more effectively and efficiently (see Appendices D and E for further protocol outlines). Any modifications to the instruction were documented in detail in the teacher journal data component and are addressed in Chapters 4 and 5. The purpose of this revision protocol was to support the students' revision of their informational compositions by focusing mini-lessons on distinct features of science informational text.

During writing workshop, the students participated in a teacher-directed mini-lesson, and then used an iPad application to revise their informational texts. Writing workshop is a traditional method for teaching writing, used especially in the early grades (Calkins, 1983; R. Fletcher & Portalupi, 2001; Graves, 1983). The model of writing workshop I used began with a brief (~15 minutes) mini-lesson focused on a specific aspect of writing based on student needs. In this study, the mini-lessons focused on revision within the science informational text genre (Purcell-Gates, et al., 2007). Each mini-lesson used a To-With-By outline (Campbell, 2009) to teach features of the genre as the focus for revision during every writing workshop session.

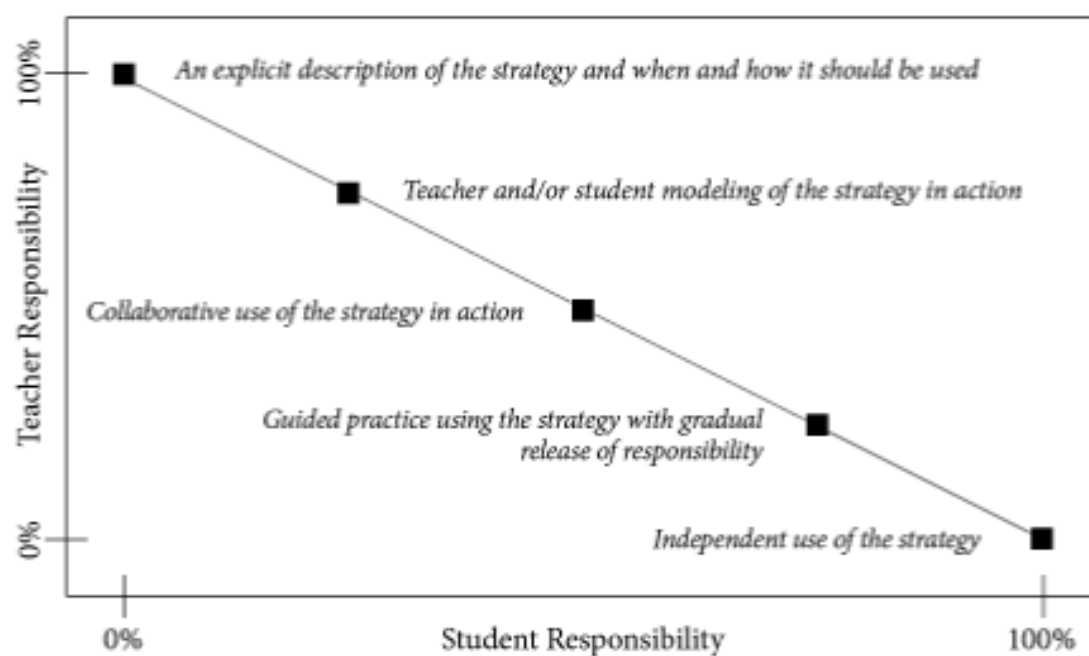
The 'To' portion was a teacher-focused introduction of skills and/or concepts. The 'With' portion was a guided instruction practice of the skill and/or concept, and the 'By' portion was when students applied what they had learned to their individual writing. There are various perspectives and terminology for this model of instruction as seen in

Table 3.2, and it is a simplified version of the widely-used gradual release of responsibility (GRR) model (Pearson & Gallagher, 1983; see Figure 3.2)

Table 3.2

To-With-By Perspectives (Campbell, 2009, p. 7)

To	With	By
The foundation	The implementation	The application
Direct instruction	Guided instruction	Self-directed learning
Main lesson	Learning centers	Project-based learning
Project presentations	Student practice	Performance assessment
Teacher-focused	Group-focused	Individual-focused
Introduction of skills	Skill building	Demonstrations of learning
Teach	Practice	Apply
I do	We do	You do



Note. Adapted from "The Instruction of Reading Comprehension," by P.D. Pearson & M.C. Gallagher, 1983, *Contemporary Educational Psychology*, 8(3), 317-344.

Figure 3.2. Gradual release of responsibility model. This figure shows an adaptation of Pearson and Gallagher's (1983) model (Duke, Pearson, Strachan, & Billman, 2011, p. 65).

After the mini-lesson, students were given time to write independently. As the teacher, I indicated the genre and prompt for the writing, and then allowed students to choose their own topics to write about to answer the prompt (i.e., the type of animal for Prompt 1). During the independent writing portion of the workshop, I circulated among students to observe their revisions of informational text and assist students when requested. I answered questions and gave help to students as needed. During independent writing time, I did not give instruction on topics or concepts I had not previously covered in the mini-lessons. A typical writing workshop encourages the teacher to do small-group or individual conferences during the independent writing time. However, in order to fulfill both the teacher and researcher role, I was mainly observing as a researcher during the independent writing time for this study. At the close of independent writing time, the workshop ended with a few minutes for students to share their writing with one another. Peers were expected to share three items of feedback—one positive, and two suggestions to improve the writing.

Prior to this research study, I had taught writing to primary grade students using a writing workshop model for nine years, following the above-described components (mini-lesson, independent writing time and conferences, student choice of topics, and sharing of writing). In my experience, the majority of second graders are readily engaged and motivated by the writing workshop format, enjoy writing, and are able to produce grade-level appropriate writing. Although writing workshop is a strong model for teaching the writing process, it does have limitations especially for struggling and novice writers who need more explicit instruction in strategies and more fluent transcription

skills. Regarding student revision, my experiences have echoed the research on revision (Saddler et al., 2014) with students not often making revisions beyond the surface level. Another limitation of writing workshop is that the majority of research conducted with this model uses narrative writing genres, without much attention to how it can be implemented successfully to teach less familiar informational writing genres (Tracy & Headley, 2013).

During the writing workshop in this study, a digital application was added to the instructional process. Students participated in the writing workshop (mini-lesson, student writing time, etc.) and composed a first draft using traditional paper and pencil. After students completed their first drafts, I typed their texts. I transcribed the drafts because second-grade students are typically more proficient with paper-pencil transcription than with keyboarding (Connelly et al., 2007), so it would have taken significant time for students to copy their drafts to the iPads before they could apply revisions. It was important to utilize the available writing time to focus on revision rather than dedicating a relatively large portion of writing time for students to copy their texts. Also, students could potentially make revisions when transcribing themselves, but because I transcribed the exact text of their first draft to the device, I could track every revision they made using a “version history” function on the application. With their drafts available on the iPads, the students revised their writing digitally throughout the remaining stages of the writing process for each prompt.

The application that was initially used in the study was Explain Everything (Explain Everything, 2017). However, due to many technological issues with Explain

Everything during the beginning stages of Prompt 1, the use of this application was replaced with the application Google Docs. Students were familiar with the Google Docs application prior to the study, having used it multiple times to “publish” finished writing products by typing them after revision and editing were completed. (More details about the change in digital application is addressed in Chapter 4.) Google Docs is an application similar in appearance to word processing software. Users can create, edit, share, and print documents, and any changes to a document are saved automatically. Previous versions of the document can be viewed easily, with additions highlighted and deletions shown with a strikethrough. I utilized the “version history” feature during data analysis to calculate the number of each type of revision the students each student applied to the draft, as well as to tally the total number of revisions each student enacted to their draft.

Data Collection and Analysis

Formative experiments typically involve collecting both quantitative and qualitative data to establish a baseline and measure progress toward the pedagogical goal. During this study, I collected both qualitative and quantitative data within a concurrent mixed methods approach (Creswell, 2009; see Figure 3.3). Quantitative data were collected before and after the intervention, and both quantitative and qualitative data were collected during the intervention (see Table 3.3).

Pre-intervention, quantitative data were collected through the administration of the Informational Text Writing Assessment (Purcell-Gates, et al., 2007; see Appendix B)

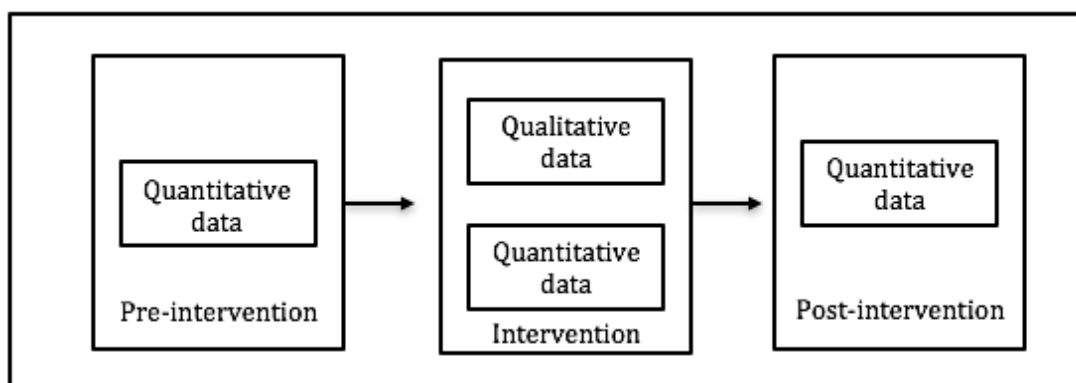


Figure 3.3. Embedded concurrent mixed methods study.

to establish a baseline for students' informational writing quality. This assessment was also administered post-intervention to measure writing improvement over the course of the experiment. During the intervention, quantitative data were collected to assess the amount of revisions and types of revisions students used in their writing as well as to measure student overall writing quality on each of the three prompts. Qualitative data were collected during the intervention through teacher journal responses, to examine (a) how the iPad application supports the revision process, (b) the factors that enhance or inhibit the revision protocol such as time constraints and student engagement and motivation, (c) any necessary modifications in light of these factors, and (d) any unanticipated outcomes of the intervention.

Quantitative Data Collection and Analysis

Informational writing assessment. An informational writing assessment was administered pre- and post-intervention to measure students' overall informational writing skills. This assessment was developed and validated by Purcell-Gates et al. (2007) with second- and third-grade students to measure writing quality with science

Table 3.3

Types of Data Cross-Matched with Goals

Goal	Quantitative data	Qualitative data
Learn if using a writing workshop focused on revision using a digital application significantly improves student informational writing.	<ol style="list-style-type: none"> 1. Informational writing assessment pre- and post-revision scores (Purcell-Gates et al., 2007) 2. Overall scores on the final drafts of the three prompted writing samples 	<ol style="list-style-type: none"> 1. Teacher journal <i>Guiding prompts for journal entries include: factors that enhance or inhibit the protocol, how the protocol can be adapted to better achieve the goal, and unanticipated positive and negative outcomes of the protocol.</i>
Learn if using a writing workshop focused on revision using a digital application significantly improves student revisions in their informational writing.	<ol style="list-style-type: none"> 1. Tallies of number of revisions between initial draft and final draft. 2. Tallies of types of revisions between initial draft and final draft. 	<ol style="list-style-type: none"> 1. Teacher journal
Learn how using the digital application in the writing workshop impacts student revisions.	<ol style="list-style-type: none"> 1. Tallies of number of revisions between initial draft and final draft. 2. Tallies of types of revisions between initial draft and final draft. 	<ol style="list-style-type: none"> 1. Teacher journal
Learn what factors enhance or inhibit the effectiveness and efficiency of using writing workshop focused on revision to help students become better writers.		<ol style="list-style-type: none"> 1. Teacher journal
Discover how the writing workshop can be modified in light of these factors.		<ol style="list-style-type: none"> 1. Teacher journal
Examine how the instructional environment changes when writing workshop is implemented.		<ol style="list-style-type: none"> 1. Teacher journal
Describe unanticipated outcomes that the writing workshop focused on revision produces.	<ol style="list-style-type: none"> 1. Informational writing assessment pre- and post-revision scores (Purcell-Gates et al., 2007) 2. Overall scores on the final drafts of the three prompted writing samples 	<ol style="list-style-type: none"> 1. Teacher journal

informational text and science procedural texts. For the purposes of this study, only the informational text portion of the assessment was used and not the procedural text portion because procedural writing was not targeted in this intervention. The purpose of this writing assessment is to “measure and describe growth in the children’s ability to compose informational...text within a science content context” (Purcell-Gates et al., 2007, p. 24).

During the informational writing assessment, students were given 30 minutes to compose an “information book.” Each student received a blank book, with only the title (such as *All About Cats*) on the front cover and eight pages with lines on the bottom half of each page and blank space on the top half of each page. Before beginning writing, the students received a prompt that I read aloud to them, giving instructions and identifying the purpose and audience for the writing they were about to do (see Table 3.4).

These prompts were slightly modified from the original assessment regarding the audience but not the instruction (the name of the city in prompt A, and the name of the museum in prompt B). In the original assessment designed by Purcell-Gates et al. (2007),

Table 3.4

Informational Writing Assessment Prompts

Prompt A	Prompt B
Hi, I own a bookstore in Provo. A lot of people ask me for books about animals, especially cats. They do not have a cat, and they do not know much about cats. They want to learn about cats. I already have a lot of books about how to take care of a cat, but I don’t have any books all about cats. Please write a book that will teach people about cats. Make pictures, too, to help them learn. I can give it to people who ask for one. Thank you.	Hi, I work at the Best Museum and we have lots of creature exhibits. A lot of people ask me for books about the creatures, especially bugs. They do not know much about bugs. They do not want to take care of bugs, but they do want to learn about them. Please write a book that will teach people all about bugs. Make pictures, too, to help them learn. I can give it to people who ask for one. Thank you.

Note. (Purcell-Gates et al., 2007; N. Duke, personal communication, June 15, 2017).

there are three prompts because they administered the assessment three times during their study. For the purposes of this study, I only used two prompts because the assessment was only administered twice, before and after the experiment. A partial counterbalanced design (Smith & Swain, 2011) was used when the writing assessment was administered. At the beginning of the study, half of the participants received prompt A and half received prompt B. At the end of the study, those who wrote to prompt A on the pre-assessment wrote to prompt B, and vice versa, thus helping to control for differences in the thinking and writing that emerge from two different prompts.

Scoring of informational writing assessment responses was focused on students' growth in the ability to compose science informational texts, thus accuracy of science content, spelling, punctuation, and handwriting were not scored. Each text was scored twice, first to obtain a holistic score to determine how effective the text was as an informational text. The holistic score was determined using a 5-point Likert scale (see Table 3.5) with a 1 being "Text does not work at all as an informational text," and a 5 being "Text works well as an informational text." The second scoring was done based on individual features of science informational text (see Table 3.6 for a list of the features).

Prompted writing samples. During the intervention and writing workshop, students were allowed to choose their own informational topics within the guidelines of the prompt. I scanned a copy of each handwritten draft for data collection purposes before students revised. After I transcribed their drafts onto the iPad, students revised on the digital application Google Docs. The students' final drafts were printed out, and the "version history" on the application was analyzed to tally the number of revisions as well

Table 3.5

Holistic Scoring Scale for Informational Writing Assessment

Entire text	
Score	Meaning (think of both effectiveness and genre identification)
0	No response, no written text
1	Text does not work at all as an information text
2	Text really does not work as an information text but has isolated moments of attempting to do so
3	Text is somewhat like an information text; it works somewhat as an information text
4	Text is close to working as an information text
5	Text works well as an information text

Table 3.6

Individual Features of Science Informational Text

Feature	Example
Uses description(s) of attributes/components	“Ants have six legs.”
Includes definitions	“Ants have spiracles, which are openings on their bodies that help them breathe.”
Uses compare and contrast language terms	Talking about ways two or more phenomena are alike and different; “Ants have three body parts and spiders only have two body parts.”
Uses denotative language	“Most worms are between 1 and 4 inches long.”
Uses timeless verb constructions	“Ants eat sugar.” vs. “The ant ate sugar.” or “The ant is eating sugar.”
Uses generic noun constructions	“Ants have legs.” vs. “Joe the ant has legs.”
Uses specialized vocabulary	“Invertebrates are animals that do not have a backbone.”
Uses realistic illustrations and/or graphical devices	Diagrams, tables, charts, maps, etc.
Uses headings to assist reader in locating information or to orient reader to information to come	“Life Cycle,” “Food,” etc.

Note. The feature list was slightly shortened from the original list (Purcell-Gates et al., 2007) for the purposes of this study.

General Scoring Guidelines (see Appendix B for full scoring guide)

- 0 Does not use this feature and would have been inappropriate to do so, given topic.
- 1 Does not use this feature and could have to provide information for the reader.
- 3 Uses this feature some but it only fairly helps to inform the reader.
- 5 Uses this feature quite effectively to inform the reader

as the type of revision. Revision types on the initial prompt were categorized following a classification scheme similar to Saddler et al.'s (2014) findings from a national survey on writing practices in elementary school (see Table 3.7). The initial changes from Saddler et al.'s scheme include omitting the "Surface level" revisions because they are editing issues and this study will focus exclusively on revising, and substitution the "Idea" category for a "Phrase level" category in order to allow for more specificity in the data collection process. Data on the prompted informational science writing samples were collected and analyzed during the intervention process, as each prompt was completed.

Qualitative Data Collection and Analysis

Teacher journal. As the teacher, I recorded an electronic journal entry daily after the writing sessions. This journal documented specifics of what revision instruction looked like, how students responded to the instruction, and how the intervention affected student interest and revisions. Within the electronic journal, I also included relevant lesson plans, teacher- and class-created writing pieces, and lesson materials such as posters, anchor charts, mentor texts, expert models, etc.

Each week, I reviewed the daily journal entries and compiled them in a structured journal entry to answer questions from the formative experiment framework (Reinking &

Table 3.7

Types of Revision Coding (based on Saddler et al., 2014)

Type of revision	Example
Word level	Changes, additions, deletions of individual words
Phrase level	Additions, deletions, combinations of phrases
Sentence level	Additions, deletions, combinations of sentences
Organizational	Rearranging sentences, paragraphs, adding headings

Bradley, 2008) that are specific to this study, but entries were not limited to these questions.

1. What factors enhance or inhibit the effectiveness, efficiency, and appeal of the instructional intervention in regard to achieving the educational goal?
2. How can the instructional intervention be adapted to achieve the pedagogical goal more effectively and efficiently and in a way that is appealing and engaging to all stakeholders?
 - a. More specifically, how can the digital application be used more effectively and efficiently to assess students' writing development and/or the revision process specifically?
3. What unanticipated positive and negative effects does the instructional intervention produce?
4. Has the instructional environment changed as a result of the intervention?

Summary

In this study, I sought to improve second-grade students' revisions in their informational writing while conducting a formative experiment. The formative experiment included an intervention during writing workshop where mini lessons were focused on revision, and students used the Google Docs application on iPads to revise their science informational text in response to a prompt. Quantitative and qualitative data were collected in an embedded, concurrent, mixed methods design throughout five phases. These data were collected to better understand the factors that impact students' revisions, and to modify the intervention as needed in hopes of improving students' revisions and the overall quality of their informational writing. The experiment also explored the instructional process and its association with the quantity and quality of students' revisions.

CHAPTER 4

RESULTS

This chapter presents the results of the study focused on improving second-grade students' revisions in their informational writing, using digital revision technology. The pedagogical goal of the study included two subgoals: increase the amount of revision students did in their writing, and use revision to improve overall quality of their writing. This discussion of results addresses the students' progress toward these pedagogical goals, as represented by the two main research questions originally posed in Chapter 1.

1. How can the use of digital writing support revision of informational text?
2. How does revision instruction and subsequent student revision influence overall writing quality of informational text?

Additionally, this chapter examines the enhancing and inhibiting factors to the intervention's effectiveness, consistent with the formative experiment framework questions (Reinking & Bradley, 2008). The data presented in this chapter are not provided to establish a causal relationship between the writing instruction protocol and student writing growth, such as in a controlled experimental study. Rather, the data were analyzed to examine the progress toward the pedagogical goals of the intervention, and to make inferences about the effectiveness of the protocol.

Pedagogical Goals

To examine the progress toward the pedagogical goal of growth in the quality of students' informational writing, I present quantitative data from the results of the Informational Writing Assessment (IWA; Purcell-Gates et al., 2007), administered both

prior to and after the implementation of the protocol. To examine progress toward the pedagogical goal of growth in the quality and quantity of student revisions within written informational text, I will present quantitative data from scores of the students' written responses to the prompts throughout the protocol. I will also present the revision data that were gathered throughout the protocol, including the quantity and types of revisions that students implemented in their writing prompts. Along with these quantitative results from the drafts and revisions, I will present themes that emerged from the qualitative data collected during the revision protocol.

Informational Writing Assessment

To gather baseline data and measure any change in the overall quality of student informational writing, I administered the IWA (Purcell-Gates et al., 2007) as a pre- and post-assessment. The IWA is a standardized measure that has been used previously as a single, one-time indicator for students' overall informational writing quality and was originally implemented with second- and third-grade students. Its protocol does not include a specific planning or revision period during the administration, nor are students directed specifically to do either planning or revising as part of their assessment. This paper-pencil assessment used in this study did not involve digital writing, but serves as measure of younger students' informational writing achievement.

Informational Writing Assessment Administration and Collection

I administered the initial IWA the week prior to beginning the revision protocol,

and administered the IWA again the week after the revision protocol was completed. The overall writing quality of students' initial informational texts was very important to measure to better understand any growth or development of students' writing during the writing experiment. This assessment also allowed for an examination of transfer—if students could apply the skills they applied in their digital writing back to a paper-pencil task. I focused heavily on revision throughout the study, and I wanted to monitor if the revisions were productive, that is, contributing an overall improvement of student writing and not merely encouraging revisions for the sake of making changes.

When administering the IWA, half of the students were given prompt A, about cats, and the other prompt were given prompt B, about bugs (presented in Appendix B). The prompt that was given to each student was assigned randomly. During the post-assessment, students were given the alternate prompt that they did not respond to for the pre-assessment. For the administration of both pre- and post-assessments, I read each of the prompts aloud once to the students. I projected a copy of the typed prompt onto the screen and told students they could refer to that copy of the prompt if they needed help remembering what to do. I then told the students they could ask for help with spelling specific words, but otherwise needed to work independently. The allowance for help with spelling individual words was described in the administration of the original IWA (Purcell-Gates et al., 2007). It is common for young writers to spend excessive time on trying to spell words, so affording support for spelling allows students to spend more time on writing. As I was not focusing on conventions in students' writing in this study, I followed the standard set forth in the original administration of the IWA.

Each student was given a booklet with a title page and eight pages for writing. Each writing page had a space for an illustration at the top and lines for writing at the bottom. The students were given 30 minutes to write, after I had finished giving instructions. If students indicated they were finished early, I directed them to “reread and see what you can do to make it better” and to “work on the illustrations.” During the administration of the pre-assessment, only a few students said they were finished writing before the 30 minutes were completed. The majority of the students were still working on their drafts and wanted additional time, but all of the assessments were collected after 30 minutes whether the students indicated they were “done” or not. When the time limit was completed during the administration of the post-assessment, the majority of students had finished writing the drafts of their text and were working on illustrations.

Informational Writing Assessment Analysis

After gathering the assessments, I blocked out the student names and replaced them with student numbers. I kept a separate record of students’ numbers, so that I could compare their pre-assessment scores to their post-assessment scores after the protocol was completed. Then, the pre-assessments were scored using the scoring guide referenced in Purcell-Gates et al.’s (2007) study. I had contacted Nell Duke, one of the researchers involved in the aforementioned study, via email, and she gave me permission to use the assessment for this study. She also sent me her scoring guide, which I used to score both the pre-assessments and the post-assessments.

The scoring of the IWA includes four holistic scores and nine feature scores. The holistic scores evaluate if the entire piece works as an informational text, looks like an

informational text, is organized like an informational text, and sounds like an informational text. This evaluation is done using a 1-5 scale, where 1 represents the text “does not work at all” as informational writing, and 5 represents the text “works well” as informational writing. The feature scores include the use of description, definitions, compare and contrast language, denotative language, timeless verbs, generic nouns, realistic illustrations, headings, and specific vocabulary. The feature scores are scored using a 1-3-5 scale, with 5 representing an appropriate and effective use of the feature to add to the quality of the informational writing. The total score is calculated from the sum of all the feature and holistic scores, with a maximum total score of 65.

In addition to my scoring of both the pre- and post-assessments, a second scorer who is trained in early writing instruction and has published research on writing scored the assessments to allow computation of inter-rater reliability. To provide a cautious interpretation of the quality of the students’ informational writing, it was decided that if any of the item scores differed by 1 point, I adjusted the scores to the lower value. After minimal discussion of differences in the pre-assessment scoring, there was an inter-rater agreement of 95% across item scores.

Informational Writing Assessment Pre-Assessment Scores

Several descriptive statistics for the initial IWA for 21 students are presented in Table 4.1. In addition to the various metrics representing the IWA scoring guide, total word count was calculated and reported here as a mean across the 21 second graders.

The total pre-assessment score for each student is presented in Figure 4.1. The

Table 4.1

*Descriptive Statistics on Informational Writing
Assessment Prior to Intervention*

Descriptives	RESULTS
Count	$N = 21$
Mean score	33.85
Standard error	1.51
Median	35
Mode	36
Standard deviation	6.90
Range of scores	27 (17-44)
Word count mean	92.21
Word count range	Minimum: 20 Maximum: 170

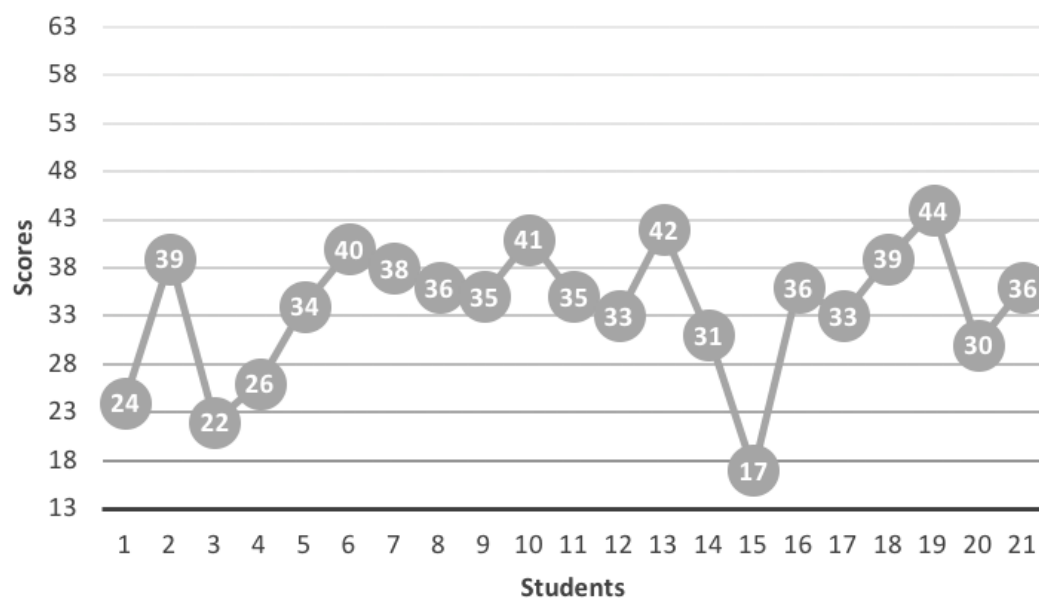


Figure 4.1. Total scores on individual students' Informational Writing Assessment prior to intervention.

minimum score that could be earned is 13, if the student received a score of 1 in each holistic and feature category. The maximum score that could be earned is 65, if the student received a 5 in each holistic and feature category. As evidenced by the scores indicated in Figure 4.1, the majority of the second-grade students had some basic knowledge of and ability to write informational text about familiar topics prior to the intervention. The scores on the pre-assessment were generally moderate scores, with a few low scores and no substantially high scores. This seems to be a fairly accurate representation, considering the students were not completely unfamiliar with informational text or writing in the last semester of the school year. The students had some exposure to reading and writing informational text in the classroom prior to the beginning of this study, and the state curriculum calls for students to write informational text in first grade.

Essentially, at pre-assessment these second graders tended to score in the mid-range of the scale with reasonable variation and some low scores. Importantly, the number of words varied greatly, reflected in the large word count range (8-278). Some of the students initially wrote very minimal text, which influenced their overall scores. In order to obtain a more representative mean for word count on the pre-assessment, I removed the high outliers of 268 and 278 words and the low outlier of 8 words, and recalculated the mean and range (see Figure 4.2). However, word count on the pre-assessment still varied greatly, with a mean of 92.21 and a range of 150, from 20 words to 170 words (see Figure 4.2). This large range of writing production reflects the variation among young writers to plan and compose text and influences how much text is

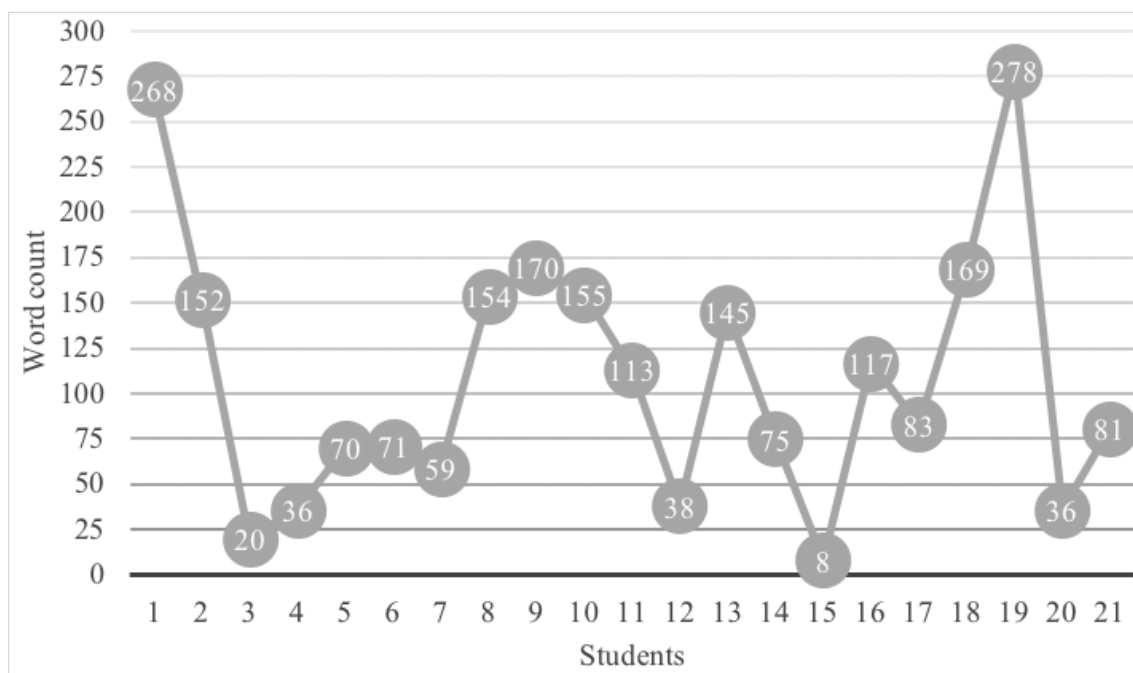


Figure 4.2. Word count on individual students' Informational Writing Assessment prior to intervention.

available to score on a writing assessment. In other words, writing achievement is partly dependent on or a function of writing productivity.

To more closely examine the students' scores on the pre-assessment and gain a sense of students' prior knowledge and current achievement, I calculated the mean for each of the holistic scores (see Figure 4.3) as well as each of the feature scores (see Figure 4.4). Prior to the intervention, it seems that students had more familiarity with the overall sense of the genre and the language of informational writing. The students demonstrated a lower level of familiarity with the organization and formatting of informational text.

As shown in Figure 4.3, these second graders evidenced some knowledge of and ability to write informational text about familiar topics. Students demonstrated a stronger

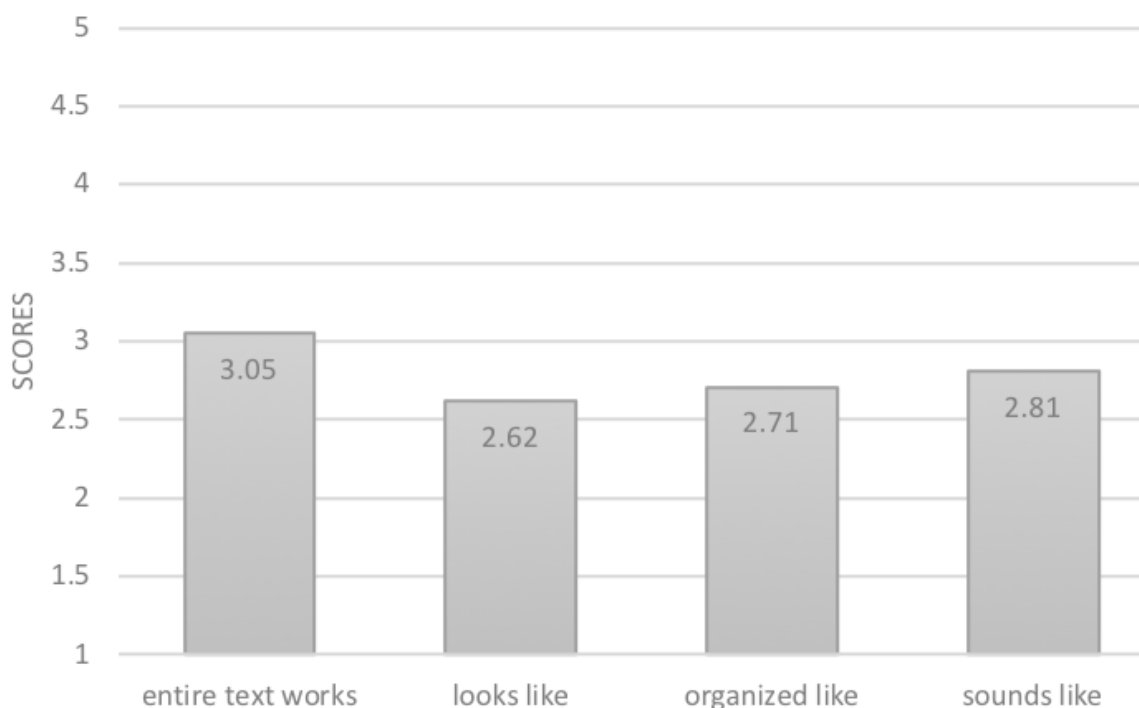


Figure 4.3. Mean holistic scores on Informational Writing Assessment prior to intervention.

understanding of the language of informational writing, which is delineated in the feature scores shown in Figure 4.4. The five higher feature scores all relate to strong descriptive and semantic aspects of informational writing. Of the lower scores, two relate to the structure and formatting of informational text (headings, illustrations). The other two lower-feature scores relate to the language of informational text (compare/contrast, definitions), but typically involve more complex sentence structure and/or higher level of knowledge about a given science topic. For example, students successfully used informational vocabulary in their pre-assessments, as evidenced in the vocabulary feature score. However, students did not include many definitions of these vocabulary words in their texts, as shown by the lower definition feature score. Including definitions in text requires a more sophisticated knowledge about the vocabulary and the science topic. It

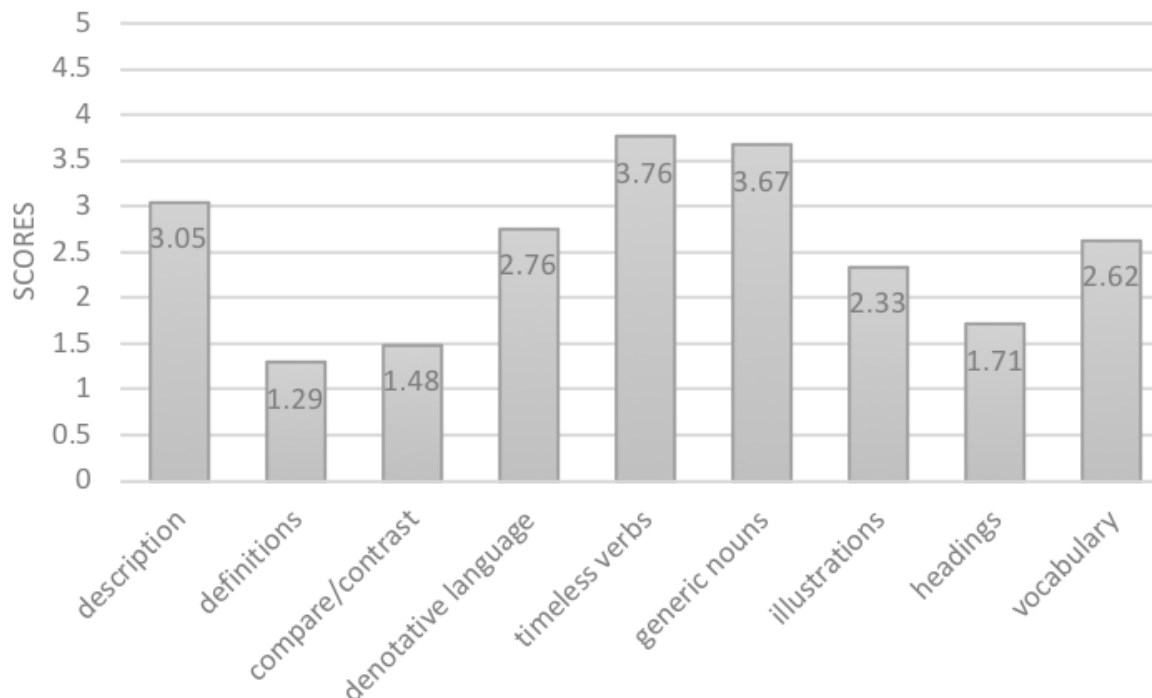


Figure 4.4. Mean feature scores on Informational Writing Assessment prior to intervention.

also calls for an awareness of a reader, and an awareness of presenting oneself as an “expert” when writing an informational text.

Thus, these second graders demonstrated a basic knowledge of and ability to write informational text in their pre-assessment scores. The students had a higher understanding of the overall sense of the genre and familiarity with the language of informational writing. They were not as familiar with the structure and formatting of informational text, as targeted in the assessment, prior to the intervention.

Informational Writing Assessment Post-Assessment

At the end of the protocol, I administered the IWA again as a post-assessment. I followed the same administration procedures as used for the pre-assessment, with the

only difference being that each student was given the alternate prompt than he or she had used for the pre-assessment. Like the pre-assessment, this administration did not involve digital writing, thus enabling an examination of any transfer the students maintained from digital writing and revisions to a more traditional informational-writing assessment. The post-assessment was scored using the same scoring guide and procedure as the pre-assessment, with an inter-rater reliability of 95% across item scores.

Table 4.2 shows student mean scores from the pre- and post-assessment. (Again, due to the 1-5 scoring scale for each item on the IWA, the lowest possible points is 13 and the highest possible points is 65.) What is notable is the almost 10-point gain in mean score. The other metrics show great comparability with similar gains.

The total pre- and post-assessment scores for each student are presented in Figure 4.5. The majority of the second graders made gains in their informational writing achievement over the course of the 6-week writing protocol. Some students made greater

Table 4.2

Descriptive Statistics for Informational Writing Assessment at Pre- and Post-Intervention

Descriptives	Pre-assessment	Post-assessment	Difference
Count	<i>N</i> = 21	<i>N</i> = 21	0
Mean score	33.85	43.57	+9.71
Standard error	1.51	1.53	+0.02
Median	35	44	+9.00
Mode	36	44	+8.00
Standard deviation	6.90	7.03	+0.13
Range of scores	Minimum: 17 Maximum: 44	Minimum: 28 Maximum: 60	+5.00
Mean word count	92.21	98.90	+6.69
Range word count	Minimum: 8 Maximum: 278	Minimum: 18 Maximum: 272	-16.00

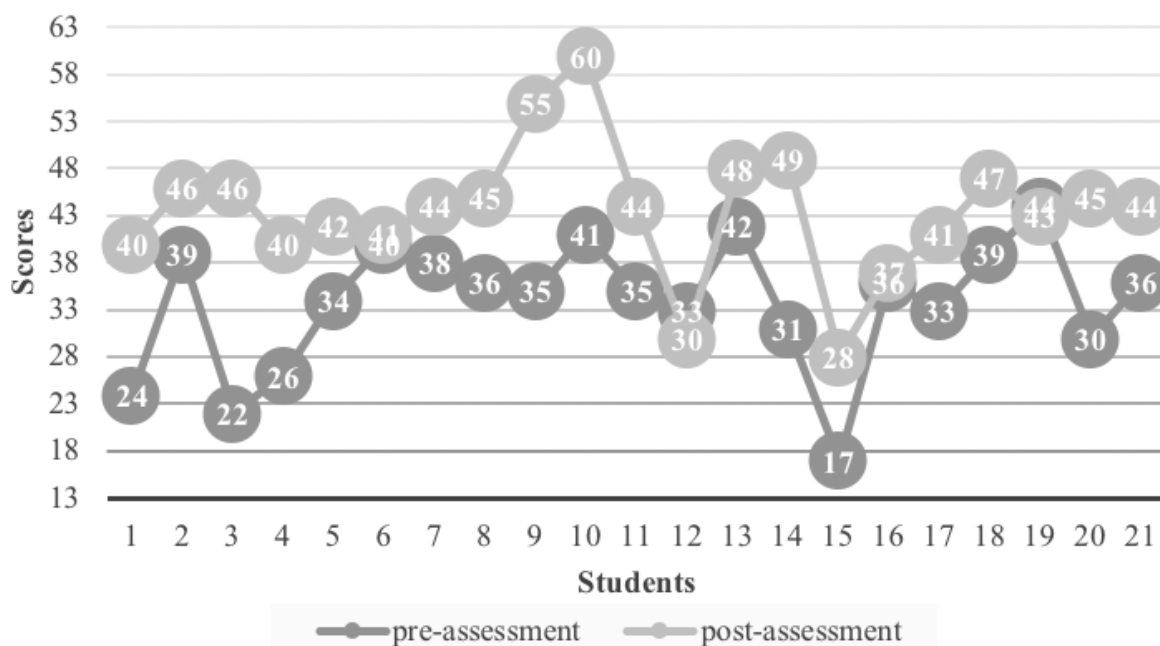


Figure 4.5. Total scores from the Informational Writing Assessment, pre- and post-intervention.

gains than others and a few students did not make substantial gains. Most students' scores hovered around the median score of 44, with a few lower and a few higher scores, as you might expect to see in a standard distribution. There were two students who had a slightly lower score (no more than 3 points) on the post-assessment. This may be due to the post-assessment being administered during the last month of school, or due to student knowledge (or lack of) about the topic of the respective prompt.

The number of words on students' post-assessment varied greatly as shown in the range of words (18-272). It is interesting to note that the majority of students had a very similar word count on their pre- and post-assessments (see Figure 4.6), even though their overall scores were different. The mean word count was only six words higher for the post-assessment than the pre-assessment. This indicates that the writing protocol did little to influence students' writing fluency and productivity on a timed writing assessment. In

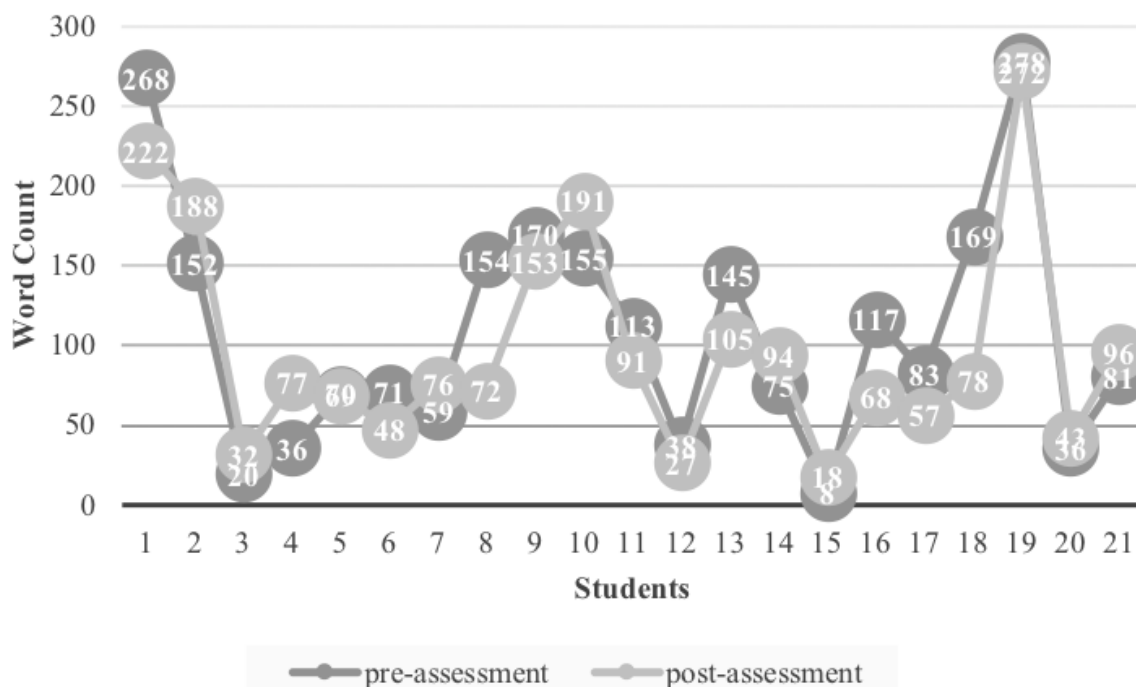


Figure 4.6. Word count on students' Informational Writing Assessment after intervention.

other words, more-productive writers at pre-assessment were more productive writers at post-assessment and vice versa. This might be expected because students spent a lot of time during the protocol writing digitally rather than using paper and pencil exclusively. Moreover, the time limit of 30 minutes precludes the opportunity to write extensively. At post-assessment, more students completed their writing during the given time and used any remaining time to work on illustrations, which is reflective of writing efficiency. However, the protocol appears to have influenced the quality and appropriateness of the specific content of the text the students wrote. The mean score increased by 9.71 points from pre- to post-assessment, but the mean word count only increased by 6.69 words. This suggests that productivity was likely not the source of the increased scores, but that the post-assessment writing was greater in quality than the pre-assessment writing.

To analyze the overall effectiveness of the revision-focused protocol on overall student informational-writing growth, I used a paired t test to measure the significance of the differences between the pre-assessment and post-assessment scores. Significant gains in several categories were apparent in students' general informational-text writing quality. The students showed significant growth overall, with the total mean score increasing by 9.71 points from pre-assessment to post-assessment ($p < 0.001$). I also examined the means and gains of each item on the scoring guide (see Table 4.3). The mean for each item scored all show positive gains.

Table 4.3

Informational Writing Assessment Gains from Pre-Assessment to Post-Assessment

Measure	Pre-assessment	Post-assessment	Gain	Standard error	Significance
Entire text	3.05	3.48	0.43	.87	$p < .035^*$
Looks like	2.62	3.10	0.48	1.078	$p < .056$
Organized like	2.71	3.38	0.67	.966	$p < .005^{**}$
Sounds like	2.81	4.14	1.43	1.121	$p < .000^{***}$
Description	3.05	4.00	0.95	.921	$p < .000^{***}$
Definitions	1.29	1.67	0.38	1.244	$p < .176$
Denotative language	2.76	4.19	1.43	.870	$p < .000^{***}$
Timeless verbs	3.76	4.76	1.00	.707	$p < .000^{***}$
Generic nouns	3.67	4.81	1.14	.655	$p < .000^{***}$
Illustrations	2.33	2.43	0.10	1.480	$p < .771$
Vocabulary	2.62	3.71	1.09	1.221	$p < .001^{***}$
Compare/contrast	1.48	2.10	0.62	1.284	$p < .039^*$
Headings	1.71	1.81	0.10	1.895	$p < .820$
Total score	33.86	43.57	9.71	7.17	$p < .000^{***}$

* $p < .05$ ** $p < .01$ *** $p < .001$

On the post-assessment, students showed significant growth ($p < .05$) for three of the four holistic scores: the entire text working as an informational text, the text being organized like an informational text, and the text sounding like an informational text (see Figure 4.7). Students had gains in the other holistic score—the text looking like an informational text, but these gains were not quite at the significant level ($p < .056$). This holistic element was heavily reliant on the use of headings and illustrations. The use of headings was not a feature that was explicitly focused on during the protocol, and the relatively short time given for the IWA assessment precluded many students from having time to work on illustrations.

After analyzing the holistic scores from the IWA, I also examined the gains on the feature scores (see Table 4.3). Seven features had gains from pre- to post-assessment, and five of these features had highly significant gains: using description, denotative language,

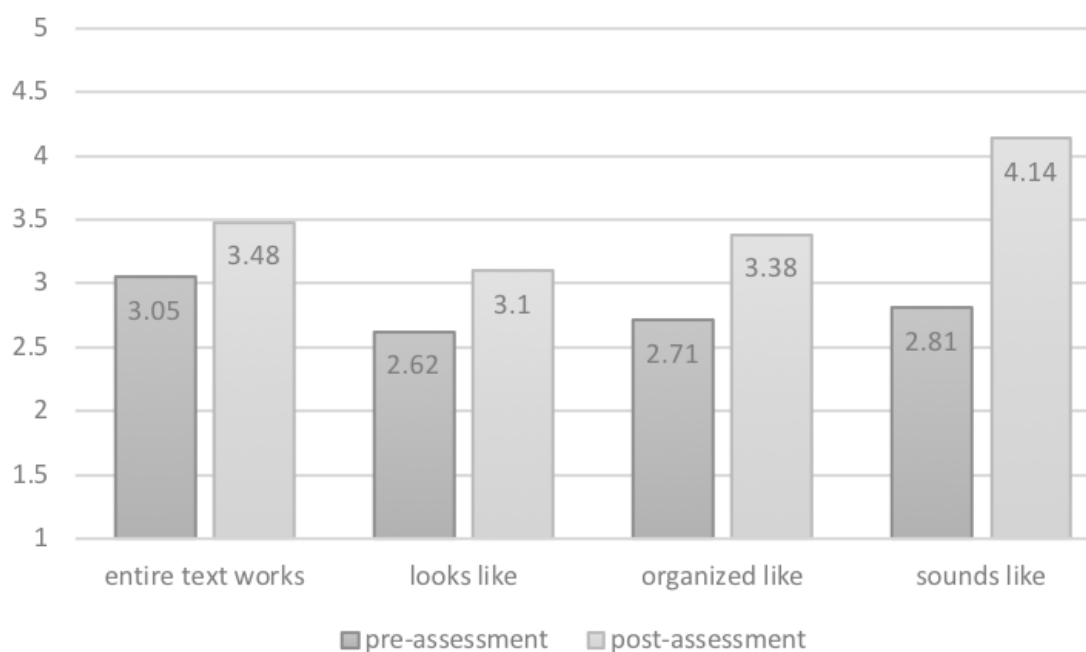


Figure 4.7. Mean holistic scores on Informational Writing Assessment pre- and post-intervention.

timeless verbs, generic nouns, and specific vocabulary. The use of definitions and illustrations did not have statistically significant gains (see Table 4.3). Of the specific features on the assessment, two items were not explicitly taught or targeted during the revision protocol—compare/contrast language and using headings. The scores from pre- to post-assessment did show growth on both of these, but only the gains on compare/contrast were statistically significant. It is interesting to note that there was significant growth for the compare/contrast category because this was not a targeted feature of instruction during the writing protocol. Perhaps as students had more exposure to informational text—through mentor texts read aloud during mini-lessons, texts read to learn information on selected topics before writing in response to the prompts, and other students sharing their own informational writing—some students were able to assimilate the concept of compare/contrast language and apply it to their own writing.

As presented in Figure 4.8, these second-grade students were able to successfully demonstrate application of the language aspects of the informational genre in their writing, including using description, denotative language, timeless verbs, generic nouns, and specific vocabulary. The feature with the highest gains was the use of denotative language. The students were less successful applying the formatting aspects of the informational genre, namely using illustrations, headings, and providing definitions. The features with the lowest gains were using headings and illustrations. This is an interesting finding and sheds some light on the idea that teaching the language of informational writing and the formatting of informational text are not one-and-the-same, and may both need to be addressed in writing instruction.

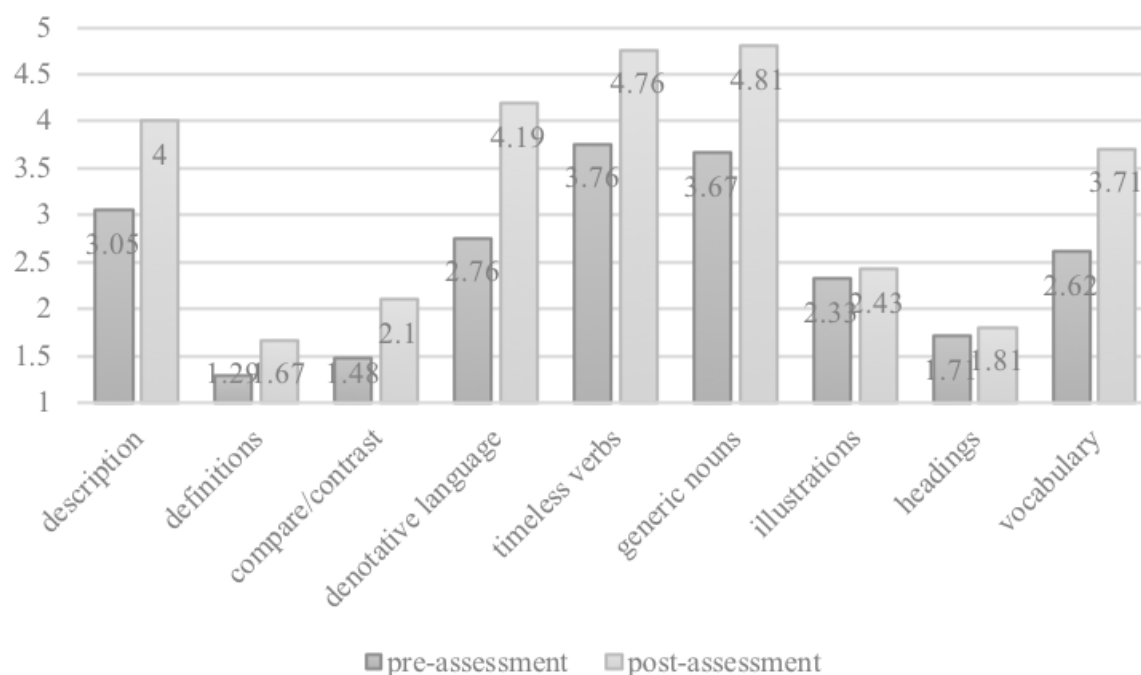


Figure 4.8. Mean feature scores on Informational Writing Assessment after intervention.

Informational Writing Assessment Results

In order to understand the significance of the differences between IWA mean scores prior to and after the intervention, I also calculated the effect size using Cohen's *d*. The effect size measures the size of the differences by indicating how large the relationship is between the pre-assessment and post-assessment scores. This is calculated by taking the difference in the two group means and dividing that difference by the average of their standard deviations. The differences between pre- and post-assessment scores for this study has an effect size of 1.23 (Cohen's *d*), which is considered very large (Cohen, 1988). A large effect size is a substantial effect that is consistent enough to make it easily observable in the data.

In summary, the administration of the IWA prior to the intervention provided baseline data from which to gauge student growth in overall informational writing

quality. It is apparent from the data that the majority of the students did have some level of understanding about how informational text works. This is understandable, being that the protocol was completed in the last few months of the school year and the students had already experienced reading and writing some informational text earlier in the school year as part of the classroom language arts curriculum. However, it is also apparent that the majority of the students did not have a solid grasp on many of the features of informational text or were not implementing them in their writing. After the 6-week writing protocol was implemented, the majority of students were able to demonstrate significantly improved informational writing on the second administration of the IWA. On average, students were able to write higher quality informational text after the protocol than before, both on a holistic and the feature level.

In next portion of this chapter, I detail the quantitative and qualitative data collected with each individual iteration of the revision protocol. The findings are outlined chronologically, both for overall writing quality and for the revisions students made in their informational texts in response to each of the three prompts. Within these descriptions of each iteration, the writing instruction, students' writing scores, quantity and types of revisions, and themes from qualitative data are also all detailed chronologically. Because the outcomes of one iteration informed any modifications for the subsequent iteration, some discussion of these modifications is included in the description of each prompt. In other words, I summarized student growth in informational writing quality in the previous section of this chapter, and in the following section, I will discuss what transpired during the intervention that may have influenced this growth to

facilitate student progress toward the pedagogical goal across the three iterations of the revision protocol.

Data from Within the Study

Quantitative data were collected during each of the three phases of the experiment protocol, consistent with the embedded concurrent mixed methods model I employed for this study. The quantitative data pieces collected during each phase were:

- Initial draft of the written response for each student across three prompts
 - Writing sample, scanned digitally
 - Word count
 - Overall score, following a school-adopted writing rubric for second-grade informational writing (see Appendix C)
- Final product of the writing prompt response for each student across three prompts
 - Writing sample, saved digitally
 - Word count
 - Overall score, following a school-adopted writing rubric for second-grade informational writing (see Appendix C)
- Tallies of the types and quantity of revisions students applied to each of the three prompts during the protocol

Qualitative data were also collected during the protocol, in the form of a teacher journal and video-recorded mini lessons. As the classroom teacher and researcher, I kept a daily journal during the protocol. I free-wrote thoughts that came to mind after each lesson such as insights, frustrations, successes, student comments, and reflections as the teacher. Mid-way through each prompt and at the end of each prompt, I compiled these

free-write thoughts into a structured journal entry. At the end of the protocol, I had six structured journal entries, two from each prompt. These structured journal entries afford a summary of what happened in the classroom with writing instruction during that particular prompt, especially in response to questions from the formative experiment protocol regarding factors that were enhancing and inhibiting progress toward the pedagogical goals.

Writing Instruction Protocol

To further examine student progress toward the pedagogical goals, I present the data—both quantitative and qualitative—from the initial drafts, revision instruction, student revisions, and final products in response to each of the three writing prompts, in sequential order.

The details of the writing protocol and lessons are explained in Appendices D and E. Essentially, on the first day of the protocol, I introduced the students to the genre of science informational text. In this introduction, I utilized a mentor text as an example of the genre. In order to call students' attention to, and promote understanding of, the features of science informational text (as identified by Purcell-Gates et al., 2007), I employed a GRR (Pearson & Gallagher, 1983) throughout the lesson. First, I modeled identifying a particular feature of the genre in the mentor text. Then, I facilitated student input and discussion to identify features of the genre, both as a class and in small groups and partnerships. Last, I asked students to identify features of the genre in other texts of the same genre. After this first day focused on the genre features, the focus of the next day was for students to work on planning: choosing the topic for that particular prompt,

and planning information on a graphic organizer, both to plan the shared writing piece as well as the students' individual writing pieces. Research has suggested the significance of planning on overall writing quality (Graham, McKeown, et al., 2012), so although this study was focused on revision, instructing the students to plan prior to drafting was an important part of the writing process to include. On the third day of the protocol, I again employed GRR until students started their drafts in response to the prompt, using paper and pencil. After the students' drafts were completed, I collected the drafts and scanned them to save a digital copy before scoring each one. The protocol continued for five more days, to make a total of eight days for each prompt. These subsequent days were focused on revision and will be revisited later in the chapter.

Writing Prompts Analysis

I determined the scores for the students' initial drafts and final products for each prompt using a classroom informational writing rubric (see Appendix C), which is based on the second-grade informational writing standard from the CCSS (see Appendix F). This rubric was created by teachers in the school district and used by the second-grade teachers at this school site for the last two years to monitor the quality of students' informational writing. There are five different items on the rubric: Focus, Content, Organization, Style, and Conventions. This rubric follows the school and district's standards-based grading model, with a scale of 1-4 for each item. Within a standards-based model, a score of 3 is considered "meeting benchmark" or "grade-level mastery." A score of 4 is considered to be "beyond benchmark" or "above grade-level mastery," and a score of 1 or 2 is considered to be "well below benchmark" and "below

benchmark,” respectively. To calculate an overall score from the rubric, all five items are added, for a possible total of 20 points. A total score of 14 or above shows mastery, according to the indicators in the CCSS standard for second-grade informational writing.

Each of the initial drafts and final products from all three prompts from the experiment protocol were scored using this rubric. The word count from each writing piece was also recorded. The writing pieces were scored by myself, and a random 10% of the writing samples were scored by another experienced writing teacher to determine inter-rater reliability. After a discussion of differences after the pre-assessment, there was an agreement of 85%. If any of the scores differed by 1 point, the scores were adjusted to the lower value as a cautious interpretation of the quality of the students’ informational writing.

Prompt 1. The first prompt read,

The owner of the City Petting Zoo needs some help. Kids coming to the petting zoo always want to know more about the animals while they are there. He wants you to be on his expert animal team and write important information to go on flyers to put by the different animals’ pens so visitors can read and learn. Choose one of his animals and write interesting and important facts to create a science informational text, so the kids can read to learn about the animal.

Prompt 1 drafts. The initial draft responses for Prompt 1 had an overall mean word count of 48.62, and an overall mean score of 12.48 (out of 20). This placed the average informational writing level for the drafts in the “below benchmark” category on the standards-based rubric used for scoring. The scores on the first prompt draft had a range of 8 to 17, with only five students scoring at or above benchmark with a score of 14 or greater. Thus, only planning and drafting did not produce acceptable informational writing for the majority of the students. I also calculated the mean for each category on

the rubric. Each category has a highest possible point value of 4, and the highest scoring category for the initial prompt was Focus, with a mean of 3. The lowest scoring category was Organization, with a mean of 1.95. The other three categories had average scores around 2, with Content and Conventions both with a mean score of 2.71, and Style with a mean of 2.1 points (see Table 4.4). As Table 4.4 shows, the comparison between draft and final scores is significant for all elements, with Organization the least improved.

Prompt 1 final products. After the revision phase of the protocol, I collected students' final products and scored them, using the same rubric I had used to score the drafts. The final products for the first prompt had an overall mean word count of 89.42, and an overall mean score of 15.24 (out of 20). This places the average student informational writing level for the final products in the "at benchmark" category on the standards-based rubric used for scoring. The scores on the Prompt 1 final product had a range of 10 to 18. The mean for each category on the rubric was also calculated. Each

Table 4.4

Mean Scores and Word Count for Prompt 1 Drafts and Final Product

Category	Draft	Final	Gains	<i>p</i> value	Significance
Word Count	48.62	89.42	40.80	< .000	***
Focus	3.00	3.76	0.76	< .000	***
Content	2.71	3.29	0.58	< .000	***
Organization	1.95	2.29	0.34	< .005	**
Style	2.10	2.67	0.57	< .000	***
Conventions	2.71	3.24	0.53	< .000	***
Total Score	12.48	15.24	2.75	< .000	***

** $p < .01$

*** $p < .001$.

category has a highest possible point value of 4, and the highest scoring category for the final product was Focus, with a mean of 3.76. The lowest scoring category was Organization ($M = 2.29$), with Style slightly higher at 2.67 points. The two other categories had mean scores above 3, with Content at 3.29 points and Conventions at 3.24 points. See Figure 4.9 for a comparison of each student's scores from draft to final product. All students in the study showed improvement from draft to final score for Prompt 1, with a range of 1-5 points overall improvement. It would appear that the protocol was appropriate for all students, and 15 students were at or above benchmark with a score of 14 or greater on the final product (see Figure 4.9).

After accounting for the word count and rubric scores for initial drafts and final products, a paired t test was calculated to determine if the gains from draft to final products were significant (see Table 4.4). With the p value for significance at $p < .05$, the

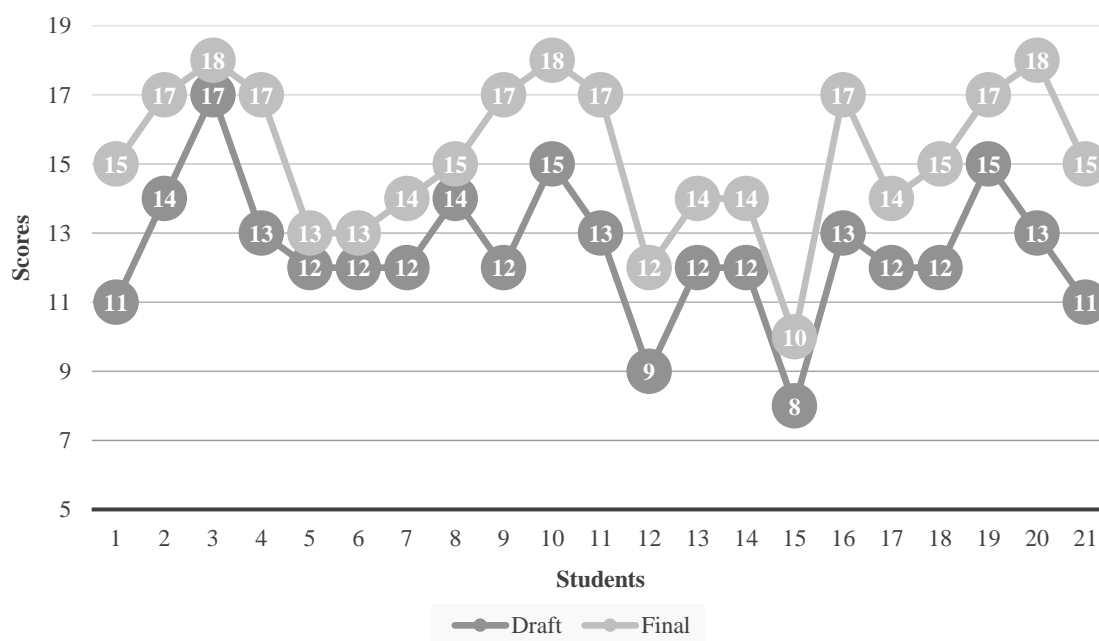


Figure 4.9. Students' overall scores from initial drafts and final products for Prompt 1.

mean gains for word count, all categories on the rubric, and the overall rubric score were all statistically significant at $p < .001$. The word count (from 48.62 to 89.42) had a percentage growth of 84% from draft to final product.

Prompt 1 revision. To examine the revisions that students applied to their writing throughout the protocol, I utilized “version history” on Google Docs. When the students were finished with their final products, I reviewed the version histories from each day they had worked on the writing. The completed written drafts for Prompt 1 demonstrate that all students made revisions on some level to their texts during the revision portion of the protocol (days 4-7 for each prompt). While reviewing the version history, I made a tally of each revision the students made to their respective texts. I also categorized each revision according to the Saddler, Saddler, Befoorhooz, and Cuccico-Slichko (2014) revision coding scheme: word level changes, phrase level changes, sentence level changes, and organizational changes.

The mean number of revisions made for Prompt 1 was 13.95 changes, with a range of 5 to 26. These included changes on the word level, phrase level, sentence level, and organizational level. Notably, the most often implemented type of revision for Prompt 1 was phrase-level changes, with an average of 5.48 phrase-level revisions for each student. The least implemented type of revision for Prompt 1 was word-level changes, with an average of 1.61 word-level revisions for each student (see Table 4.5).

Prompt 1 analysis. In this study, I was hoping to examine whether the number or type of revisions made to the drafts predicted the final score for Prompt 1. However, the sample size was insufficient to determine such relationships because there was

Table 4.5

Means for Each Type of Revision Implemented in Response to Prompt 1

Type of revision	Example	Mean for Prompt 1
Word level	Changes, additions, deletions of individual words	1.61
Phrase level	Additions, deletions, combinations of phrases (more than one word, but not a full sentence)	5.48
Sentence level	Additions, deletions, combinations of sentences	4.14
Organizational	Rearranging sentences, paragraphs, adding headings	2.81
Total		13.95

insufficient data to detect them. It is likely that number or type of revisions does relate to increased writing scores, but further research with larger sample sizes is necessary to determine how the kind or quantity of revisions does relate to improved writing scores. For this study, I was able to examine correlations between the number of revisions students implemented in their writing and their overall writing quality through a Pearson's correlation. I examined the correlation between initial draft rubric scores, total number of revisions, the increase in word count from draft to final product, and the final product rubric scores (see Table 4.6). A significant positive correlation emerged between the initial draft score and the final product score ($p < .001$). Another significant positive correlation emerged between the increase in word count and the final product rubric scores ($p < .01$). The total number of revisions did not significantly correlate with the final product score, but the correlation was positive. Theoretically, the types of revisions may be more important to writing quality than the quantity of revisions, but more samples are needed to determine the interaction between type of revision and final score. Thus, it appears that the increase in word count that occurred during the revision was more significant to the final product score than the number of revisions applied.

Table 4.6

Summary of Pearson's Correlation for Prompt 1 Final Product Score (N = 21)

Variable	Pearson correlation with final score	<i>p</i>
Draft score	.809	.000**
Increase in word count	.585	.005**
Total number of revisions	.298	.189

Prompt 1 teacher journal. In order to look more closely at the revision instruction and student writing time during the Prompt 1 segment, I analyzed the daily free-write teacher journal for codes and themes. I also analyzed the two structured teacher journal entries for Prompt 1, and the discussion of those structured entries will be addressed after presenting the quantitative data for each of the three prompts. For the daily free-write teacher journal entries, I started data analysis by listing two a priori codes. These two codes were in alignment with the research questions and pedagogical goals for this study. These two codes were: digital writing and revision instruction. Then, I read through the teacher journal to sort each comment within the entries according to these codes. Subsequently, I read through each code and recorded any themes that emerged across codes (see Table 4.7).

Digital writing. In the teacher journal, I noted that digital writing positively influenced the revision protocol and writing workshop by increasing awareness of the text, utilized students' prior knowledge and digital skills in a productive way, and provided a closer examination of the revisions for data analysis. It is interesting to note that many of the themes that emerged from the data were related to the students' ability to revise both positively and negatively. Prior knowledge was one of these factors. It was a

Table 4.7

Codes and Themes from Prompt 1 Daily Teacher Journal

A priori code	Theme	Date(s) mentioned
Digital writing	Awareness of text	3/13
	Tech prior knowledge	3/15
		3/16
		3/20
	Closer look for research and data analysis	3/16
	Fosters independence	3/20
	Motivation and engagement	3/14
		3/20
	Technical issues	3/13
		3/14
		3/15
		3/16
Revision instruction	Engagement, excitement, and motivation	3/8
		3/12
		3/15
		3/19
		3/20
	Mastering features and applying knowledge	3/9
		3/14
		3/20
	Prior knowledge	3/9
		3/13
		3/14
		3/15
		3/19
	Needing more time	3/8
		3/12
		3/14
	Students' ability/readiness level	3/8
	School schedule/logistical Issues	3/8
		3/13
		3/14

positive factor in that students had some prior knowledge about the utilization of a technological application and prior knowledge about visuals found in science informational text. However, any lack of prior knowledge with technology (such as with

lack of keyboarding skills), likely influenced students' abilities to revise efficiently.

During the Prompt 1 writing sessions, the dominant negative theme regarding digital writing as coded in my journal was that of technical issues with the initial application (Explain Everything). As I analyzed the teacher journal, I read a few entries regarding the frustration I had with the application as the teacher, and the frustration expressed by students. In the teacher journal, I explained an instructional decision made in light of these technical issues. I expressed that because of the technical issues with Explain Everything, I was concerned I would lose any student motivation, the validity of any revision data, or even be able to finish the Prompt 1 sessions. After the first two days of revising for Prompt 1, I recorded in the teacher journal that I moved all of the students writing over to the application Google Docs. This decision to switch applications is addressed in more detail later on in this chapter.

The other negative digital writing theme that emerged from the daily teacher journal entries was that of some students' lack of prior knowledge and/or skills with the device. I expressed that while most students could navigate the iPad, a few were unfamiliar with it and it took them more time to navigate. In the teacher journal, I noted that many students did not have keyboarding proficiency, including navigating the keyboard (such as knowing where the punctuation marks were, how to make a letter capital, how to return to the next line, etc.) and this slowed their productivity with revision and editing.

Revision instruction. Outside of factors related to using a device for digital writing, there were positive and negative factors related to the revision instruction.

Positive themes that emerged were student excitement and motivation, students' prior knowledge, and the mastery/application of concepts taught. The students were very excited and motivated about the prompts themselves, especially with the idea that they had a specific audience to write to and a specific purpose for writing (i.e., petting zoo explanations). Because this protocol was done in the last trimester of the school year, the students did have some prior knowledge about writing informational text that potentially benefitted the instruction and their writing quality. Another positive factor for student writing was that students were able to master and apply the concepts that were taught during the writing mini lessons.

Negative themes that emerged were students' broad range of ability levels, students needing more time, school logistics and schedule issues, lack of focus and engagement, and lack of and/or issues with prior knowledge. Within the classroom of second-grade students, there were many levels of writing ability, as evidenced by the broad range of scores on the IWA pre-assessment. This was a negative factor because some students needed more scaffolding than others, and students could get distracted and disengaged during instruction if the presentation of the content was outside of their scope of understanding. Along with the broad range of ability levels was also a broad range of writing productivity rates. Although most students were able to finish their writing task during the time allotted, a few students consistently needed more time to complete their work. This was a negative factor because I did not want to give them extra time so that we could keep the data consistent, but it made the subsequent writing task difficult if they were not finished with the previous task.

Modifications for Prompt 2. After the revision instruction and final products for Prompt 1 were completed, I implemented some data analysis. I scored the student drafts and final products for Prompt 1, and tallied the quantity and types of revisions that students applied to their writing during the protocol for Prompt 1. I also reread the teacher journal from Prompt 1. (The Pearson's correlation and teacher journal coding were not analyzed prior to beginning Prompt 2.) Within the framework of formative experiments, it is important to look at the data after each iteration and then make modifications to the "intervention" as needed, in order to make further progress toward the pedagogical goal. An examination of the students' writing scores and the teacher journal entries led me to make the following modifications for the implementation of the protocol for Prompt 2:

1. Discontinue use of Explain Everything, and use the Google Docs app exclusively.
2. Increase the amount of planning time to two days instead of one, and focus on organization during this stage.
3. Gradually release more responsibility to the students with less time spent modeling and more time doing guided practice.

Prompt 2. The second prompt read,

At the planetarium, there is a room with a telescope and many different pictures of objects that are in space. The planetarium director wants some posters to hang up in this room. She would like our help making posters with interesting and important information about objects in our solar system. Choose one of the space topics below and write all about it to make a poster. Make sure you include specific details and facts to help visitors to the planetarium learn a lot about space!

Prompt 2 drafts. The initial drafts responding to Prompt 2 had an overall mean word count of 107.95, and an overall mean score of 14.52 (out of 20; see Table 4.8). This

Table 4.8

Mean Scores and Word Count for Prompt 2 Drafts and Final Products

Category	Draft	Final	Gains	<i>p</i> value	Significance
Word count	107.95	139.81	31.86	< 0.00	***
Focus	3.57	3.90	0.33	< 0.01	**
Content	3.00	3.24	0.24	< 0.02	*
Organization	2.62	3.00	0.38	< 0.02	*
Style	2.52	3.24	0.72	< 0.00	***
Conventions	2.81	3.24	0.43	< .001	**
Total score	14.52	16.62	2.1	< 0.00	***

p* < .05*p* < .01****p* < .001

placed the average student informational writing level for the drafts at the lower end of the “at benchmark” category on the standards-based rubric used for scoring. The scores on the drafts for the second prompt had a range of 10 to 17. Comparing the draft scores for Prompt 2 to the draft scores for Prompt 1 shows that the students started out with a higher quality text before any revisions. This suggests a transfer and application of knowledge learned from the Prompt 1 revision instruction. The topic for the Prompt 2 drafts was not one that students had more background knowledge on in comparison to their background knowledge on the topic for Prompt 1. There was a mean word count growth of 147.5% from Prompt 1 draft to Prompt 2 drafts, and 21% growth for mean word count from Prompt 1 final products to Prompt 2 drafts. This large growth could be influenced by students having an additional day for planning. The range of scores on the draft was narrowed by 2 points (10-17 as compared to 8-17), and the mean overall score on the drafts was 2 points higher (14.52 as compared to 12.48).

After scoring the drafts with the same rubric that was used during the Prompt 1 process, the mean for each category was also calculated. The highest scoring category for the initial draft for Prompt 2 was Focus, with a mean of 3.57. The lowest scoring category was Style, with a mean of 2.52. The Organization category had a mean score of 2.62, Conventions had a mean of 2.81, and Content had a mean of 3. (see Table 4.5). Each of these categories had higher mean scores on the Prompt 2 draft than the Prompt 1 draft. Both Organization and Style had higher mean scores on Prompt 2 drafts than they did on the Prompt 1 final products. The modification to the protocol to emphasize organization during the planning phase of the writing process appears to have positively influenced the organization of student writing.

Prompt 2 final products. After the revision phase of the protocol, I collected and scored students' final products, using the same rubric used to score the drafts. The final products for the second prompt had an overall mean word count of 139.81, and an overall mean score of 16.62 (see Table 4.7). This mean score placed the average student informational writing level for the final products at the high end of the "at benchmark" category on the standards-based rubric used for scoring. The scores on the second prompt final product had a range of 11 to 20. The mean for each category on the rubric was also calculated. Each category has a highest possible point value of 4, and the highest scoring category for the final product was Focus, with a mean of 3.9. The lowest scoring category was Organization, with a mean of 3 points. The categories Content, Style, and Conventions all had a mean of 3.24 points. See Figure 4.10 for a comparison for each student's scores from draft to final product for Prompt 2. All students in the study showed

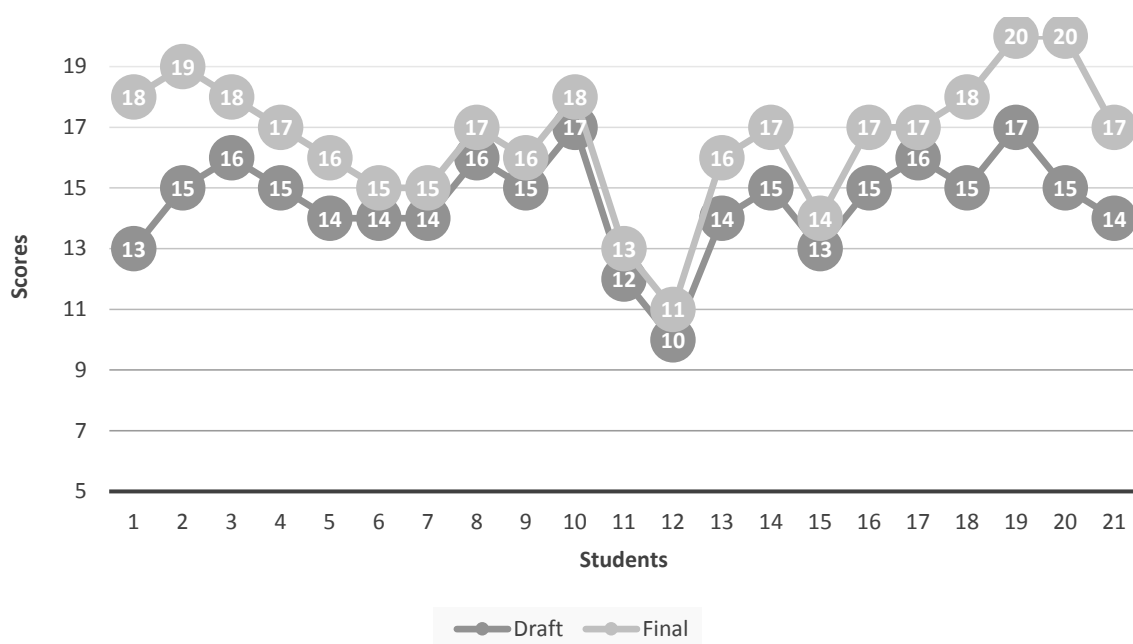


Figure 4.10. Students' overall scores from initial drafts and final products for Prompt 2.

improvement from draft to final score, with a range of 1-5 points overall improvement, with only four students' final products scoring below benchmark with a score less than 15.

After accounting for the word count and rubric scores for initial drafts and final products, a paired t-test was calculated to determine if the gains from draft to final product were significant (see Table 4.8). With the p value for significance at $p < .05$, the mean gains for word count, all categories on the rubric, and the overall rubric score all showed as statistically significant. The word count had a percentage growth of 29.5% from draft to final product for the second round of writing.

Prompt 2 revision. After students completed their written drafts for Prompt 2, students made revisions on some level to their texts during the revision portion of the protocol (days 4-7 for each prompt). The mean number of revisions made for Prompt 2

was 10.57 changes, with a range of 4 to 20. These included changes on the word level, phrase level, sentence level, and/or organizational level. The most often implemented type of revision for Prompt 2 drafts was sentence-level changes, with an average of 4.76 sentence-level revisions per student. The least-often implemented type of revision for Prompt 1 was organizational level changes, with an average of 1.8 word-level revisions per student (see Table 4.9). Overall, students made fewer revisions in their writing in response to Prompt 2 than they did in response to Prompt 1 (10.57 versus. 13.95). However, students started with higher quality drafts for Prompt 2, which could have some bearing on the lower number of revisions, with their drafts not needing as many changes. The drafts for Prompt 2 were also significantly longer, which may have made it more difficult for students to make as many revisions because it would take them longer to reread their drafts. Students did not make very many organizational level changes during Prompt 2, in comparison to Prompt 1. This may have been influenced by the modification to the protocol to emphasize organization during the planning phase, with not as many changes necessary during the revision phase, which is supported by the

Table 4.9

Means for Each Type of Revision Implemented for Prompt 2

Type of revision	Example	Mean for Prompt 2
Word level	Changes, additions, deletions of individual words	3.71
Phrase level	Additions, deletions, combinations of phrases (more than one word, but not a full sentence)	3.59
Sentence level	Additions, deletions, combinations of sentences	4.76
Organizational	Rearranging sentences, paragraphs, adding headings	1.80
Total		10.57

higher draft scores. Students made revisions beyond the word level to the text, again in contrast to the research by Graham, McKeown et al. (2012).

Prompt 2 analysis. In similar fashion to the analysis for Prompt 1, I was hoping to examine whether the number or type of revisions made to the drafts predicted the final score for Prompt 2. Again, the sample size was insufficient to determine such relationships. I was able to examine correlations between the number of revisions students implemented in their writing and their overall Prompt 2 writing quality through a Pearson's correlation. I examined the correlation between initial draft rubric scores, total number of revisions, the increase in word count from draft to final product, and the final product rubric scores for Prompt 2 (see Table 4.10). A significant positive correlation emerged between the initial draft score and the final product score ($p < .001$). Another significant positive correlation emerged between the increase in word count and the final product rubric scores ($p < .01$). The total number of revisions did not significantly correlate with the final product score, but the correlation was positive. Again, the types of revision applied may be more important to writing quality than the quantity of revisions, but more samples are needed to determine the interaction between type of revision and final score. Thus, it appears that the increase in word count that occurred during the

Table 4.10

Summary of Pearson's Correlation for Prompt 2 Final Product Score (N = 21)

Variable	Pearson correlation with final score	<i>p</i>
Draft score	.804	.000**
Increase in word count	.567	.007**
Total number of revisions	.220	.338

** $p < .01$.

revision was more significant to the final product score than the number of revisions applied.

Prompt 2 teacher journal. In order to look more closely at the revision instruction and student writing time during the Prompt 2 segment, I analyzed the daily free-write teacher journal I had written during the protocol for codes and themes in the same manner as the Prompt 1 segment. Some themes emerged that were similar to those in Prompt 1, but there were also some new themes and some themes in Prompt 1 that were not identified in Prompt 2 (see Table 4.11).

Digital writing. In the teacher journal entries, I observed that digital writing positively influenced the revision protocol and writing workshop because of students' familiarity with the Google Docs app. However, I also noted that this familiarity was also a negative factor when some students would get distracted by the digital features (adding images, fixing spelling, changing formatting, etc.) during portions of the protocol when they were asked to work on revising their drafts' content. The other negative factor I noted in the journal regarding digital writing for Prompt 2 was the challenge to revising longer texts on the iPad. The drafts for Prompt 2 were on average twice as long as the drafts for Prompt 1, and the increased length made it difficult for some students to manipulate, scroll, and find the portions of the text they were changing.

Revision instruction. I noticed many themes for positive factors related to the revision instruction upon rereading my entries in the teacher journal. In several entries, I noted students' increased independence during the writing process, and increased independence utilizing informational text features in their writing, possibly due to the

Table 4.11

Codes and Themes from Prompt 1 and Prompt 2 Daily Teacher Journals

A priori code	Theme	Prompt 1 journal dates mentioned	Prompt 2 journal dates mentioned
Digital writing	Awareness of text	3/13	
	Tech prior knowledge	3/15	
		3/16	
		3/20	
	Closer look for research and data analysis	3/16	
	Fosters independence	3/20	
	Motivation and engagement	3/14	
		3/20	
	Technical issues	3/13	
		3/14	
		3/15	
		3/16	
	Familiarity with the app ^a		4/10
			4/11
Revision instruction	Longer texts ^a		4/12
	Engagement, excitement, and motivation	3/8	4/10
		3/12	4/9
		3/15	4/11
		3/19	4/16
		3/20	
	Mastering features and applying knowledge	3/9	3/28
		3/14	3/29
		3/20	3/30
			4/11
			4/16
	Prior knowledge	3/9	3/28
		3/13	3/29
		3/14	3/30
		3/15	4/11
		3/19	
	Needing more time	3/8	4/9
		3/12	4/16
		3/14	
	Students' ability/readiness level	3/8	3/28
			3/29
			4/11
			4/13
			4/16
	School schedule/logistical issues	3/8	
		3/13	
		3/14	
	Critical thinking ^a		3/28
			4/11
			4/13

^a Indicates new themes in Prompt 2 teacher journal entries

repetition of these features across prompts. On a related note, the students' prior knowledge was again a positive factor during Prompt 2. Another repeating theme during Prompt 2 was student motivation and engagement, not just during the digital writing portion of the Prompt but throughout the writing process.

A new positive theme that emerged during the Prompt 2 segment was the noticeable unprompted critical thinking done by the students. I observed that some students critiqued the trade books they were reading to research their topic prior to drafting, noting the authors' use of informational text features. Comments such as, "This book doesn't have a conclusion. It just goes to the glossary," and "Look at this sentence Mrs. J, it's not even expert talk!" were made by students while reading. Some students were critical about the facts and details on the class writing pieces being scientifically correct. While students were revising their writing with a peer on Day 7, some students helped others check their facts for correct scientific information, without any prompting or instruction from the teacher. As I read through the teacher journal during analysis, I thought critical independence was an interesting finding. I didn't connect the critical thinking of the students to the process we were doing during revision, but that is essentially what a writer is doing when he or she revises: thinking critically about the content of the writing based on its purpose.

The negative revision-related themes that emerged following the second round of the protocol were very similar to those during the Prompt 1 segment. These negative themes included students needing more time due to absences or other reasons, some students struggling to focus for the whole independent writing time, a lack of and/or

issues with prior knowledge, and students lacking independence with tasks or finding them very difficult. However, these issues pertained to relatively few students in the study.

Modifications for Prompt 3. Consistent with the framework of formative experiments, I again reviewed the data after the second iteration to make modifications to make progress toward the pedagogical goal. An examination of the students' writing scores and the teacher journal themes led me to make the following modifications for the implementation of the protocol for the last prompt:

1. Use the application Google Slides, instead of Google Docs, for the revision in 3. Move “adding visuals” to the editing phase of the protocol.
2. Extend the drafting phase by one additional day for a total of three.
3. Connect the writing project to an art project and report day for parents and peers to visit and see the students' work.
4. Spend less time in the mini-lesson, giving students more time to work on their writing independently. Add writing conferences for students who seek out teacher-help during independent writing time. This was in response to a few students wanting more guidance during independent writing time, but the majority of students were ready for less guided practice and more independent application.

Prompt 3. The third and final prompt read,

The kindergarten and first grade students at our school love to learn about wild animals! But they don't have much time in class to learn about them. Their teachers saw your amazing informational writing projects, and they would like our help making animal books with interesting and important information about different wild animals! Choose one wild animal to write a book about.

Prompt 3 drafts. The initial drafts of Prompt 3 had an overall mean word count of 176, and an overall mean score of 14.24 (out of 20; see Table 4.12). This placed the average student informational writing level for the drafts at the lower end of the “at

Table 4.12

Mean Scores and Word Count for Prompt 3 Drafts and Final Products

Measure	Draft	Final	Gains	<i>p</i> value	Significance
Word Count	176	289.52	113.52	$p < 0.000$	***
Focus	3.71	3.81	0.1	$p < 0.329$	
Content	3.19	3.33	0.14	$p < 0.267$	
Organization	2.095	3.9	1.805	$p < 0.000$	***
Style	2.81	3	0.19	$p < 0.104$	
Conventions	2.43	3.19	0.76	$p < 0.000$	***
Total Score	14.24	17.23	2.99	$p < 0.000$	***

*** $p > .001$.

benchmark” category on the standards-based rubric used for scoring. The scores on the drafts for the third prompt had a range of 6 to 19, which was larger than the range for Prompt 1 (8 – 17) and Prompt 2 drafts (10 – 17). Comparing the draft scores from Prompt 3 to the draft scores for Prompt 2 showed that the students started out with slightly less quality text on average. However, it continued to show a transfer and application of knowledge learned from the revision instruction during the previous two iterations. The slightly lower mean score may be partially attributed to the fact that Prompt 3 asked for a longer product (report) than the first two prompts. The mean word count for Prompt 3 drafts was 176, in comparison to 107.95 words for Prompt 2 drafts (63% growth) and 48.62 words for Prompt 1 (261.99% growth). There was also a 25.89% word count growth from Prompt 2 final products to Prompt 3 drafts. This large growth could be influenced by students having an additional day for drafting, and the product that Prompt 3 asked students to create. The large growth in word count from Prompt 2 to Prompt 3

responses also indicates greater writing fluency and competency at this point in the study.

Students were assuming identities of writers who write and who are willing to revise.

After scoring the drafts with the same rubric that was used to score both of the previous samples, I calculated the mean for each category. The highest scoring category for the initial draft for Prompt 3 was Focus, with a mean of 3.71. The lowest scoring category was Organization, with a mean of 2.09. The Conventions category had a mean score of 2.43, Style had a mean of 2.81, and Content had a mean of 3.19. (see Table 4.12). The categories Focus, Style, and Content had slightly higher mean scores on Prompt 3 drafts than they did on the Prompt 2 drafts. The categories Organization and Conventions had slightly lower scores on the Prompt 3 draft than the Prompt 2 draft. It appears that on Prompt 3 drafts, the students were able to write slightly more focused content, but organization and conventions suffered slightly. Perhaps this was due to the nature of the prompt, asking for much more information about the topic. In an effort to write more extensively, the organization and conventions could be less of priority to students. None of the categories had a higher mean score on the Prompt 3 draft than the Prompt 2 final product.

Modification to the protocol to add an additional day for drafting positively influenced students' writing productivity, as demonstrated by the high word count and increased quality of focused content within the writing. Interestingly, this modification did not correspond with overall writing quality of the students' Prompt 3 drafts. This shows that writing productivity is not the only factor important to writing quality.

Prompt 3 final products. After the revision phase of the protocol, I collected and

scored students' final products, using the same rubric used to score the drafts. The final products for the Prompt 3 had an overall mean word count of 289.52, and an overall mean score of 17.23 (out of 20). This places the average student informational writing level for the final products in low end of the "above benchmark" category on the standards-based rubric used for scoring. The scores on the third prompt final product had a range of 14 to 20. The mean for each category on the rubric was also calculated. Each category has a highest possible point value of 4, and the highest scoring category for the final product was Organization, with a mean of 3.9. The lowest scoring category was Style, with a mean of 3 points. The other three categories all had mean scores above 3 (at benchmark) with Conventions at 3.19, Content at 3.33, and Focus at 3.81 points. See Figure 4.11 for a comparison for each student's scores from draft to final product for Prompt 3. All students in the study showed improvement from draft to final score for Prompt 3, with a range of 1-8 points overall improvement. While there were four students

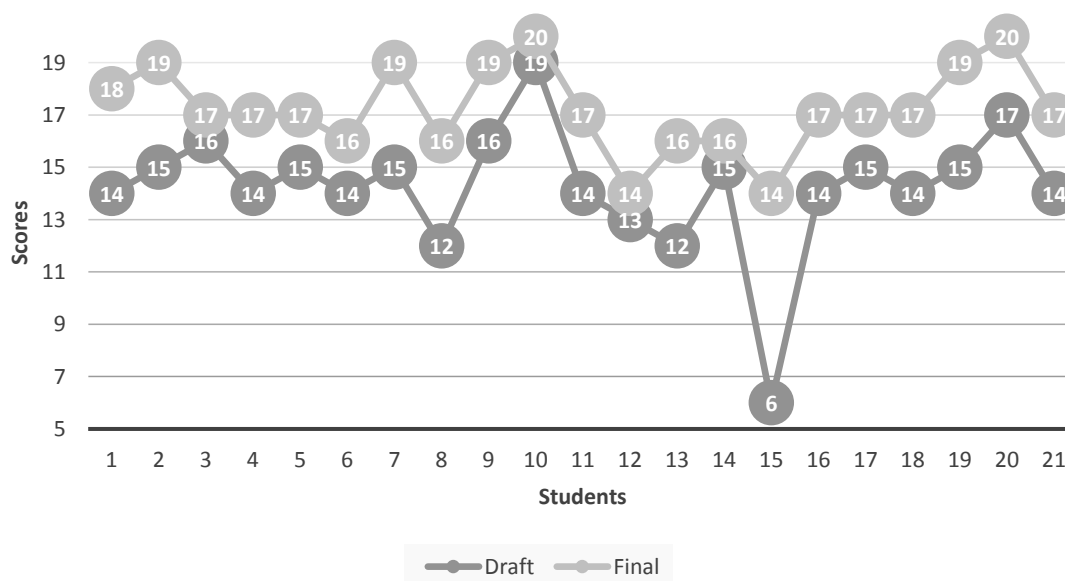


Figure 4.11. Student overall scores from initial drafts and final products for Prompt 3.

who scored below benchmark on the initial draft, all were at or above benchmark on the final draft. The revision instruction was able to help all students make the gains to reach an expected level of writing quality. After accounting for the word count and rubric scores for initial drafts and final products, a paired t-test was calculated to determine if the gains from draft to final product were significant (see Table 4.12). With the p value for significance at $p < .05$, the mean gains for word count, two categories on the rubric (Organization and Conventions), and the overall rubric score all were statistically significant. The word count had a percentage growth of 64.5% from draft to final product. The categories of Focus, Content, and Style did not have significant gains for Prompt 3, but were all relatively high on the initial drafts.

Prompt 3 revision. After students completed their written drafts for Prompt 3, all students made revisions on some level to their text during the revision portion of the protocol (days 4-7 for each prompt). The mean amount of revisions made for Prompt 3 was 22 changes, with a range of 14 to 36. These included changes on the word level, phrase level, sentence level, and/or organizational level. The most often implemented type of revision for Prompt 3 was sentence-level changes, with an average of 13.38 sentence-level revisions for each student. The least often implemented type of revision for Prompt 3 was phrase-level changes, with an average of 2.64 phrase-level revisions for each student (see Table 4.13). Overall, students made more revisions during the third round than they did for Prompt 1 or 2. Students made about the same number of word level changes for Prompt 3 with slightly fewer phrase-level changes, many more sentence-level changes, and more organizational changes. Again, students made revisions

Table 4.13

Means for Each Type of Revision Implemented for Prompt 3

Type of revision	Example	Mean for Prompt 3
Word level	Changes, additions, deletions of individual words	3.46
Phrase level	Additions, deletions, combinations of phrases (more than one word, but not a full sentence)	2.64
Sentence level	Additions, deletions, combinations of sentences	13.38
Organizational	Rearranging sentences, paragraphs, adding headings	4.95
Total		22

beyond the word level to the text, in contrast to previous research with elementary writers, with a noticeable increase in organizational-level changes.

Prompt 3 analysis. The sample size for Prompt 3 responses was again insufficient to determine if the number or type of revisions made to the drafts predicted the final score. I was able to examine correlations between the number of revisions students implemented in their writing and their overall Prompt 3 writing quality through a Pearson's correlation. I examined the correlation between initial draft rubric scores, total number of revisions, the increase in word count from draft to final product, and the final product rubric scores for Prompt 3 (see Table 4.14). A significant positive correlation emerged between the initial draft score and the final product score ($p < .001$). Another significant positive correlation emerged between the increase in word count and the final product rubric scores ($p < .05$). The total number of revisions did not significantly correlate with the final product score, but the correlation was positive. Thus, it appears that again the increase in word count that occurred during the revision was more significant to the final product score than the number of revisions applied.

Table 4.14

Summary of Pearson's Correlation for Prompt 3 Final Product Score (N = 21)

Variable	Pearson correlation with final score	<i>p</i>
Draft score	.768	.000**
Increase in word count	.455	.038*
Total number of revisions	-.054	.816

* $p < .05$

** $p < .001$

Prompt 3 teacher journal. In order to look more closely at the revision instruction and student writing time during the Prompt 3 segment, I analyzed the daily free-write teacher journal for codes and themes in the same manner as I did for Prompts 1 and 2. Some themes emerged that were similar to those in Prompts 1 and 2, but there were also some new themes and some themes in Prompt 3 that were not identified previously. These themes that were new to the journal entries during Prompt 3 are marked in Table 4.15 with a superscript letter “a.”

Digital writing. In the teacher journal, I recorded that digital writing positively influenced the revision protocol and writing workshop through students being able to easily manipulate the text during revision and the ability to add visuals and images. The switch of applications to Google Slides made for an easier manipulation of the text across pages, lending itself well to the longer products. The lack of technological proficiency that was identified in Prompt 1 was again noted in Prompt 3, with some students being slow and inefficient at keyboarding. This is likely due to their lack of keyboarding knowledge, and that keyboarding instruction was not a component of the classroom writing instruction. Another negative factor surrounding digital writing was the

Table 4.15

Codes and Themes from Prompt 1, 2, and 3 Daily Teacher Journals

A priori code	Theme	Prompt 1 journal dates mentioned	Prompt 2 journal dates mentioned	Prompt 3 journal dates mentioned
Digital writing	Awareness of text	3/13		
	Technology prior	3/15		5/1
	knowledge &	3/16		
	proficiency	3/20		
	Closer look for	3/16		
	research and data			
	analysis			
	Fosters independence	3/20		
	Motivation and	3/14		
	engagement	3/20		
	Technical issues	3/13		
		3/14		
		3/15		
		3/16		
Revision instruction	Familiarity with the		4/10	5/1
	app, technological		4/11	5/2
	helps		4/12	5/3
	Longer texts		4/10	
	Sloppy handwriting ^a			4/26
	Engagement,	3/8	4/9	4/23
	excitement, and	3/12	4/11	4/24
	motivation	3/15	4/16	5/2
		3/19		
		3/20		
	Mastering features	3/9	3/28	4/23
	and applying	3/14	3/29	5/2
	knowledge	3/20	3/30	
			4/11	
	Prior knowledge	3/9	3/28	5/1
		3/13	3/29	
		3/14	3/30	
		3/15	4/11	
		3/19		
	Needing more time	3/8	4/9	5/2
		3/12	4/16	
		3/14		

(table continues)

A priori code	Theme	Prompt 1 journal dates mentioned	Prompt 2 journal dates mentioned	Prompt 3 journal dates mentioned
Revision instruction (continued)	Students' ability/readiness level	3/8	3/28	5/3
			3/29	
			4/11	
			4/13	
			4/16	
	School schedule/logistical issues	3/8 3/13 3/14		
	Critical thinking		3/28	
			4/11	
			4/13	
	Influencing teacher practice ^a			4/23
	Student confidence and independence ^a			4/24
				4/26
	Focus and productivity ^a			4/25
				4/27
				4/30
				5/2
				5/3

^a Indicates new themes in Prompt 2 teacher journal entries

observation I noted that some students' handwriting for the drafts and prewriting was very sloppy.

Revision instruction. Many themes for positive factors related to the revision instruction emerged from my notes in the teacher journal. Students continued to demonstrate an awareness of informational text features, express an excitement for learning and writing, benefit from prior knowledge, and gain independence and confidence with revision and the writing process. I described in the journal that students generally had high levels of focus and productivity, implemented a large number of revisions, and that I had a feeling of improvement in my teacher practice. Because I was going through cycles of instruction all focused on the same genre and genre features, I felt like I was able to refine and improve instruction over each iteration.

The negative themes that emerged related to revision instruction were very similar to those identified in the journal entries during the previous two iterations, such as students needing more time, a lack of or resistance to generating text by some students, and a focus on editing rather than revising during the peer-revision portion of the protocol.

Enhancing and Inhibiting Factors

In the previous section, I described the themes specific to each prompt that were identified in the daily teacher journal. In addition to the daily open-ended journal entry, I also recorded six structured journal entries, at the mid-point and final point of each iteration of the revision protocol. This next section will look at common themes across the three iterations, as identified from the six structured journal entries. These themes can provide insight into Formative Experiment Framework question four: What factors are enhancing and inhibiting the effectiveness, efficiency, and appeal of the revision instruction in regard to improving student revisions?

To analyze the structured-teacher-journal entries, I first read each entry to get a general sense of the data. Then, I read each entry a second time and coded any comments that could be perceived as a contributing factor to either enhancing or inhibiting the effectiveness, efficiency, and/or appeal of the protocol at working toward meeting the pedagogical goal (Reinking & Bradley, 2008). After completing the coding for each of the six journal entries, I compiled the comments that were identified as enhancing factors and looked for themes in the data. I repeated this process for the inhibiting factors.

Through this analysis, the perceived enhancing and inhibiting factors were compiled into three themes: revision instruction, digital writing, and teacher decisions.

Enhancing Factors

Revision instruction. Through analysis of the teacher journal, I identified several enhancing factors that related to the design and implementation of the revision instruction itself throughout the project. These factors include: explicit revision instruction, GRR, the cycles of instruction, authentic tasks with student choice, and peer collaboration.

Explicit Revision Instruction. Each daily focus of revision was a feature of science informational text—stating the main idea of the text, organizing the text with sub-topics, using descriptive details, writing with “expert talk,” incorporating specific vocabulary and definitions, and including visuals such as photographs. In a few journal entries, I read descriptions of how the feature-by-feature format of revision instruction in this study was freeing to me as the teacher because it spread out the features of informational text into pieces that were implemented day by day. For example,

As a teacher, not having the pressure to teach the students everything I want them to do in their writing before or during the DRAFTING stage [is enhancing the effectiveness of the revision instruction]. For example, getting the kids to use specific vocabulary words, or organize their paragraphs. It’s somewhat freeing to be able to really hit that hard during the REVISION stage. (Teacher Journal, April 27)

One factor that I perceived to have enhanced the effectiveness of the revision instruction was the inclusion of explicit revision instruction being released to the students, as noted in the following excerpt:

Breaking down the revision process into daily pieces, with a specific focus for each day, has really helped my students apply the revision to their writing. Instead

of, 'here's a rubric with five things to check your writing for,' it's one thing for each day. I am seeing the students apply it immediately to their writing. (Teacher Journal, March 16)

The benefit of explicit revision instruction was referred to frequently in my journal entries during all three rounds of writing and revision. "Again, breaking the revision [process] into specific small pieces to look at each day has really helped the students access revision in a manageable, accessible way" (Teacher Journal, April 27).

Within the writing protocol, the revision process was continued across multiple days. This factor was identified in the teacher journal as one that I perceived to have enhanced the effectiveness of said protocol. The students were provided with more opportunities to revise, and did not miss out on the entire revision period if they were absent or less focused for a day.

Even if a student was absent one day, he or she could continue to revise the next day and just jump in where we were at. When revision is only a one-day thing, if the student is absent that day and misses the lesson and writing time, it makes it difficult to reteach and make that up. Doing revision multiple days meant that students could revise, even if they weren't at school every single day during the protocol. (Teacher Journal, March 23)

Gradual release of responsibility. Another factor that I deemed to have enhanced the revision instruction by making it more accessible to students was the GRR provided within each day's lesson and subsequent writing time. Teacher journal comments at the end of the first prompt related to the enhancing nature of this factor. "I noticed they implemented a LOT of the topics of the revision lessons I had taught..., students were adding more specific vocabulary, adding more details, using definitions, etc." (Teacher Journal, March 23). Being able to understand and apply the instruction seemingly boosted their confidence, which heightened the appeal of the protocol. This increased confidence

was clearly noticed during writing for Prompt 3, as demonstrated by this comment from the final structured journal entry. “I think the students’ confidence in writing has really blossomed throughout this project. That confidence and belief that they CAN write in this genre has really helped their motivation and excited them about the prompts as well” (Teacher Journal, April 27).

Cycles of instruction. The cyclical nature of the revision instruction, with three writing prompts focused on the same genre, offered many opportunities for students to engage with their writing and the different features of science informational text. Students’ familiarity with the content was mentioned in the journal entry at the end of Prompt 2.

The students are also more familiar with some of the concepts and genre features we revised. For example, revising for specific vocabulary and definitions went a LOT smoother this time. The students were grasping the concept immediately and remembering how to apply it. (Teacher Journal, April 11)

As the teacher, I perceived that teaching the same features and genre multiple times, using a similar instructional process, also improved my familiarity and skill at delivering the instruction in an effective manner, as noted in the following comment.

Teaching the same genre for 3 prompts in a row, using a similar process, has helped me as a teacher be much more familiar with what I am doing. I think it has helped the students to have a routine as well. I often hear [the students] making comments about what is coming next and what we are working on today/yesterday/tomorrow. (Teacher Journal, April 27)

Authentic tasks with student choice. In the teacher journal, using an “authentic task” as the prompt that students were responding to in their writing was a factor that seemed to enhance the effectiveness of the writing protocol. “The students could think about the real-life audience who would read their writing, and we could reference back to

questions like, ‘What else would a visitor to the petting zoo want to know about this animal?’ rather than just ‘What else could you write?’” (Teacher Journal, March 23). The authenticity of the writing tasks also seemed to enhance the appeal of the writing project, as noted in another journal entry.

Several students have made comments about how cool it is that we are making posters to actually hang in a planetarium in SLC. A few students have been to the planetarium. I am seeing the validity and benefit of making the writing prompts have “authentic” purposes and audiences! (Teacher Journal, April 11)

The students were able to choose the specific topic they wrote about for each prompt. I perceived student choice of topics as an enhancing factor “because each student has different background knowledge so they could pick one they were familiar with” (Teacher Journal, March 23). Choosing a topic that students’ have background knowledge for is an important influencing factor for revision and writing instruction (DeGroff, 1987). The accessibility and effectiveness of the revision instruction may have also been enhanced by students’ prior knowledge with writing informational text. Writing informational text was taught on a basic level earlier in the school year as part of the class curriculum. As stated in a journal entry, my perception as a teacher was that “The background knowledge the students already have, from units and material earlier this year (like what a glossary is, informational paragraph structure, etc.) really has helped us extend and work on revision more effectively” (Teacher Journal, May 4).

Peer collaboration. Another factor that appeared to increase the appeal of the writing projects, as reported in the teacher journal, was including the opportunity for students to work with peers. They were able to work with peers during the mini-lessons as part of the guided practice section, as well as share their writing at the end of each

writing session. Almost every student wanted to share something at the end of the writing time, so they had to take turns.

Students love to talk about their writing, so I made sure to have them share with a partner when independent writing time was over. What they shared was their choice. I did give them some suggestions – they could 1) read their writing to the partner and ask for suggestions, 2) tell them what they revised that day, or 3) talk about what they were going to work on next time. (Teacher Journal, April 27)

Also mentioned in the journal entries was that collaboration also seemed to enhance the learning by giving students the opportunity to practice the skills and features with access to reinforcement from a partner before they were asked to do it on their own (Teacher Journal, May 4). During the guided practice portion of the mini-lesson, responsibility for creating and revising the class writing pieces was gradually released responsibility across all three prompts. For the first prompt, the class writing piece was about half teacher-modeled and teacher-directed, and half student-directed. By the third prompt, the majority of the class writing piece was successfully written by the students, needing only minimal teacher guidance.

Digital writing. Another theme that emerged from the structured teacher journal entries included factors related to digital writing that enhanced the effectiveness, efficiency, and appeal of the protocol during the revising and editing stages of the writing process. The factors in this category are: motivation and engagement, revision without ruining, and familiarity and functionality of applications.

Motivation and engagement. As recorded in the teacher journal, using digital writing while revising—rather than simply a publishing tool—heightened students’ motivation to write and revise. Multiple entries in the teacher journal entries mentioned

that using iPads during revision seemed to enhance the appeal of revision and of writing in general for the students, such as this comment recorded from a student— “I’m done with my text, but I don’t want to be done! It’s so much fun writing on the iPad!” (Teacher Journal, March 23) and this teacher reflection on the subject.

The students...really enjoyed being able to search for real photographs and add those to their writing to make it look even more professional and realistic. They were extremely excited that I printed a second color copy for them to take home, in addition to the copies I printed to send to the petting zoo. (Teacher Journal, March 23)

Being able to format their writing so it looked “professional,” also seemed to enhance the appeal for students.

After students were finished with their entire poster and had edited, I showed them how to change the color / font / size of their headings and title. They really liked being able to do that and format their posters in the way they wanted. A couple students who were working a little unfocused / slow picked up the pace when they saw some students getting their printed poster! Seeing it in hard copy and being able to take a copy home was a motivating factor at the end. (Teacher Journal, April 17)

The increased appeal from the technology seemed to multiply when students expressed their enjoyment of writing to their peers. Students appeared engaged and to be enjoying the process, and this high level of engagement seemed to result in students being productive writers, as described in the journal entries.

Students being excited about their writing projects is spreading around the classroom. One boy told me this past week that he was more excited about doing writing than he was about going to recess. Other kids overheard and verbally agreed that writing was “so much fun.” When the students are excited and have a good attitude about it, it’s easier to convince them to work hard! (Teacher Journal, April 11)

Revision without ‘ruining.’ Using an iPad to revise made the task of transcription less daunting. One comment in the teacher journal stated, “The ease of transcription on

the iPad seems to free up their cognitive resources to actually revise, and they aren't [worried about] 'ruining' their own handwriting" (Teacher Journal, May 4) such as with paper-pencil revising. During the protocol, there were multiple opportunities to teach students how to use the technology to make their revisions efficient. One recorded example of this states, "I gave the whole class a brief lesson on how to "cut and paste" text within their document on the iPad after several students asked for help with it. That seemed to free them up for more revisions" (Teacher Journal, May 4). Also noted in the teacher journal was that "not only is using tech really fun and engaging, but also seems to let students have the freedom to make changes and not stress about if it's going to "ruin" their writing. They can add the text anywhere (beginning, middle, end) and everything else just adjusts" (Teacher Journal, March 23).

Familiarity and functionality of applications. Within the theme of digital writing, another factor that enhanced the efficiency of revision was using an application that the students were already familiar with (Google Docs). The students were not distracted from their writing as much as they were when they were using the first application (Explain Everything), and were able to become comfortable using the Google Docs to revise (see Teacher Journal, April 11). Once students had experienced the logistics of Google Docs during the first prompt, using Google Docs for the second prompt and Google Slides for the third prompt enhanced the efficiency of the instruction. They did not have to learn the logistics for each prompt and could focus their attention on the revision process and even extend their knowledge. This extension was described in the journal entry from April 11 by the following statement. "Students had already gone

through the logistics of adding visuals to their writing, so this time we could go beyond that. I taught students to select images that aligned with their written words, and then add a caption to each visual.”

Teacher decisions. Through analysis of the structured teacher journal entries, I found that some teacher decisions during prompts, outside of the outlined revision protocol, enhanced the effectiveness, efficiency, and appeal of the protocol. There were a few factors within this theme of teacher decisions, namely providing resources, providing individualized support, and increasing engagement.

Providing resources. One journal entry described that bringing in books on the topics the students were writing about and allowing them to read the books prior to and during the planning phase was helpful for the students. The students would “look through [the books] to confirm facts they knew, answer questions they had, or help them identify additional [information] to include in their writing” (Teacher Journal, March 23).

Providing students with resources such as books and anchor charts seemed to enhance the effectiveness and efficiency of their writing because the students were able to find the information they needed in a timely manner. They could focus their time and efforts on writing and revising, rather than searching for the resources they needed. The books were not available during the drafting days, to prevent over-reliance or copying. Anchor charts (see Appendix I for examples) seemed to help students be more efficient in the writing process, as described in this comment.

I provided [the students] with an anchor chart that had space vocabulary for day 5 this time, which saved a lot of time for the students. They didn’t have to look up many definitions on the online dictionary and could refer to the anchor chart first and then spend more time actually writing in the vocabulary and/or definitions.

(Teacher Journal, April 11)

Some of the resources that students could use were created with teacher support during the mini-lessons, such as the headings list for Prompt 3. “We came up with the guiding subtopics (headings) together as a class for their animal books. That way the students could spend their time working on the content within each section, instead of stewing about what each section should be about” (Teacher Journal, April 27).

Providing individualized support. During the instruction for the Prompt 3, writing conferences were available for students who wanted additional guidance during the independent writing time. This was a modification to the protocol for Prompt 3 only. As recorded in the journal, these writing conferences seemed to be helpful to making the instruction more personalized and specific to those students who felt stuck. In a traditional writing workshop, conferences with students are part of the workshop. However, in this study I purposefully did not include conferences in the protocol to begin with so that I would be able more fully observe the students while they wrote independently as a researcher. Out of the 21 students included in the study, five students took advantage of the opportunity to meet in an individual writing conference.

Adding writing conferences really helped a few students this week. They needed a little more guided practice than what was built into the mini lesson, with their text specifically. During the writing conferences, I mostly just asked the students questions to get them thinking and let them do the revision and work. (Teacher Journal, May 4)

Increasing engagement. Toward the end of the protocol, during the tedious work of revising Prompt 3 drafts, I noted in the journal that some students were struggling to stay focused and motivated to work productively. Telling students that they would be

integrating an art project to make habitat dioramas of their animals seemed to reignite their focus to continue their hard work.

I ended up adding a habitat diorama art project when we got to the day to add visuals. I had told the students about this project when we started revising, so they could work hard and look forward to it. It seemed to motivate them to apply their learning and work hard so that they would be ready to do the art project with us. (Teacher Journal, May 4)

One other factor during Prompt 3 that seemed to keep students engaged as they began the last month of school and were feeling a sense of burn-out was to explain that they would host an animal report day in the classroom where parents and other students could come see their hard work. In the last journal entry, a reflection described how looking forward to the animal report day was a boost the students needed, and it was a motivating factor in the majority of students continuing to do their best work and finish strong (Teacher Journal, May 4).

In summary, some enhancing factors that emerged from the structured teacher journal entries related to revision instruction. These enhancing factors included: scaffolding of revision, GRR, the cycles of instruction, authentic tasks with student choice, and peer collaboration. Enhancing factors also related to digital writing, including motivation and engagement, revision without ruining, and familiarity and functionality of applications.

Inhibiting Factors

Through analysis of the structured teacher journal entries, I identified three themes for the factors that appeared to inhibit the effectiveness, efficiency, and appeal of the revision instruction in regard to improving student revisions and overall writing

quality. These inhibiting factors fell within the three themes: revision instruction, digital writing, and school-related factors.

Revision instruction. In the structured teacher journal entries, I identified some factors regarding the revision instruction itself that seemed to inhibit the effectiveness, efficiency, and appeal of the writing instruction and student revisions across prompts. These factors were: issues with prior knowledge, repeated cycles of instruction, and issues with peer collaboration.

Prior knowledge issues. This protocol took place during the last trimester of the school year. Consequently, there was some prior knowledge that was assumed of students from my teaching earlier in the school year. This was not always the case. During the instruction for Prompt 1, there were comments in the teacher journal about needing to spend time giving students a review on some concepts like, “writing a main idea sentence” and “what an adjective is” (Teacher Journal, March 16). During Prompt 2, students did not have a large amount of prior knowledge related to the topic of the prompt (objects in space). This small amount of background knowledge meant students had to spend more time researching before they could write accurately, as explained in the teacher journal.

[The students] don’t have a lot of background knowledge about [space]. We didn’t cover planets in depth during our science units this year. We did learn about the moon and stars, but not more than that. The students easily chose a topic for their poster but had to do a little more research to learn about their planet/object. A couple of students did not [read] the provided books [thoroughly] and there are definitely a few scientific misconceptions/factual errors in their writing. (Teacher Journal, March 23)

In the initial revision-instruction protocol followed during Prompt 1, organization

was only stressed during the revision portion of the protocol. The students had been exposed to informational text organization earlier in the school year, but many did not remember and/or apply that knowledge to their initial drafts for Prompt 1. Explained in the teacher journal was the thought that addressing organization only in the revision stage was not the most effective way to teach organization. The lack of organization while students were revising, and trying to organize all of the information from their entire draft after it was already on the page, seemed to be an inhibiting factor to the effectiveness and efficiency of the instructional design.

Cycles of instruction. As evident from the quantitative data from Prompts 1 and 2, students significantly increased their writing productivity and quality across prompts. The writing protocol was designed to scaffold students to be more independent and productive throughout the repeated cycles of instruction. The product required in response to Prompt 3 was more complex of a product than either of the previous two products students had created during this project. This increased complexity caused anxious feelings from a few students when they realized what they were being asked to do for Prompt 3. “The magnitude of this writing project is a little bit overwhelming for [a few students].... I can tell [they are] stressed and turned off by the amount of writing I am asking them to do” (Teacher Journal, April 27)

Task complexity can be a motivating factor to some students, but it may have inhibited the effectiveness of some of the writing at times, or for some students. The quantity of text in the product for the third prompt also inhibited the quality and depth of the revisions. My journal noted that the length of responses for Prompt 3 “made it more

difficult to go as deep with the revisions. During the mini-lessons, the students did a lot of the revisions of the class draft in pairs. I did model briefly each day, but I know the class draft (and the students' drafts) could've used more improvements. Due to the quantity of text and the time constraints, I feel like we sacrificed a little bit of the quality of the revisions" (Teacher Journal, May 4).

Peer collaboration issues. One of the revision days included peer revision. Each student was assigned a partner, and given instructions on how to work together to help each other with their revisions. During Prompt 1, students were assigned partners based on their initial draft scores, with partners in pairs having similar scores. During Prompt 2, students were partnered based on who was sitting next to them already, in an effort to be efficient because I did not have a chance to assign partners prior to writing time that particular day. However, this method of partnering students may have inhibited the effectiveness of the peer revision. "Partnering the students up by convenience was not the most effective, even though it was efficient. Some of the students spent the whole time working on one student's writing, and some others were unfocused or told each other their writing was 'perfect' and they didn't need to change anything" (Teacher Journal, April 27). Other students became very "fascinated with the animal facts they are learning and wanting to share them... that has taken up some of their [peer revising] time" (Teacher Journal, April 27).

Digital writing. In the structured teacher journal entries, I identified some factors regarding the theme of digital writing that appeared to inhibit the effectiveness, efficiency, and appeal of the writing instruction and student revisions. These factors

were: technological issues, lack of technological proficiency, and technological distractions.

Technological issues. Technological issues and frustrations seemed to be an inhibiting factor during the first prompt. In order to understand some of the technological issues, I will first present some background on the applications in use for the study. The application that was initially planned to use for this study, Explain Everything, had some unforeseen limits when put into use with the students. This application saved student projects as mp4 video files, recording every change the students made to their written project. The purpose for these video files in the data collection process was the plan that they would help analyze the types and quantity of revisions students were applying to their writing, by watching the playback and recording the revisions. The application uses a cloud server, but did not have live cloud streaming. Every file had to be saved locally on the iPad before it was uploaded to the cloud, and then downloaded locally again before any continued work could be done. Using this application with 20+ students all recording their work, for 30-40 minutes each day for 4 days, led to large video file size that the classroom iPads were not capable of processing. This memory overload caused the application to freeze, crash, and not save student work. Students were understandably frustrated with the issues, and it was starting to completely prevent them from doing the work of revision on their writing projects. Trying to solve trouble with the application took valuable time and attention away from the writing instruction, and inhibited students being able to apply their revisions, as described in the following comment from the teacher journal. “I had a couple days where [I] was spending more time being tech

support than being a writing teacher” (Teacher Journal, March 16). The decision was made to switch to a different application, Google Docs, and utilize the version history feature to do the revision analysis. Throughout the other two prompts while using Google Docs, there were not as many technological issues, but they did happen occasionally, such as students were not being able to log in on the device, the devices losing battery life quickly, and the application not syncing immediately with the cloud.

Lack of technological proficiency. Students with low levels of proficiency with keyboarding seemed to be an inhibiting factor to their productivity during this project. They had computer instruction/practice for 30 minutes once a week throughout the school year, but students reported that during this time they only typed a few spelling words and then had free time to play games online. The computer teacher did not teach keyboarding to students in grades K-2, a lot of students were not familiar with the keyboard at the beginning of second grade. Prior to beginning the writing protocol, students had used the Google Docs application to type a few other writing assignments as “publishing,” so they did have a little bit of experience with the application and typing on the iPads. Described in the teacher journal is the observation that the majority of the students were still very slow at typing, especially during Prompt 1. “Some students are really slow at typing. I know they could write more quickly if they were handwriting at this point” (Teacher Journal, March 16). Even by the end of Prompt 3, there were still comments in the teacher journal about a few of the students’ lack of proficiency with technology as a writing tool, and how it inhibited their writing productivity. There were four students who especially struggled with technological proficiency across all three prompts.

Students who lack keyboarding skills/technology skills definitely go slower than others. That can hold them back and frustrate them at times. Then they get distracted by the tech issues instead of focusing on the content. Most of the students do great with the iPads [at this point], but a handful still struggle. (Teacher Journal, May 4)

Technological distractions. When students were working on Prompts 2 and 3, comments in the teacher journal indicated that using the editing and formatting features of the application were sometimes a distraction from the actual work of revision. Some students wanted to fix spelling errors on the first day of revising, so spell check features were turned off until the editing day. The students knew how to add images and change formatting after doing it during Prompt 1, and some started to do that right away on the other two prompts rather than revising the text. However, the distractions of the other applications and functions of the iPad unrelated to Google Docs and the writing project did not prove to distract students. The students were consistent about staying focused on their writing while using the iPad, even if it was jumping to editing and formatting before they received those instructions.

School-related factors. Within the structured teacher journal entries, I identified factors that were general school-related issues but were noted that they may have inhibited the effectiveness, efficiency, and appeal of the writing protocol across prompts. These factors were: absenteeism, attitudes about school, and scheduling.

Absenteeism. “More students have been absent for this prompt than the other two... One girl was gone for over a week and had to rush to catch up when she got back” (Teacher Journal, April 27). As many classroom teachers likely experience, when students are absent it is a struggle to get them “caught up” on work that they missed. This

project was no exception. Several students were absent for a day or two up to a week or more during this project. Described in the teacher journal is the observation that it was difficult to teach students who had been absent the specific features we had worked on while they were gone, and find the time in the richly scheduled school day for them to work on their writing.

Attitudes about school. Because this project was done in an authentic classroom, it was not exempt from common inhibiting factors to student success in school such as intermittent lack of interest, lack of motivation, absenteeism, distracting behavior, and scheduling. Some of these factors that may have inhibited this particular writing protocol were noted in the teacher journal.

There are a few students who struggle with motivation in writing in general, or with motivation about school altogether. Also, the normal school things we face like students being absent, having to go to the restroom, behavior issues, scheduling conflicts, etc. Those can definitely inhibit the effectiveness of the writing and revision protocol at times. (Teacher Journal, March 23)

Also mentioned in that same entry was that the iPads seemed to increase the appeal for struggling writers, but that “some really struggle with the drafting and prewriting because that involves paper-pencil writing” This, in turn, may have inhibited their revisions because “students who didn’t have a whole lot written on their draft still didn’t have a significant amount of writing even after it was typed and they revised, because they had less to start with” (Teacher Journal, March 23). Some students started to have a “task completion” mindset during Prompt 3, not wanting to revise as much because they “just want to get it done” (Teacher Journal, April 27). Perhaps Prompt 3 was on the high edge of the threshold for writing tasks among young writers.

Scheduling. Noted in the teacher journal were comments that there were a few times during the protocol that the time of day for writing instruction had to be adjusted. This was typically due to school assemblies, iPads being needed by other classes, or other things outside of the control of the classroom. It would be very complicated and difficult to measure the influence of these school-related factors on the writing instruction, but comments in the teacher journal indicate how much these changes could take away from the effectiveness or efficiency when students had to adjust to interruptions and schedule changes. Half of the protocol was completed during the time in the school year calendar (after spring break until the last week) that the majority of teachers and parents expect that pushing kids to do anything academic will more difficult than earlier in the school year. There was definitely a struggle to stay focused with some students toward the end of Prompt 3, as described in the teacher journal.

I have noticed this time of the year is really a struggle with getting the kids to stay focused with anything. I think they would do better work if I had started just a couple weeks earlier. I wondered if they are really getting burned out of writing informational text with no other genres mixed in (I usually change up the units and don't do 3 straight informational prompts), but a sense of burn out and lack of focus is typical every year no matter what we are working on after spring break. Teacher Journal, May 4).

In summary, the factors that may have inhibited the effectiveness, efficiency, and appeal of the revision protocol were related to revision instruction, digital writing, and school-related factors. More specifically, these inhibiting factors included: issues with prior knowledge, repeated cycles of instruction, issues with peer collaboration, technological issues, lack of technological proficiency, technological distractions, absenteeism, attitudes about school, and scheduling.

Research Questions

Guiding this study, in addition to the pedagogical goals, were two research questions.

1. How can the use of digital writing support revision of informational text?
2. How does revision instruction and subsequent student revision influence overall writing quality of informational text?

I will now present further data analysis to answer these research questions.

Research Question #1

Research question #1 asked, *“How can the use of digital writing support revision of informational text?”* As I presented previously, the students were able to implement different levels and amounts of revision to their informational texts during the writing protocol (see Table 4.16). There was no control group in this study to compare results with if students did not use digital writing, while receiving the same revision instruction. However, the numbers and type of revisions that the students were using in this study were definitely contrary to previous research on this subject (see Table 4.16). In my nine years of experience implementing writing instruction and revision with young elementary students, I have observed similar findings to those reported in writing research. That is,

Table 4.16

Mean Number of Each Type of Revision for all Three Prompts

Heading	Prompt 1	Prompt 2	Prompt 3
Word level	1.62	2.48	2.14
Phrase level	5.38	2.90	1.76
Sentence level	4.14	4.76	13.38
Organizational level	2.81	0.43	4.71
Total revisions	13.95	10.57	22.00

young writers do not often revise. They do not often want to change their original drafts, typically add anything new at the end of the writing piece where they have extra room, and generally make only a couple changes to their writing for the sake of saying they “revised.” In this formative experiment using technology to make revisions, second-grade writers did make varying amounts and types of revisions in response to three different prompts (as shown in Table 4.16).

In my observations during this study and the examination of the quantitative revision data, there is substantiation that using digital writing minimized several of the challenges early writers face when revising their writing. First, using digital writing for the purpose of revising ostensibly heightened the motivation for students to actually revise (see Figure 4.12 for examples of digital student revisions). They were excited to use the iPad and wanted to make changes rather than worrying about their writing getting “ruined” or seeing the task of revision as more tedious transcription work. Second, the ease of text manipulation (e.g., adding a word in the middle of a sentence, moving words around, changing the order of phrases, etc.) fostered revisions that did not detract from the organization of the text. Students did not have to be concerned that they might run out of room on the page, erase text they had worked so hard to transcribe so that they could revise in the middle of the page, and rewrite entire sentences to move them to another section. Third, the use of digital writing gave students a chance to see their text as a “published” and “professional-looking” piece of writing. This removed the arduous task of handwriting, encouraged them to produce their best work, and to think beyond the transcription to the higher levels of revision—how the content communicated their ideas.

Type of Revision	Example from Prompt 2, student 22
Word-level	them. Venus is a planet named after a the roman goddess- of love and beauty .
Phrase-level	them. Venus is a planet named after the roman goddess of love and beauty :which her name is Aeru
Sentence-level	.Venus has hundreds of volcanoes and craters too. It is a terrestrial planet,which means a planet with a solid surface,made of rock.It also has a lot of craters,which means large holes made by asteroids,which means medium size chunk of rock and metal that orbits the sun.
Organizational	Venus is the 3rd brightest object in the sky. Venus is almost the same size as earth. It also weighs the same amount. 7,520 miles wide .Venus has hundreds of volcanoes and craters too. Venus is 7,520 miles wide.

Figure 4.12. Examples of student revisions on the word-, phrase-, sentence-, and organizational level.

Research Question #2

Research question #2 asked, “How does revision instruction and subsequent student revision influence overall writing quality of informational text?” The analysis of data from each prompt’s draft and final writing sample, previously presented in this chapter, examined the influence of student revisions on each specific prompt. In order to see the influence of the revision instruction on a separate science informational text, namely, the IWA, I conducted a Pearson’s correlation with quantitative data of the writing assessments. Prior to conducting the correlation, I converted all of the overall

writing scores from prompt drafts and final products to a scaled score as represented by the students' level of mastery (see Table 4.17). This decision is in line with a current trend in education, which is to look at student raw scores by addressing if they are meeting "benchmark" or are "at grade level" (Marzano, 2009). In this study, the rubric used to score the students' writing prompts was designed to measure their writing in this manner and assign each student a scaled score of 1- 4, with 4 being "above grade level" and 1 being "well below grade level." As such, students' overall scores on their drafts and prompts were converted to a category on a mastery scale (see Table 4.18) prior to calculating the correlation.

As can be seen, all these young writers were deemed at or beyond the grade-level benchmark on their informational text writing within six weeks and via three writing tasks. Admittedly, they were participating in the revision protocol at the end of the school year in a class that valued and promoted informational writing. Still, only 5 students were assessed as a 3 or 4 at the outset and within five weeks all 21 were able to demonstrate informational writing competency.

Table 4.17

Conversion of Overall Writing Scores on Prompts to a Level of Mastery and Scaled Score

Scaled score	Level of mastery	Raw scores
1	Well below benchmark	5 to 9
2	Below benchmark	10 to 13
3	At benchmark	14 to 16
4	Above benchmark	17 to 20

Table 4.18

Scaled Scores on Students' Drafts and Final Products for Prompts 1, 2, and 3

Student	Prompt 1 draft	Prompt 1 final	Prompt 2 draft	Prompt 2 final	Prompt 3 draft	Prompt 3 final
1	2	3	2	4	3	4
2	3	4	3	4	3	4
3	4	4	3	4	3	4
4	2	4	3	4	3	4
5	2	2	3	3	3	4
6	2	2	3	3	3	3
7	2	3	3	3	3	4
8	3	3	3	4	2	3
9	2	4	3	3	3	4
10	3	4	4	4	4	4
11	2	4	2	2	3	4
12	1	2	2	2	2	3
13	2	3	3	3	2	3
14	2	3	3	4	3	3
15	1	2	2	3	1	3
16	2	4	3	4	3	4
17	2	3	3	4	3	4
18	2	3	3	4	3	4
19	3	4	4	4	3	4
20	2	4	3	4	4	4
21	2	3	3	4	3	4
Mean	2.19	3.24	2.90	3.52	2.86	3.71

Note. Bold scores indicate scores at or above benchmark.

To answer this research question, I also wanted to examine the relationship between the post-assessment total score and the final scores for Prompts 1, 2, and 3. However, because of the small sample size, I could not determine this relationship. In order to examine any correlation between the writing that students produced during the revision instruction protocol and the post-assessment scores, I conducted a Pearson's correlation with the data from the IWA (pre-assessment and post-assessment), and the final scaled scores on the prompts (see Table 4.19). A significant positive correlation was

Table 4.19

Summary of Pearson's Correlation for Prompts 1, 2, and 3 Final Product Scores, Pre-assessment, and Post-Assessment (N = 21)

Variable	Pearson correlation with post-assessment total scores	<i>p</i>
Pre-assessment total scores	.526	.014*
Prompt 1 final scores	.520	.016*
Prompt 2 final scores	.329	.145
Prompt 3 final scores	.326	.149

p < .05.

found between the pre-assessment score and the post-assessment score, as well as the final score for Prompt 1 and the post-assessment score. The final scores for Prompt 2 and 3 did not significantly correlate with the post-assessment score. Further research with a larger sample size is necessary to examine the how revision instruction can transfer to another writing task.

Summary

In summary, analyses of the collected data reveal that students did revise their informational texts across different levels. The increase in textual word count during revision did positively correlate with the final product scores for each prompt. All students in this study were able to reach benchmark writing expectations for second-grade informational writing. The students also demonstrated significant increases from pre-assessment to post-assessment. This was a relatively small sample size ($N = 21$) and a short-term project (6 weeks), so the results are encouraging and worthy of consideration, but should be interpreted with caution. The data show that second-grade students are

capable of revising their written informational text digitally. Data also demonstrate that second-grade students are capable of making varying levels of revisions, including sentence-level and organizational, when given revision instruction and implementing them digitally. The data suggest that the revision instruction had a positive correlation with student overall informational writing quality on the IWA.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

This study explored the influence of a revision-focused writing protocol on second-grade students' revisions in their informational writing. The purpose of this study was to examine how the use of digital writing can support revision of early writers' informational text, and to examine how revision instruction and subsequent student revision influenced students' overall writing quality. Furthermore, the pedagogical goals of the formative design used in this study were to increase the amount of revisions second-grade students applied to their writing, and to use revision to improve the overall quality of second-grade students' informational writing.

This chapter provides a review of the study, a discussion of the study's results and salient findings as they relate to existing research and the theoretical framework, and implications of the study's findings for research and classroom practice. I also present the limitations of the study's design and answer the final two questions in the framework for conceptualizing and conducting formative experiments (Reinking & Bradley, 2008), which are:

1. Has the instructional environment changed as a result of the intervention?
(How?)
2. What unanticipated positive or negative effects does the intervention produce?

Summary of the Study

The purpose of this study was to examine how a revision-focused writing protocol can be implemented in a second-grade classroom to improve the quality of students'

revision and overall informational writing quality, and how the use of digital revision technology could facilitate said revisions.

Previous research has examined the important place that revision holds in the writing process (Bereiter & Scardamalia, 1987; Flower et al., 1986; Saddler et al., 2014). However, the majority of studies that have examined revision in relation to early writers report that early writers rarely revise their work, and when they do revise, their revisions do not always improve the quality of the text (Bereiter & Scardamalia, 1987; Hooper et al., 2006; Van Gelderen, 1997). Moreover, young writers who do revise often implement only surface-level revisions (Chanquoy, 2001; Dix, 2006; Graham, McKeown et al., 2012). A small number of studies have examined revision with elementary-school students (Brakel Olson, 1990; Chanquoy, 2001; Fitzgerald & Markham, 1987; Grejda & Hannafin, 1992; Pifarre & Fisher, 2011; Reynolds & Hart, 1990; Zammuner, 1995). These studies utilized peer collaboration, revision within the writing process, and incorporating technology with revision. However, none of these studies was conducted with students younger than third grade and the majority of these studies focused on narrative writing.

Despite strong theoretical tenets of the importance of revision to improve writing quality, evidence is lacking in how this connection can be strengthened with early writers to improve revisions and writing quality. Additionally, there has been very few research studies done in the context of revision instruction for informational writing with elementary writers. A few studies propose that technological tools and digital writing could be of benefit to elementary writers as they revise (D. C. Fletcher, 2001; Goldberg et

al., 2003; Grejda & Hannafin, 1992; Pifarre & Fisher, 2011). However, these studies are not generalizable to early writers, and more research could indicate how digital devices can be used during the revision process, and how they might affect overall writing quality.

This study was intended to help fill the gap in the research on the use of a revision-focused writing protocol with early writers and student use of technology applications during the revision process, and how each factor influences the revisions students make and the quality of their writing on a transference task. In order to understand these factors in a real-life classroom setting, I utilized an embedded, concurrent, mixed methods design within the framework of a formative experiment to understand early writers' revisions of informational text. First, I gathered baseline data for students' informational writing abilities through the administration of the IWA (Purcell-Gates et al., 2007). Next, I implemented a 6-week revision-focused informational writing protocol with 21 second-grade students in an authentic mainstream classroom. During the writing protocol I collected quantitative and qualitative data in the form of student writing samples, tallies of revision types and quantities, and teacher journal entries. Finally, I administered the IWA a second time to students as a post-assessment measure to compare students' growth in composition via a standardized measure of informational writing.

Summary of Major Findings

Theoretical Framework

The theoretical framework for this study included socio-cognitive theory with attention to both social and cognitive aspects of writing achievement, such as the cognitive process model (Flower & Hayes, 1981). The theoretical foundations of this study inform the revised cognitive process model by Hayes (1996), who acknowledged the roles that working memory, visual-spatial variables, motivation and affect, and the motoric processes play in the cognitive process. This revised model also views the writing process as a recursive cycle more than a linear process. One model for writing instruction based on the cognitive process model is that of a writing workshop (Atwell, 1987; Calkins, 1983; Graves, 1983), which was the general model used in this study with some modifications. The modifications to the writing workshop model in this study were also based on sociocognitive theory, and included an extended focus on revision, explicit instruction of revision strategies and informational text features, and a GRR for student application of these strategies and text features.

The pedagogical goal of this study was centered on increasing and improving the revisions that primary writers applied to their informational texts, and also improving the overall quality of students' informational texts. Theoretically, students' working memory can be overloaded by the tasks of transcription, spelling, and other lower-level writing skills, leaving very limited resources for higher-level writing skills such as revision. This theory has been supported with evidence from several studies examining writing quality related to students' transcription abilities (Berninger & Swanson, 1994; Olinghouse, 2008;

Olinghouse & Leaird, 2009,) and that when less working memory is needed for basic transcription skills, more is available for writers to devote to tasks such as revision. However, the majority of these studies were done with narrative writing tasks. The cognitive load of writing informational text would seem to demand more working memory as students have to recall less-familiar elements, such as vocabulary, definitions, scientific concepts, and facts that are often new to them prior to or during the drafting process. Indeed, informational writing with a focus on communicating science knowledge is complex mental work, especially for primary-grade writers.

The socio-cognitive theory of writing was used to inform and design the writing protocol used in this study. If the cognitive load of lower-level writing tasks is lightened, then students may be able to devote more of their working memory to higher-level writing tasks such as revision. Using digital tools during revision may help lighten the load of transcription for early writers because the tedium of handwriting is lessened. With the digital application that was used in the study, students also had access to readily available tools for spelling, capitalization, and punctuation. The digital application also lent itself to simpler text manipulation than on paper-pencil, as students could delete, add, and change the text digitally without having to rewrite entire sections of text or worry about making their text difficult to read.

Another piece of the theoretical framework that informed this study was the GRR model developed by Pearson and Gallagher (1983). This model suggests that cognitive work should shift slowly and intentionally from teacher modeling, to joint responsibility between teachers and students, to independent practice and application by the learner

(Fisher & Frey, 2013). Underlying the GRR is a mix of cognitive and social constructivist theories (Bandura, 1986; Piaget, 1952; Vygotsky, 1962). Together, these theories suggest that learning occurs both cognitively as well as through interactions with others. The GRR is a model for effective instruction in which the responsibility for task completion shifts during instruction from teacher to students. Within the GRR model for instruction, the teacher begins by assuming all the responsibility for performing a task, utilizing methods such as direct instruction and modeling. Gradually, the responsibility for task completion shifts to shared teacher and student responsibility through guided practice and scaffolding. Finally, the responsibility for task completion is primarily assumed by the student in independent strategy use (Duke et al., 2011).

The writing protocol for this study focused on informational text. Because the composition of science informational text is relatively daunting and burdensome for many primary-grade writers, the writing workshop model already established in the classroom was modified to support students as they worked toward independent proficiency with informational writing. Within the writing workshop, a GRR-based framework called To-With-By (Campbell, 2009) was implemented in an effort to explicitly teach both the genre features of informational text and the revision process in a scaffolded and accessible manner. Within each writing session, I included teacher modeling with demonstrations, explanations, and think aloud. Then, students participated in guided practice when they worked with me and with each other to write and revise (see Appendices J, K, and L for examples of class-created shared writing products in response to Prompts 1, 2, and 3). After guided practice, students moved on to independent writing

where they worked on their individual writing pieces to apply what they had learned during the previous two components of the writing session. Last, students shared their writing with each other, giving more opportunities for social interaction and learning from their peers. These modifications to the writing workshop enabled explicit instruction of specific genre features of science informational text, and explicit instruction of strategies that students could use to revise their writing. These modifications also provided students with many opportunities to learn from interactions with me and peers before they were expected to produce writing on their own each day.

Summary of Progress Toward the Pedagogical Goals

The pedagogical goals of the study were to increase the amount of revisions second-grade students applied to their writing, and to use revision to improve the overall quality of second-grade students' informational writing. Over the course of the 6-week writing protocol, 76% of the students were able to demonstrate an increased number of revisions to their informational texts, as evidenced by the number of revisions tallied on each prompt. During Prompt 1, the mean total number of revisions was 13.95 per student, with 10.57 per student during Prompt 2, and 22 per student during Prompt 3. Across all three prompts, students implemented an average of 15.51 revisions per prompt. Although 76% of students had an increase in the number of revisions they applied from Prompt 1 to Prompt 3, only a 33% of students continually increased the number of revisions from Prompt 1 to Prompt 2, to Prompt 3 (see Table 5.1). However, the five students who did not show an increase in the number of revisions still managed to demonstrate grade-level

Table 5.1

Total Number of Revisions per Student During Each Prompt

Student	Prompt 1 draft score	Prompt 1 revisions	Prompt 2 revisions	Prompt 3 revisions	Prompt 3 final score	Gains from P1 draft to P3 final
1	11	14	12	29	18	+7
2	14	16	12	15	19	+5
3	17	7	9	16	17	+0
4	13	10	16	16	17	+4
5	12	15	18	22	17	+5
6	12	16	8	14	16	+4
7	12	13	13	22	19	+7
8	14	5	5	38	16	+2
9	12	14	4	18	19	+5
10	15	17	14	25	20	+5
11	13	18	8	14	17	+4
12	9	15	13	30	14	+5
13	12	12	7	30	16	+4
14	12	15	12	24	16	+4
15	8	8	8	14	14	+6
16	13	16	8	32	17	+4
17	12	8	8	14	17	+5
18	12	20	14	20	17	+5
19	15	26	20	36	19	+4
20	13	19	10	16	20	+7
21	11	10	3	17	17	+6

writing competency with informational text with the revisions applied for Prompt 3.

Each writing product that was asked of the students for the individual prompts was within the science informational genre, but also increased in demand. Students were asked to create an “information sheet” for Prompt 1, a “poster” for Prompt 2, and “booklet” for Prompt 3. This increase in complexity appears in the planning sheets for each product. The planning sheet for the Prompt 1 information sheet had spaces for one

main idea and five details. The planning sheet for the Prompt 2 poster had spaces for three subtopics with three to four supporting details within each one (see Appendix G). The planning sheet for the Prompt 3 booklet was the most rigorous, with spaces for six different subtopics and three to four supporting details for each (see Appendix H). The successive prompts each asked for more information about the topic, in order to create the product asked in the prompt. When creating the prompts, I knew that it would be much easier to show results of increased writing quality if the tasks were all similar in requirements. However, increasing demands of each prompt would be able to show more growth in writing quality, communicate high expectations to students, and add rigor to the research design.

Regarding overall informational writing quality, at the beginning of the writing protocol, only five of the 21 students demonstrated proficiency on the initial draft for Prompt 1, which was the “easiest” writing product in the study. After revisions, 17 students met grade-level expectations for Prompt 1. Although the product for Prompt 2 was inherently more difficult, and about a more abstract topic, 17 students showed proficiency on the initial draft and 19 were at grade-level benchmark for informational writing by the final product. The product for Prompt 3 was by far the most challenging product of the protocol, asking students to write a booklet with six different subtopics. On the initial draft, 17 students were at benchmark, and by the final product, all 21 students in the study were able to meet or exceed the benchmark for informational writing. Essentially, in just six weeks every single student in this study was able to reach grade-level proficiency at independently writing science informational text. In fact, the large

majority of students were able to produce writing that surpassed grade-level expectations.

Answers to the Research Questions

Research question #1 asked, “How can the use of digital writing support revision of informational text?”

Revising digitally. The present study approached revision of informational texts using technology with second-grade students. There is limited research conducted previously that measured elementary writers’ revisions and overall writing quality using technology (Connelly et al., 2007; D. C. Fletcher, 2001; Goldberg et al., 2003; Grejda & Hannafin, 1992; Lisy, 2015; Nuvoli, 2000; Pifarre & Fisher, 2011; Seawel et al., 1994; von Koss Torkildsen et al., 2015). In this study, students were able to successfully revise informational text using a word processing application on an iPad. This supports previous findings that early writers do have the capacity to revise their texts, especially when given instruction (Graham, Bollinger et al., 2012) yet extends that finding to support that early writers have the capacity to revise their texts digitally as well as via paper-pencil. The second-grade students in this study were able to use a word processing application on an iPad to implement their revisions. In the teacher journal, I noted many times that the use of the iPad seemed to support students in their revisions. More specifically, digital writing supported students’ revisions through the added benefits of ease of transcription, manipulation of text, the ability to add images, spell check, the professional look they could produce, and the ability to revise without “ruining” the draft. Other comments in the teacher journal indicated that using iPads during the writing process also heightened the motivation to write and revise, and engaged students who were not as engaged when

writing in traditional methods.

Research has been clear that students in the early grades are much faster and proficient at handwriting than typing (Connelly et al., 2007; Hayes & Berninger, 2010). Typically, a faster writing speed correlates with longer texts produced and higher assessed writing quality (Connelly et al., 2007). Students' handwriting and typing speeds were not measured as part of this current study, but the teacher journal did report observations that students were slow at keyboarding. In this sense, using technology could be a hindrance, but it appears from the results in this case that students were still successful making many revisions. Perhaps this is due to the structure of the writing protocol, which allowed students a total of about 2 hours across 4-5 days per prompt to work on revising their texts. Not many other revision tasks in previous research measured revisions when students were given more than one day to revise, or more than 30 minutes total.

In this study, revision was part of the writing process within the writing workshop model, and honored as an essential component of that process. Providing time for students to write and make revisions may have been an integral part of the effectiveness of the writing protocol. In a national survey of revision practices in elementary classrooms, Saddler et al. (2014) reported that on average, only 6 minutes per day are dedicated to revision. Within this writing protocol and its focus on revision, half of the writing sessions across 8 days per prompt were dedicated to revision, including instruction and time for students to revise. This works out to be an average of 25 minutes per day dedicated to revision, which is significantly more time than what is allocated in

the average elementary classroom. Although early writers are slower at typing than handwriting, when given time to revise, the students in this study were able to revise their texts digitally. Concomitantly, students in this current study demonstrated increased productivity evidenced by the significant increase in word count from draft to final product for each of the prompts. The word count across prompts increased very significantly, from an average Prompt 1 draft word count of 48.62 words to an average Prompt 3 final word count of 289.52 words. Giving students time to write and revise not only led to an increase in the number of revisions, but also an increase in writing productivity, potentially demonstrating that writing is revision.

Quality of revisions. The participants of this study were able to apply revisions to informational text that were beyond word-level changes, which was a surprising result. Previous research regarding early writers' revisions consistently report that they typically do not go beyond surface- and word-level changes (Saddler et al., 2014). In this study, students implemented word-, phrase-, sentence-level changes, and organizational changes during each prompt. The mean number of revisions that students made from prompt to prompt varied, with a high of 22 revisions during Prompt 3, 13.95 revisions during Prompt 1, and the lowest mean of 10.57 revisions during Prompt 2. Importantly, the most often implemented type of revision for Prompt 1 was phrase-level changes, and the most-often-implemented type of revision for Prompts 2 and 3 were sentence-level changes (see Figure 5.1). These results suggest that revising digitally may have enabled students to devote more attention and working memory to the task of revision, thus enabling them to apply more complex revisions, as demonstrated by the high numbers of phrase-,

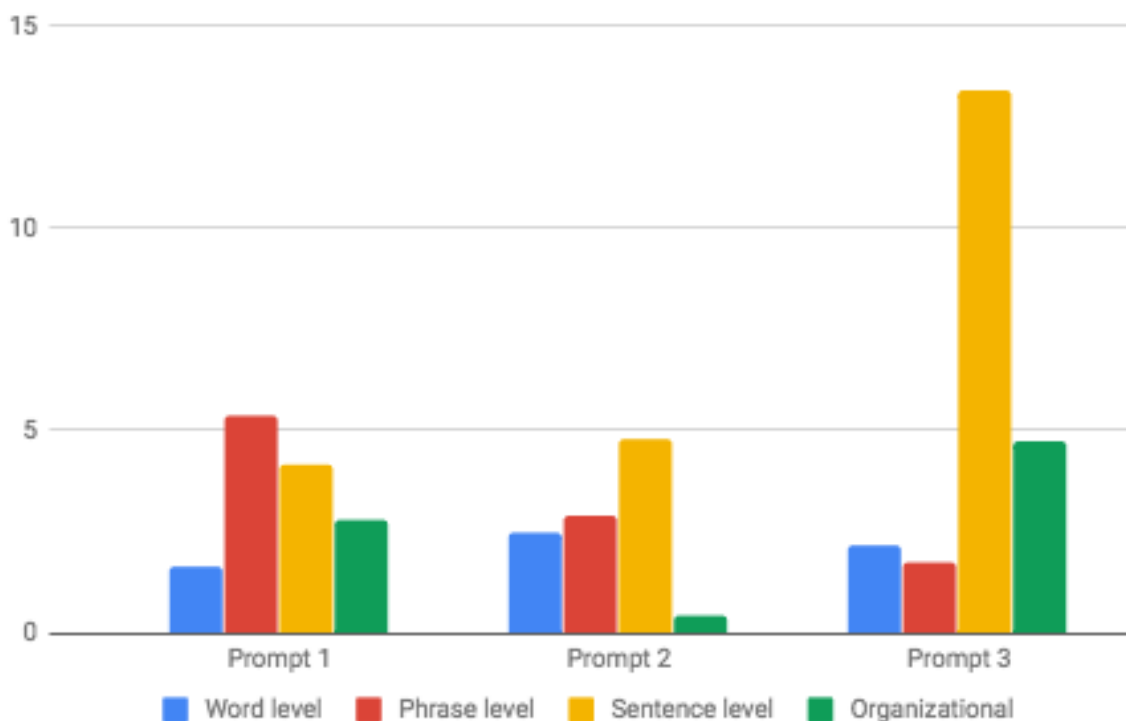


Figure 5.1. Quantity of types of revisions for each prompt.

sentence-level, and organizational changes students applied to their drafts.

It is evident from the revision data that both the topic and the task were significant factors in the types of revision that students applied to their informational writing. Each prompt had a different science topic. Prompt 1 was about domestic animals, which is a topic that typical second-grade students have some background knowledge about. The students were able to select from a list of animals to write about, and as noted in the teacher journal, many students wrote about animals they were already somewhat familiar with. Out of the 21 students, nine students chose to write about dogs. The task for Prompt 1 was an “information sheet.” This task was the minimum of what the CCSS writing standard expects from informational writing from second-grade students: “Write informative texts in which they introduce a topic, use facts and definitions to develop

points, and provide a concluding statement or section” (Council of Chief State School Officers & National Governors Association, 2014, ELA-Literacy standard W.2.2). The expectations for this task did not require students to have subtopics like the other two prompts.

During the revision stages, the features of informational text that were targeted in the mini-lessons included using descriptive details, specific vocabulary and definitions, considering organization, and using visuals. If students added descriptive details and/or definitions, those would typically be a phrase- or sentence-level change because of the nature of those features. For example, on the initial draft a student wrote “The male is bigger and it has longer tail feathers than the female.” During revision, he added definitions for the words ‘male’ and ‘female,’ which were each more than one word, and were categorized as phrase-level changes. “The male or boy is bigger and it has longer tail feathers than the female or girl.” During Prompt 1, organization was not explicitly focused on during the planning stages, but only during revision. After the mini-lesson focused on considering organization, students did make some organizational revisions, such as grouping sentences by subtopic and adding headings (see example in Table 5.2).

Prompt 2 was focused on the topic of space, again with a list of specific choices for students to pick for their individual writing. Space is a topic that is more abstract, and the students had less background knowledge about. During the school year prior to this writing protocol, these students had learned in class about the moon, sun, and stars. Many of the students chose to write about individual planets and asteroids, which were not ever discussed in class prior to this writing protocol. During the planning stage of the writing

Table 5.2

Prompt 1 Draft and Final Product for Student 1

Draft	Final
Dogs are intsting thay can jump rilly hily. Dogs have babbys. thay are very fast. Dogs wher bown to be cool. Thay can bite and skrach. But thay only do that wen you pley ther tell. and thay do that to preterkt ther sethfs. and thay can be good pets. and thay are fuzzy. the end.	Amazing Dogs <u>Fun Facts</u> Dogs are interesting. They can jump really high. There are lots of cool dogs. And here are some. Red, black, white. <u>Life Cycle</u> Dogs are mammal. Dogs have babies. They are very very fast. Dogs were born to be cool. <u>Defense</u> They can bite and scratch. and they do that whenever you be mean. But they only do that when you pull their tail. And they do to protect themselves. <u>Pet Dogs</u> And they can be good pets. And they are fuzzy. There are lots of cool dogs in the world.

protocol, students had access to informational books about their specific topics. However, during the drafting and revising stages they did not have access to these books in an effort to avoid students copying text directly from the books. This may explain the lower revision quantities for Prompt 2. It is difficult to write more extensively and add details on topics that one does not have a solid understanding about (DeGroff, 1987). Students may not have grasped the scientific concepts fully and therefore not known how to organize or elaborate the information in a way that would help the reader understand. This is evidenced by some of the vague headings students created for their subtopics in Prompt 2, such as “Cool Facts,” “Amazing Saturn,” and “Did You Know?”

Furthermore, the task for Prompt 2 asked students to create a poster. The example poster that I showed students when presenting the task had different sections and

subtopics (see Appendix I). During the planning stage for Prompt 2, organization was an area of focus. Students were given a planning sheet that enabled their prewriting to be focused by subtopic and afforded space for them to write headings for each section (see Appendix G). The students were able to write drafts that were organized by section, and did not have as many organizational revisions for this prompt as they did for Prompt 1. They were also given an additional drafting day during Prompt 2 so they had more time to create their initial draft than they did during Prompt 1. Sentence-level revisions was the highest mean number of revisions, and many of these sentence-level revisions were from students adding sentences as captions for the visuals they chose for their text. For example, the captions for the images on a poster about Saturn included “This is what Saturn looks like,” “Saturn is 10 time bigger than Earth,” and “Saturn is the sixth closest planet to the sun.” The majority of the captions students wrote did not add any new information about the topic, and merely were descriptions of what the image represented. For example, “This is a big meteor,” “This is a meteor falling,” and “This is a meteor in space.” Although these types of captions did not add quality to the text, they were still categorized as sentence-level revisions and added text quantity. Some of the captions students added were not full sentences, and were categorized as phrase-level revisions.

The Prompt 3 topic centered on wild animals. Students were able to choose the wild animal they wanted to write about, as long as it was not extinct. On the day that the prompt was introduced, I had several informational books about wild animals available for students to look through in order to give them ideas of what animal they would like to write about. The students each chose animals that no one else in the class was writing

about, which was an indication of their growing confidence as writers and desire to create a product that was obviously unique in comparison to their classmates' writing. Some students even chose a specific species of animal, such as King Cobra snakes. Much like for Prompt 2, students were given an informational book they could read prior to planning and use during the planning stage. In general, any background knowledge the students had about their chosen animal was fairly vague and mostly centered around what the animal looks like and what habitat it lives in. Providing informational books for students to read enabled them to research more details about their animal prior to drafting.

The task for Prompt 3 was the most rigorous of the three prompts. Students were asked to create a "booklet" about their wild animal. As a class, we brainstormed the subtopics that we felt like were "important" information to include, and ended up with six different subtopics. The students were given two days to research and plan their informational writing, and they had a planning sheet with space for an introduction, six subtopics and supporting details, and a conclusion (see Appendix H). After the planning stage, students were given two writing sessions to draft their booklets, which was not enough time for many of them to write all of their ideas. In order to keep the protocol progressing as planned in the time available, we had to move forward even when some students were not finished with their drafting. We did move forward into the revision stages of the protocol due to time constraints, and many students spent a lot of time during the revision stages continuing to draft their ideas from their planning sheets. Because these details were additions to the text after I had scored the initial drafts, they

were categorized as revisions, and many of these were sentence-level changes to the text. This can partially explain the high number of sentence-level changes for Prompt 3.

Overall, both the topic and task for each prompt influenced the types and quantities of revisions students applied. Another influencing factor was the length of students' initial drafts, which on average increased significantly across prompts. The longer Prompt 2 and 3 drafts took more time to reread and determine where revisions were needed, and as recorded in the teacher journal, I questioned if the longer texts made it more difficult for the students to revise. However, the more text they had written in their initial draft, the more text that was available to revise. As evidenced from the revision tallies (see Figure 5.4), students were still able to make revisions from different levels on the more demanding writing tasks.

Impact of revisions on overall writing quality. In previous research, the impact of elementary writers' revisions on overall writing quality produced mixed results, with some research indicating that elementary students' revisions do not necessarily translate into higher quality writing (Brakel Olson, 1990; Grejda & Hannafin, 1992; Limpo et al., 2014). In a doctoral study done with second-grade students, Lisy (2015) found that the revisions students applied to their writing did not influence the overall writing quality of text whether they revised on paper or on the computer. The type of revisions that students applied the most in her study were word-level changes, including fixing spelling errors. It is understandable that the change of a word here and there, and the correction of spelling would not have a significant impact on the overall writing quality as reflected in a rubric score.

A major finding of this current study is that the revisions that students made to their informational texts did make a change on the overall writing quality of their text, as indicated by the rubric scores before and after revisions. On the drafts for Prompt 1, only 24% of the students' writing scored at or above benchmark for informational writing. This suggests that even in a writing-focused classroom of second-grade students in the last trimester of the school year, the writing lessons and tasks included in the first three days of the protocol—a discussion of the genre and its features, a mentor text example, prewriting session, and drafting session—were not enough to support all students in reaching grade-level writing proficiency with informational text.

However, after the four writing sessions focused on revisions to Prompt 1, 81% of the students scored at or above benchmark for informational writing on their final Prompt 1 products. The writing sessions focused on revision enabled 57% more students to reach grade-level standards with Prompt 1. In other words, over half of the students were able to move their writing quality from below benchmark to at or above benchmark through a few days of instruction focused on revision of informational writing. The changes in the prompt scores from draft to final product also indicate that “one and done” writing assignments and assessments may not be sufficient for students to show competency in writing. Even in this writing-focused classroom of late second graders, the majority of students was not able to meet expectations on the draft for the first prompt. Revision was needed to help students improve their writing sufficiently to show changes in their scores and move their writing products to the expected level.

Examining the rubric scores from Prompt 2, students seemed to apply the

informational writing skills learned during Prompt 1, with 71% of the students scoring at or above benchmark for informational writing on their Prompt 2 drafts. Thus, after just two weeks and one round of the writing process, students' drafts demonstrated improved writing. When analyzing the teacher journal entries, a new theme that emerged during Prompt 2 was that students were thinking critically without prompting. I observed students critiquing the trade books they read to research their topic during the planning stage, noting the authors' use or lack of use of specific informational text features. Students were also critical about the facts and details we planned and drafted on the class writing piece for Prompt 2, wanting to make sure it was "expert talk" and that the facts were scientifically correct. Spending our writing sessions focused on revision during Prompt 1 seemed to shift students' thinking to promote critical independence, which is an integral part of revision—being able to think critically about the content of the existing writing and compare the text to its purpose and intended message. Although students had initially higher scores on their drafts for Prompt 2, the revisions they applied to Prompt 2 continued to increase the quality of texts. The revision-focused writing protocol seemed to support all students, with 90% of students scoring at or above benchmark for their Prompt 2 final products.

A similar pattern of higher initial draft scores along with continued improvement after revision was reflected in the Prompt 3 scores. On the draft for Prompt 3, 81% of students scored at or above benchmark. At the end of Prompt 3, after revisions, 100% of students scored at or above benchmark for informational writing on the final product, with 71% of the students scoring above benchmark. In contrast to the Lisý (2015) study,

the revisions students applied in the current study most often were phrase- and sentence-level revisions. With some of the prompts, students even applied more organizational changes than word-level changes. With phrase-, sentence-level, and organizational changes, some students added definitions and details, moved sentences to different sections, and rewrote phrases to help clarify and expand the text. These types of content changes are evident in increased scores from prompt draft to final product. For example, Student 19 applied 16 revisions to her Prompt 1 draft, including 4 word-level, 4 phrase-level, 3 sentence-level, and 5 organizational revisions (see Table 5.3 for examples). Her score on the initial draft was 13, and after these revisions her final product score was 17. The revisions she applied enabled her to move her writing piece from below benchmark to above benchmark for informational writing. Theoretically, phrase-level, sentence-level and organizational revisions have the potential for a greater impact on the score of the overall quality of the writing than word-level changes.

Research question #2 asked, “How does revision instruction and subsequent student revision influence the writing quality of informational text?”

Impact of instruction on overall writing quality. Besides the students’ revisions of prompt drafts, the impact of students’ revisions on their overall writing quality in this study may also be due to the instruction within the study. Previous research concluded that ineffective planning and revising by older grade students may be an indicator that they had not benefitted from appropriate instruction in earlier grades (Limpo et al., 2014) and that there is a need for research to provide teachers with evidence-based practices that can be used to teach and support young writers’ revising skills.

Table 5.3

Examples of Revisions Applied to Student 19's Text on Prompt 1

Revision type & details	Draft	Final (changes underlined)
Word-level revision (1) - <i>Changed the word "places" to the more specific vocabulary word "habitat"</i>	They can live in lots of placas (places).	They can live in lots of <u>habitats</u> .
Phrase-level revision (1) - <i>Added a phrase with more details about how goats are strong to this sentence.</i>	Goats are verey strong.	Goats are very strong <u>and big there horns are the strongest part of their body.</u>
Sentence-level revisions (3) - <i>Added 3 more sentences with details about what goats eat, including a the specific vocabulary word herbivore with a definition.</i>	Learn more about goats.	<u>They mostly eat grass and trach.</u> <u>They have little tail. They are mostly herbivores, which means they eat plants.</u> Learn more about goats.
Organizational revision (3) - <i>Sectioned text into subtopics, added headings, moved sentence about living in the mountains to the habitat section.</i>	They can live in lots of placas (places). There are more then 300 goat's in the world. Goats are verey strong. They live in mounten's and ather placas. Learn more about goats.	<u>Habitat</u> They can live in lots of habitats. There are more than 300 goat's in the world. <u>They live in mountains and other places.</u> <u>Fun Facts</u> Goats are very strong and big there horns are the strongest part of their body. They mostly eat grass and trach. They have little tail. They are mostly herbivores, which means they eat plants. Learn more about goats.

In this study, second-grade writers rose to the challenge of revising and were capable of revising informational text in effective ways. Having high expectations for early writers and then scaffolding their learning to meet the expectations can help students achieve, as demonstrated in this study. The revision protocol included explicit instruction about features of the genre and the revision process, as well as reading many examples of informational texts from mentor authors and hearing the texts written by

their peers. Receiving specific instruction about applying revision may have helped students revise more effectively, and not merely revise for the sake of revising, but for the purpose of improving the text. Hearing multiple examples of science informational text may have helped students gain a better understanding of the genre and what they were working toward creating.

In order to examine overall improvement in informational writing quality within the study, I calculated the gains from Prompt 1 drafts to Prompt 3 final products. Across the -week writing protocol, on average students improved their writing by 4.67 points on the informational writing rubric. The rubric allows for 5-20 points, indicating that on average, student informational writing quality improved enough to move their independent writing quality from one level to the next on the rubric.

While each student was able to produce grade-level informational text on the third iteration, groups of students progressed differently throughout the study. To observe and compare the differences in student writing gains across the study, I grouped the students using their initial draft scores on Prompt 1. The 2 students who scored 10 or less were placed in the “well below benchmark” group, and the 14 students who scored 11-13 points were placed in the “below benchmark” group. The four students who scored at grade level (14-16 points) were placed in the “benchmark” group, and the one student who scored above grade level (17-20 points) was placed in the “above benchmark” group. I calculated the mean for each group’s scores on the prompt drafts and final products (see Figure 5.2) to track average growth for each group across the writing protocol.

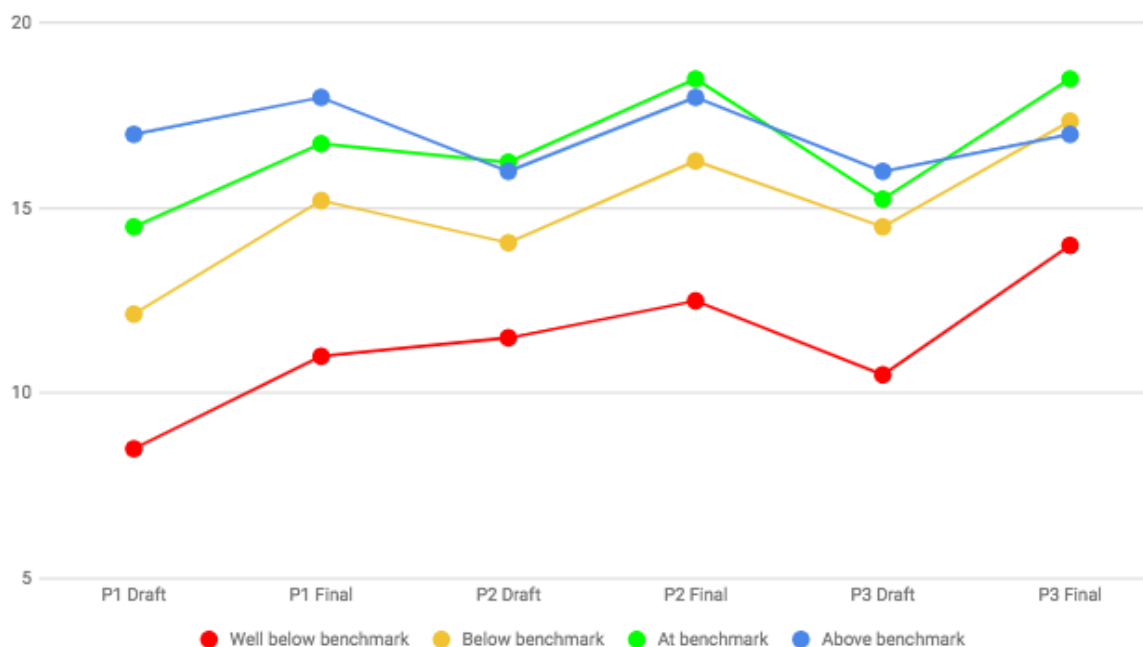


Figure 5.2. Draft and final scores by subgroup.

This examination of subgroups' scores led to the following conclusions.

- Students in each subgroup made gains overall during the writing protocol.
- Revisions improved each subgroup's writing, as shown by higher final product scores than draft scores for each prompt.
- Students in the below-benchmark, at benchmark, and above-benchmark groups were able to reach grade-level writing by the final product of Prompt 1 and were able to sustain at least grade-level writing across the remaining prompts' drafts and final products.
- Students in the well-below-benchmark group did not produce grade-level writing until the Prompt 3 final product.
- Students in the below-benchmark and at benchmark groups made the most gains across the protocol, and ended above benchmark, benefitting the most from the writing protocol.
- Students in the above-benchmark group sustained grade-level or above writing proficiency across the protocol.

Taking all of these conclusions into consideration, it is clear that the writing protocol “worked” for all students in the sense that they were all able to reach benchmark

and that focused instruction regarding revision improved their writing in every prompt. The students who started out well below the benchmark did take longer than the other students to reach proficiency. This is understandable because the well-below-benchmark group had the greatest growth needed to reach benchmark. However, it is also exciting because they were able to reach benchmark within just six weeks of focused instruction in this genre and only needed one more iteration of the writing protocol than the rest of the sub-groups to reach benchmark.

Transfer of informational writing skills. Within this research, I wanted to explore if the revision instruction protocol and experience with revision would influence their informational writing quality in general. Would students be able to apply the skills and knowledge to another informational writing task outside of the writing protocol? In other words, would the awareness and application of the features of the scientific informational genre transfer to subsequent writing tasks? This is important because previous research on revision instruction has rendered mixed conclusions on whether the revisions that students make have a stronger impact on writing quality, and whether to provide support for taking so much “extra” time teaching revision explicitly. It was also important to evaluate students’ overall writing quality on a subsequent writing task to examine how much students could transfer from digital writing back to traditional paper-pencil writing.

The students’ pre- and post-assessment IWA scores show that students were able to transfer writing skills to another informational writing task. The gains on the IWA from pre- to post-assessment were statistically significant ($p < .000$), from a mean of

33.85 to a mean of 43.57, meaning their writing markedly improved in six weeks.

However, the mean word counts on the IWA from pre- to post-assessment (92.21 to 98.90) were not significantly different, which is understandable given the 30-minute time constraint of the assessment. Additionally, while productivity is important, the comparable word counts from the pre- to post-assessment indicates that the source of the increased scores on the post-assessment was greater quality.

When examining the IWA scores by holistic category, the highest mean score on the pre-assessment was “sounds like an informational text” at 2.81 points. This category was also highest on the post-assessment (4.14 points), and had the greatest gains of the four holistic categories. As reported in the teacher journal, students really grasped the concept of “expert talk” and implemented it well in their writing, showing familiarity with the genre and that specific feature. During the protocol, the students were exposed to many examples of informational text through mentor texts read aloud, and this may have contributed to the large increase in this category. The other two holistic categories assessed were “looks like an informational text” and “is organized like an informational text.” The “looks like” category did not have significant gains from pre- to post-assessment. This category included things like headings and illustrations, and neither of these was a focus in this particular revision protocol. Students did use the iPad to add images to their texts, but did not often use paper-pencil to illustrate their texts. However, on the IWA they were expected to illustrate using paper-pencil. The lack of time available on the IWA may have also influenced the “looks like” score, because the majority of students wrote their text first and then went back to do the illustrations after

they were done writing. If they spent the entire 30 minutes on their text, they did not then have time to add illustrations.

The “organized like” category showed significant gains, although less than the “sounds like” category. The sentence structures used in informational text were not explicitly taught in this writing protocol, and may be more challenging for early writers to assimilate. In this writing protocol, some of the components of the organization of informational text such as compare/contrast and writing an introduction and conclusion were not explicitly taught. Another factor that may have negatively influenced students’ scores in the “organized like” category is that the IWA is a “one and done” writing assessment, with no time or instructions given for either planning or revising. Research targeting writing instruction has indicated that planning and revising are significant to the quality of student writing (Graham, McKeown et al., 2012), and when those pieces of the writing process are ignored during an assessment, it may not represent a full picture of the students’ writing competence. Thus, with more time and instructions to review, the posttest writing assessment scores may have been even higher and better representations of students’ informational writing.

Assessments for elementary informational writing. In this study, two different writing assessments were utilized: the IWA and a school-based rubric scoring for the drafts and final products from each prompt. The IWA was used as a pre-post measure, to assess students’ baseline competence with informational writing and to measure growth on a standardized writing measure. The rubric was used to assess the drafts and final products from each prompt as compared to grade-level expectations and benchmarks, as

well as to measure overall writing quality before and after revision.

When interpreting writing scores, it is important to examine the assessment itself. Table 5.4 shows a comparison of the two assessments used in this study. IWAs for early writers are very few and not well-researched. It was very difficult to find a standardized writing assessment specific to informational text for use with second-grade students. The use of two separate assessments in this study demonstrated that students can score very differently depending on the assessment that is used. On the IWA, the possible total scores are from 13 to 65. The total average score for the students in this study on the pre-assessment was 33.85, with a standard deviation of 6.9. There is no indication of a grade-level “benchmark” score for this assessment, and it was designed for use with second- and third-grade students, so it allows for more sophisticated informational writing. With

Table 5.4

A Comparison of the Informational Writing Assessment and the Informational Writing Rubric

Informational writing assessment	Informational writing rubric
Researcher-created, standardized and validated	Teacher-created, used in school and district
Based on the features of the science informational text genre	Based on the CCSS for informational writing
Used with second- and third-grade students	Used with second-grade students
Timed 30-minute assessment	Not timed
No directions for planning or revising	Teachers can give directions for planning, revising, editing
No support during assessment excluding spelling words for students who ask	Teachers give varying levels of support and instruction
4 holistic scores and 9 feature scores, total score can range from 13 to 65	Five category scores, total score can range from 5 to 20
Discriminating in the scoring	Potential ceiling effect with the scoring
No benchmark or “grade level” score indicated	Scale scores 1-4 indicating well below benchmark, below benchmark, at benchmark, or above benchmark

the highest score being 60 on the post-assessment, none of the students in this study reached the highest score (65) on the pre- or post-assessment. In contrast, the informational rubric used to score the drafts and final products of each prompt was designed to be used with second-grade students only, and had a ceiling effect and smaller scoring range, 5-20. Using this rubric, many students demonstrated “above grade-level” proficiency on their writing pieces during the protocol, but did not reach the highest scores on the IWA post-assessment.

It is apparent from the results of both assessments that students did show growth in their informational writing abilities over the course of the protocol. An examination of both measures gives even more information about students’ writing. The IWA results give more information about how well students were utilizing specific text features, while the rubric results indicate how well students are writing in comparison to the CCSS standard and other students at the same age and grade. The average gain for all students from pre- to post-assessment on the IWA 9.71 points. Looking at sub-groups, the two students who scored “well below benchmark” on the Prompt 1 draft were also the two lowest scoring students on the IWA post-assessment. One of the students in this group made more than average gains, from a score of 17 on the IWA pre-assessment to a score of 28 on the post-assessment, and an increased word count from 8 to 18. However, the other student in this sub-group did not show an improvement on the IWA, with a score of 33 on the pre-assessment to 30 on the post-assessment, and a reduced word count from 38 to 27. He did indicate at the end of the time on the post-assessment that he was not finished. Both of the students in this sub-group ended with a similar total score on the

IWA (28 and 30, respectively), which was two standard deviations below the average total post-assessment score of 43.57. Perhaps this indicates that time dedicated to planning and revising informational writing is even more critical for lower-achieving writers than it is for average-achieving writers.

Although 71% of students in the study demonstrated above-grade-level writing on the final product for Prompt 3, the highest score a student attained on the IWA post-assessment was 60, out of 65 possible. The IWA was created for use with both second- and third-grade students, so the continuum of writing quality was broader than that of the second-grade level rubric. Therefore, using only grade-level writing rubrics to teach and assess student writing may be limiting student capability to produce quality writing even when given adequate instruction.

Because of the significant mental load inherent in science informational text writing, second-grade students can produce higher levels of text with scaffolded instruction and scaffolding across several days with time dedicated to each component of the writing process. The ultimate goal of all instruction is for students to be independently successful, and as evidenced by the IWA post-assessment scores, the writing protocol in this study did help students make significant gains toward being able to write informational text independently without teacher guidance.

Formative Experiment Framework

Formative Changes

This study was conducted as a formative experiment. As part of a formative experiment, an intervention is modified in response to the data collected, to further

progress toward the pedagogical goal. Discerning the formative changes to this experiment is important to gain an understanding of how these changes influenced progress toward the pedagogical goal and influenced the overall instructional environment. Thus, teacher-determined modifications to the intervention were applied after each iteration/prompt as outlined in Chapter 4. All of these formative changes were implemented in response to the data, both from the scores on the prompts, instructional observations, and from the teacher journal entries. These formative changes, the data that motivated these modifications to the second and third cycles of the experiment, and the outcomes are outlined in Table 5.5. These formative changes allowed for a continuation of progress toward the pedagogical goals in the study.

Final Formative Experiment Framework Questions

Reinking and Bradley (2008) describe formative experiments as transformative, and that an “intervention that is the object of a formative or design experiment is often one that has the potential to positively transform the environment for teaching and learning” (p. 21). To continue this examination of how this particular formative experiment transformed the instructional environment, I will address the last two questions in the Formative Experiment framework referenced in Chapter 1.

1. How has the instructional environment changed as a result of the intervention?
2. What unanticipated positive or negative effects does the intervention produce?

A 6-week intervention is not a very significant length of time in comparison to formative experiments that span an entire school year or more. Still, the instructional

Table 5.5

Formative Changes for the Second and Third Iterations of the Experiment

	Data	Formative change	Outcome
Modifications for Prompt 2	Technological issues with Explain Everything	Switched applications to Google Docs	Less student and teacher frustration with the application; focus on revisions rather than application problems
	Organization was the lowest scoring category on Prompt 1 final products	Focused on organization during the planning stage	Students able to organize ideas before beginning drafting
	Increase in task complexity and science topic knowledge needed for Prompt 2	Increased planning time from one to two writing sessions.	Students able to read information about their selected topic, and get ideas on paper for all three subtopics
	Students demonstrated basic understanding of the genre features during Prompt 1	Spent less time in the “to” portion of the mini-lesson; and increased time in the “with” portion creating a class writing piece	Students had more responsibility and opportunities to write with guidance before they worked independently; more student engagement in the mini-lesson
Modifications for Prompt 3	Task asked for in Prompt 3 was a “booklet”	Switched applications to Google Slides	Students worked on revisions page-by-page while keeping overall organization; this encouraged focus of details on each subtopic
	Increase in task production asked for in Prompt 3	Increased drafting time from two to three writing sessions	Students had high productivity, as evidenced by high word counts for Prompt 3
		Moved adding visuals from the revision stage to the editing stage	Students had more time to revise the text, as evidence by the high number of revisions for Prompt 3
	Majority of students demonstrated continued understanding of and grade-level application the genre features and during Prompt 2	Shortened the mini-lesson time and increased independent writing time	Continued the GRR as students took on more responsibility for independent writing
	A few students did not produce grade-level writing by the end of Prompt 2	Added an option for students to have a writing conference with teacher if desired	Allowed students who felt they needed more support to access teacher guidance
	Time of the school year was after Spring Break; students had been writing the same genre for several weeks	Connected the writing to an art project and report day	Sustained motivation for students to continue doing their best work

environment indicated some noticeable shifts as a result of the writing protocol both in the environment for learning and the environment for teaching. The transformations in the environment for learning included the development of a ‘writer identity,’ a general excitement and motivation about writing, increased student engagement from students of all levels of writing proficiency, and an authentic integration of the connection between reading and writing. The teaching environment changed by facilitating deeper teacher understanding of the genre, increased teacher self-reflection, and heightened teacher awareness of student capabilities to produce quality writing.

Environment for learning. The overall shift in the instructional environment for learning was that the students began to develop, or further developed, a ‘writer identity’. Research has indicated that students develop beliefs and identities about themselves as readers and writers even in the early grades. After conducting a study examining second-grade students’ writer identities, Seban and Tavsanlı (2015) concluded, “Through literacy practices students develop and enact their identities as writers. If teachers want to help their students develop competent writer identities, they need to consider the potential use of writing as a way to express themselves” (p. 232).

Some educators might wonder if second-grade students would feel weary about revising for four consecutive days. But, the teacher journal entries I recorded throughout the protocol noted that students were very motivated and excited about writing even during the days focused on revision. They were eager to improve their writing and I noted that the students believed they could, in fact, produce text equal to the task asked of them in the prompts. The students in this study had worked on other writing tasks throughout

the school year prior to the protocol, yet this informational text protocol seemed to ignite a new level of ownership of their writing. Producing writing seemed to pervasively move from something students “had to do” to something they “wanted to do.” One student was so eager to work on his revisions that he expressed “Can’t we just work on our own writing now?!” during the mini-lesson part of the writing workshop (Teacher Journal, April 11) and “One student said to me that she was done with her text, but she didn’t want to be done because it was really fun to write her story on the iPad. This is a student who is not quite [on grade level] in language arts)” (Teacher Journal, March 20).

Participants in this study were in an authentic classroom with typical demographics; students were at many different levels of proficiency and interest regarding writing. Some students had been hesitant about writing in general, and often needed a lot of support and encouragement to get their ideas on paper at all. At the beginning of the school year, one student’s preferred activity during writing workshop was to scribble in his journal. Another student preferred to stare at the blank pages in his journal for the majority of the workshop time. It was often difficult for me as the teacher to get everyone in the classroom engaged in writing simultaneously prior to this writing protocol.

Although I had a vested interest in this study, cared deeply about my students’ writing development, and am passionate about writing myself, I was still astounded at the high levels of student engagement during writing workshop throughout this protocol. Students who were often reluctant, uncomfortable, and resistant during writing workshop earlier in the year were easier to engage during this protocol, and were able to

independently produce quality informational text. In the early stages of the study, I recorded in the teacher journal that “some of my most reluctant writers are much more motivated to revise when they use the iPad to do it” (Teacher Journal, March 14)

Another shift in the instructional environment for learning involved students’ excitement and passion about writing. During the study, students expressed to each other their enjoyment of writing time, some even preferring working on writing to going to recess, which is very uncommon for second-grade students to prefer anything over recess! This change was evident in the teacher journal during Prompt 3:

Wow! I have never seen a group of kids so excited about animal reports! Their energy when I read the prompt and explained what we got to do was almost palpable. I honestly think they are more excited than other groups of kids because they have already had such success with informational writing, and they feel like they can actually DO it. (Teacher Journal, April 24)

Several students’ parents casually mentioned to me throughout the study how much their children were excited about the writing projects we were doing. When we did our animal report day after the Prompt 3 final products were finished, the students were glowing with pride in their work and eager to read their printed booklet to literally anyone who would listen.

The last change in the environment for learning involved the connection between reading and writing. As the classroom teacher and literacy researcher, I sought to connect reading and writing all year long. However, this protocol took that connection to a new level. During the protocol, I read aloud mentor texts and guided students in examinations of the informational text features within the mentor texts. We read and wrote, reread and revised, and reread and edited the class informational writing pieces during the guided

practice portions of writing workshop. Students independently read science informational books before and during the planning stages of the prompts, to learn information about their topics. They wrote informational texts, and then reread them multiple times during the revision stages. Students read their writing aloud at the close of writing workshop, sometimes in a partnership and sometimes to the whole class. They read aloud their revised informational texts to a partner during peer revision toward the end of each prompt. The writing protocol dissected informational texts so that students could understand the features they were attempting to write in their own texts. It was an authentic amalgamation of reading and writing on a level I had rarely experienced in my classroom before with informational text.

Environment for teaching. Conducting a formative experiment in an authentic classroom led to some transformation in the teaching environment as well as the learning environment. A common practice in current education is to “unpack standards” (Zengler, 2017). This entails teachers thinking critically about the standard and determining all of the background knowledge, prerequisites, skills, and learning targets that would go into mastery of that standard. Doing this formative experiment focused on informational writing led to me to not only “unpack” the informational writing standard, but figuratively take apart the suitcase itself. Through the repeated analysis of informational text features through the iterations of the experiment, I was able to understand the features of informational writing and how they work together, how to organize a paragraph, and why each feature is important and contributes to the text. Understanding these pieces more fully as the teacher led me to be able to model, explain, and teach them

much more effectively. Spending six consecutive weeks on the same writing genre definitely facilitated this change.

Beyond the informational writing itself, doing the formative experiment led to even more reflective practice in my teaching. I have considered myself to be a very reflective teacher from the beginning of my career, constantly evaluating current student learning and my teaching practices, and looking for ways to continually improve student learning. The writing protocol in this study furthered that reflection and reinforced the power of diving in deeply to the data to make instructional decisions. For example, analyzing the students' overall Prompt 1 scores and the scores within each category, I was able to see that Organization was the lowest scoring category. That led me to adjust the instruction for Prompt 2, to focus more on Organization as part of the planning stage. Being able to pinpoint the pieces that required more instruction led to a discovery that when given the instruction in the areas they were lacking, students were capable of much more than I had previously seen them produce.

When I designed the initial writing protocol, I was unsure what the outcome would be. I knew I had higher expectations for student writing than other second-grade teachers I had worked with, but I also knew that I taught writing more regularly. I based my internal expectations for student writing quality on several factors: the CCSS for second-grade informational writing, writing I had previously seen second-grade students produce, and existing research about primary writers and informational text. As I began the study, I knew that only 50% of the students in this study had demonstrated grade-level basic literacy skills at the beginning of their second-grade school year, and several

of them had demonstrated reluctance toward writing throughout the year. However, as I began implementing this writing protocol, I began to see very quickly that the students were capable of more than what I had previously seen them produce, and were able to revise their writing effectively with sufficient time and adequate instruction. I expressed in the teacher journal that,

I am really wondering what is acceptable/appropriate to expect from second-grade writers. I just keep pushing them, and a lot of the students are measuring up. . . The amount of revision I am seeing is not something I have had before! Several of the students are adding full sentences and moving sentences and phrases to different pages. (Teacher Journal, May 2)

Through the components of the writing protocol, all of the students' revisions, independent writing quality, and productivity improved much more in six weeks than I anticipated. The complexity and productivity expectations increased across each prompt, and students repeatedly were able to meet those demands. My expectations for second-grade writers were increasingly heightened throughout this study, leading me to strengthen my beliefs that all students can reach adequate levels of success when given appropriate instruction. Hattie's (2009) 15-year research project to determine what works in school's documents that teachers' beliefs in their students' abilities is one of the greatest influences over student achievement in which schools do have control over. This present research study adds support to his conclusion; as my expectations as a teacher increased, so did the students' writing achievement.

Limitations

Although this study does add to the literature on writing instruction in the primary

grades, revision instruction, and using digital applications to write and revise informational text, it is not without limitations. Any significant results and conclusions from this study need to be interpreted with these limitations in mind. The most significant is that this study was conducted in one classroom and may not be generalizable to classrooms in much different contexts with different characteristics. Also, because this study was a formative experiment, there was not a control group to have a direct comparison to another classroom in a similar context. Not having a control class limits the conclusions that can be drawn from comparing the baseline data and the post-assessment because it is difficult to know exactly how much growth the students would have on their writing without the focused writing instruction.

A delimitation of this study was the relatively short-time frame of instruction and time between the baseline data and post-assessment. The study was conducted in an authentic classroom setting, with a large amount of curriculum in all subjects to address throughout the school year. Therefore, spending more than six weeks on one specific genre was not feasible even though the students continued to grow in writing achievement throughout the school year. This short-time frame also did not allow me to ascertain students' progress long-term nor the stability of their progress. However, it should be noted that the time frame was sufficient for helping most students reach grade-level writing expectations for composing informational texts. It appears to have been time well spent and indicates that the protocol was effective and efficient as a writing approach.

Another important aspect of the study to address is that I was the researcher and

the classroom teacher. This allowed me to have insights as a researcher that I may not otherwise have had, but is also a delimitation in that I intentionally switched roles during the writing workshop from teacher during the mini-lesson, to participant observer when the students were writing. Although this is a possible strength in that I was involved in the instruction of this formative experiment, it was important to remain aware of the dual roles of teacher and researcher. Finally, I did not collect quantitative data on the students' handwriting or typing fluency at any point during the study. This would have given additional insight into students' writing productivity and for whom the use of the digital application during revision was most beneficial.

Implications

Inherent in the nature of formative experiments is a connection between theory and practice. Theory informed the initial pedagogical goal and design of the intervention, and the results of the intervention can inform theory in return. Previous research regarding early writers' revisions has suggested that young writers are capable of revising, but need adequate instruction and support to do so effectively (Graham, Bollinger et al., 2012; Saddler et al., 2014). Yet, the need exists for conclusive research providing evidence-based practices for elementary revision instruction that will improve students' overall writing quality. The revision-focused writing protocol that students participated in during this study provided second-grade writers with focused revision instruction and a digital application to use while revising. Students were able to revise their drafts and improve their writing to meet grade-level expectations for informational

writing quality. Thus, several implications exist for classroom teachers and future research.

Implications for Practice

It is my hope that this study provides information for other educators interested in improving early-writers' revisions and increasing the quality of early-writers' informational text. Implications for classroom practice include: a) dedicate time for students to not only write, but also time to revise their writing; b) use explicit instruction to teach genre features and revision strategies; c) provide opportunities for students to have authentic writing experiences; d) teach primary writers to use peer revision and peer collaboration; e) incorporate technological tools to support students' revision and foster proficient digital writing.

Time to write and revise. Saddler et al. (2014) described the differences between effective and less effective revisers. One of these differences is the time spent revising, with effective writers spending a greater proportion of time revising, even considerably more time rewriting their work than initially drafting it (Hayes & Flowers, 1986; Saddler et al., 2014). Learning to write takes frequent practice with sufficient support and instruction (Smith & Swain, 2011), thus the importance of dedicating time to writing and more time to revision is a significant implication for classroom practice. Each writing session in this study was 45-60 minutes in total, including teacher instruction and student independent writing time, with a total of 8-10 sessions per prompt. Despite some variation, at least half of the sessions during each prompt were dedicated to revision. This may appear an intense amount of time, but the majority of the students in this study were

able to use revision to aid in production of grade-level quality informational texts after only two weeks. However, the entire six weeks of instruction in revision were necessary in order for all students to achieve grade-level informational writing competency. Providing students with ample and adequate time to plan, write, and especially revise their writing is crucial for developing primary grade students' capabilities with revision.

Beyond the day-to-day time for each writing session, the overall time spent focused on one particular genre may have been a key factor in the writing protocol being successful for all students. Six weeks of the school year is a relatively large amount of time, especially when considering the multiple writing genres that teachers are asked to teach and the multitude of other subjects, standards, knowledge, and skills that elementary students need to learn. However, the writing protocol incorporated many other language arts skills such as developing oral language in discussions about the texts and genre features, reading exemplar and student-produced informational texts, deepening understanding of science vocabulary and concepts through reading and writing about them, and thinking critically. With these components taken into consideration, the writing protocol was in reality an integrated unit focused on science informational text for real-world purposes and audiences. Thus, teachers can use writing instruction as a platform for teaching content and supporting many other curricular priorities while they guide students to writing mastery.

Explicit instruction. Providing time for primary-grade students to revise is an important step, but not sufficient to create effective revisers if unaccompanied by effective instruction. Revisions implemented by elementary students, especially those in

early grades, are often surface-level and do not always improve the overall quality of the writing itself (Saddler et al., 2014). Revision instruction is a necessary factor to support students being able to create effective and meaningful changes in their writing. In this study, the use of explicit instruction in genre features and revision strategies, with a GRR, seems to have been an integral component in the high level of improvement in revision and overall writing quality. Prior research has reported that explicit instruction has been successful in elementary writing instruction with the planning and drafting areas of the writing process (Graham, McKeown et al., 2012). This study suggests that explicit instruction is effective for teaching revision as well.

Throughout the 6-week writing protocol, the writing tasks were progressively demanding. This was not part of the initial design of the study, but due to an evolution in my expectations based on observations of students' writing abilities throughout the study. Throughout the study, I sensed that setting high expectations for all students and scaffolded instruction to facilitate students in achieving these expectations resulted in high levels of writing achievement from all students. Set in a mainstream classroom, this study included English learners and students from low socio-economic backgrounds, as well as students with attention deficit problems, speech and language difficulties, and lower basic early literacy skills. Notably, the majority of students in the study was able to produce writing beyond grade-level expectations as set forth by the CCSS for second-grade informational writing. Setting high expectations for all students, including early writers, has the potential to push teacher instruction and student achievement to higher levels.

Authentic writing experiences. Each prompt in this study provided the students an opportunity to write for stipulated purposes and audiences, such as planetarium visitors and younger students at the school. Qualitative data from the teacher journal frequently included insight into how these authentic writing experiences encouraged students to consider the purpose and audience while they were writing. I believe that focusing on the meaning of the composition and how it might be interpreted by a reader was a motivating factor in students making revisions that were beyond the surface level. These findings echo theories about revision, that skilled revisers critically read their work focusing on the meaning rather than merely spelling, grammar, and punctuation (Saddler et al., 2014). Creating opportunities for primary students to write authentically may increase their understanding of the value and importance of revision, resulting in implementing changes that positively influence the overall quality of the text. As evident in this study, authentic writing experiences can also foster primary grade students' "writer identity" and encourage students to see themselves as productive writers from a young age.

Peer collaboration. In the small amount of existing research regarding revision instruction with elementary writers, peer collaboration is a recurring theme. In this study, peer collaboration was a small component of the revision instruction and experiences. At the end of each writing time, students were given the opportunity to share their writing with a partner, small group, and occasionally the whole class. Students did not give each other constructive feedback during this time, but could compliment aspects of each other's writing. Toward the end of each prompt, one writing session was specifically

dedicated to students doing “peer revision,” sharing their writing pieces with a partner and receiving constructive feedback. This was implemented at various levels of effectiveness, with some students enacting productive revision during this time, but others focusing more on editing changes such as spelling and punctuation. Regardless of what level of revisions the partnerships implemented during peer-revision opportunities, it was apparent that primary-grade students are capable of working collaboratively to improve a text. This has implications for classroom practice, that students as young as second grade can be taught to enact peer-revision processes. Not only can peers give constructive feedback that may be received more readily than teacher feedback, the peers are able to closely review other examples of the genre and get even more experience revising a text.

Digital writing. This study explored the use of digital writing with early writers as they used a digital application during the revision process. Results from this study are encouraging, suggesting that revising digitally may lighten the cognitive load of transcription and allow writers to devote more working memory to the task of revision. Qualitative data from this study supports previous research findings that students in the primary grades are faster at handwriting than typing (Connelly et al., 2007), but these second-grade students were still able to produce quality writing when revising digitally. This brings additional value to teaching technology skills to primary-grade students such as keyboarding, and utilizing digital devices to write and revise. Students are expected to write digitally in elementary school to demonstrate knowledge, and in the past have not shown high levels of proficiency when asked to do so (NAEP, 2014). Teaching students

how to write while using technological devices starting in primary grades may help prepare them to write more proficiently via this medium in an increasingly digital world.

Implications for Research

Studies investigating elementary revision instruction have analyzed the effects of peer collaboration, direct instruction within the writing process, and technological tools on students' revisions. This study was different than previous research in that it was conducted with primary-grade students and adaptations were made throughout the course of the study. The findings from this study can inform theory and suggest several areas of future research.

First, it may be beneficial for this study to be replicated with a larger sample size, to include equal numbers of participants in an intervention and control group. Using two comparable groups of students would provide additional evidence regarding whether modifications to writing workshop in this study, namely explicit instruction and the use of digital writing, significantly increase student revision and improve informational writing quality. It would also be beneficial for this study to be implemented with the focus on additional genres and at different times of the school year, to observe how revision instruction and the use of digital applications can influence primary-grade students' revisions and writing quality of narrative and argumentative compositions.

Revisions that students implemented in their writing in this study were categorized using a modified coding scheme from Saddler et al (2014) that included word-, phrase-, sentence-level, and organizational changes. The data from these revision classifications were used primarily to observe types and quantities of revision in order to

describe group findings and themes. Further research on individual students' revisions and specific ways that these revisions affected the overall text quality would be necessary to fully understand best practices for teaching revision strategies and features of a genre that will improve student-writing quality. Individual case studies researching primary-grade students' revisions of text would provide further insight and benefit teachers wishing to use these practices in their classrooms. Additionally, there were two informational text features that were not focused on during instruction in this study—the use of headings and compare/contrast language. Research is needed incorporating these features in instruction to determine whether early-grade writers can successfully implement these features in their informational text.

Second, identifying an existing reliable IWA to evaluate primary grade student writing in this study was a difficult task. Continued development of valid and reliable IWAs for students in primary grades is an area of research that would benefit the field at large. Standardized writing assessments may also enable educators to establish “typical” levels of writing proficiency for each grade level and identify what level of expectations would match students' writing development. Standardized assessments for primary-grade reading are plentiful, yet are severely lacking when it comes to writing. It is difficult for an educator to encourage student-writing proficiency when there is not an existing target. These assessments could also help educators see more closely in what feature or aspect of writing the student needs additional improvement.

Third, some of the unanticipated outcomes and components of this study would benefit from further research to explore and understand their role for primary grade

writing instruction. These include: a progressively demanding approach to writing instruction, the significance of an authentic prompt for writing, the relationship between quantity and quality of text for early writers, and an examination of the preferability of different writing genres amongst early writers. Exploring each of these areas would lead to further understanding regarding primary-grade writers and writing instruction.

Last, the formative experiment design was an integral part of the success of the writing protocol in this study. The teacher-researcher decisions during writing instruction were critical as I frequently examined the quantitative and qualitative data and reflected on how I could modify the writing protocol to facilitate student independence with effective revising. Flexibility within a research study to make modifications to an intervention is not often permissible as researchers seek to control what is currently happening and report the findings. In order to use a pragmatic approach with students and determine what works best to promote writing achievement for all students, it is critical to not only observe and reflect but to also make changes and then further study the impact of these changes. Therefore, more formative experiments are needed within writing research to examine best practices for writing and revision instruction that work for early writers.

Concluding Thoughts

The informational writing protocol that students engaged in during writing workshop provided second-grade students with revision-focused instruction and opportunities to improve their revisions and overall informational writing quality. The

findings from this study provide insight into what happens when second-grade students are given explicit instruction regarding revision and then use a digital application to revise their informational texts. The students in this study were able to apply word-, phrase-, sentence-level, and organizational revisions to their texts using the digital application. These revisions contributed to the overall quality of the informational texts positively, with higher mean scores for the final product of each prompt than the initial draft of each prompt. Students' mean and individual informational writing scores documented positive change over the course of the 6-week protocol, with all students being able to reach grade-level proficiency on at least one of the three prompts within the study.

These second-grade students also demonstrated significant growth on the IWA, used as a standardized pre-post measure of informational writing. However, there was not a statistically significant relationship between students' revision quantities and overall prompt scores as measured with a multiple linear regression. This may be due to the small sample size ($N=21$) of the study. The qualitative data, in the form of teacher journal entries throughout the study, outlined positive and negative factors of both the digital writing component and the revision instruction itself. Overall, this study indicates that second-grade students are capable of making higher level revisions when provided with the instruction, time, and resources to do so.

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APPENDICES

Appendix A

Literature Review Table for Revision Instruction for Elementary Writers

Table A.1

Literature Review Table for Revision Instruction for Elementary Writers

Study	Research purpose / question(s)	Sample characteristics	Procedures	Research design and analysis	Findings
Revision Instruction for Elementary Writers					
Searched ERIC, Education Full Text, Education Source, Academic Search Premier.					
Revision instruction + writing + elementary, peer revision + elementary, peer revision + primary grades, technology + revision + elementary.					
Only empirical studies from peer-reviewed journals, with elementary students in mainstream classrooms.					
7 studies met the requirements					
0 studies with primary grades – students younger than age 9					
2 specific to peer revision					
5 specific to technology					
Brakel Olson (1990)	Explored the effect of peer feedback and revision direct instruction on the revision behavior and quality of writing.	$N = 93$ 6 th grade students from 6 classrooms in 4 different U.S. middle-class suburban schools	Measured type and amount of revision behavior in four instructional situations over 4 ½ months. RI/PP – 6 lessons with revision strategies taught, peer partners to revise PP – no revision strategies taught, peer partners to revise RI – 6 lessons with revision strategies taught, revised alone C – no revision strategies taught, revised alone.	First and final drafts compared. Chi-square analysis. Revisions tallied and classified using Bridwell (1980) categories: - single word level - multiple-word level - sentence level - multiple-sentence level Writing quality analyzed with Cooper's (1977) personal narrative writing scale with modifications.	Revision behavior was influenced by instruction. There were significant differences across groups on rough and final drafts. All participants did most of their revising at the word level. RI/PP – majority revised more on the final draft PP – correlated positively with overall writing quality, revised more on the final draft RI – majority revised more while drafting than between rough and final drafts, more revisions but overall writing quality declined between first and final drafts C – revised more on the final draft

(table continues)

Study	Research purpose / question(s)	Sample characteristics	Procedures	Research design and analysis	Findings
Zamuner (1995)	Examine whether cooperative writing and revising significantly influence text quality.	N = 34 "Normal" range students ages 9-10 from 4 schools in Italy.	Students wrote a draft of a narrative text using a word processor, then revised in 3 different conditions, with no time limit and general revision instructions of "make it better," and "correct mistakes." 3 different revising conditions: 1. Independent writing and independent revising 2. Independent writing and collaborative revising 3. Collaborative writing and collaborative revising	Analyzed using a coding schema to assess general and syntactic text features, text correctness, story content, and structure.	Revision did improve text quality, and whether students worked independently or collaboratively did influence the text quality. Condition 1 – improvements in some areas of the text Condition 2 – significant improvement in almost all measured areas of the text Condition 3 – improvements in some areas of the text
Reynolds & Hart (1990)	Examined the effect of three methods of prewriting organization on the revision or compositions	N = 36 4 th grade students	Random assignment to 1 of 3 groups using a different type of prewriting organization. 1. Brainstorming 2. Outlining 3. Cognitive mapping	Students were instructed on the prewriting method and worked on examples prior to their own revising. First and second drafts were collected and scored with a 9-point organization evaluation.	Significant difference between the cognitive mapping group and the other two groups, with mapping group scoring higher on the second draft.
Fitzgerald & Markham (1987)	Investigate whether direct instruction in revision would affect student knowledge of revision, ability to make revisions on paper, and effect on writing quality.	N = 30 6 th grade students	Experimental group received 13 revision lessons over a month Control group spent the time reading good literature Participants in both groups wrote a story, were interviewed about revisions, then revised and wrote a final draft.	Post-test only design Analyzed using Faigley & Witte (1981) revision classification scheme to analyze number of revisions per 100 words.	Knowledge of revision typically linked to amount of revision in student text. No significant relationship between student knowledge of revision and quality of finished piece. No significant relationship between amount of revision and quality of final writing.

(table continues)

Study	Research purpose / question(s)	Sample characteristics	Procedures	Research design and analysis	Findings
Chanquoy (2001)	Examine if a delay between the initial drafting and the revising stages could improve frequency and nature of revisions.	N = 60 3 rd – 5 th grade students in France, 20 each grade.	3 conditions that all students participated in, writing a personal narrative. 1. Online revision – students were stopped during drafting and asked to reread and revise. 2. After-writing revision – immediately after drafting, students reread, revised, and recopied the whole text 3. Postponed revision – students wrote one day, and revised the day after	Analyzed for frequency of revisions, length of the texts, frequency of surface errors, and percentage of remaining uncorrected formal errors using ANOVA Qualitative analysis was also performed to examine kinds of errors, and formal & meaning revisions	Postponing the revision process increased the frequency and depth of student revisions. Younger students produced shorter texts but revised more than older students.
Grejda & Hannafin (1992)		N = 66 6 th grade students in 3 different classrooms.	Word processing training 1 hour a day for 5 days, 1 hour of revision instruction a day for 10 days. C-C – used word processing for all writing P-P – used paper and pencil for all writing C-P – used word processing to revise daily writing but paper and pencil to revise compositions	Students revised a standard composition and an original composition. The score for the standard measure was a percentage of the number of correct revisions to the total possible errors. The score for the original composition was a percentage of the correct revisions versus the total number of initial mechanical and organizational errors. Original compositions evaluated for overall writing quality. Revisions on both standard and original compositions classified and tallied.	Group 1 corrected a higher percentage of mechanical and organizational errors on both analyzed compositions. Groups 1 and 3 had marginally higher overall writing quality than group 2.

(table continues)

Study	Research purpose / question(s)	Sample characteristics	Procedures	Research design and analysis	Findings
Pfarrer & Fisher (2011)	Explore how a wiki on the computer could be used to support the composition and revision processes.	$N = 25$ Ages 9-10, in lower socio-economic area in N.	Students assigned to groups of 6 students for collaborative activities on and off the wiki. They worked in pairs with the computer. Wrote a collaborative informative text, going through 3 phases during 7 class sessions. Phase 1: collaborative talk Phase 2: researched the topic Phase 3: joined wiki to write in pairs for final text.	Analyzed texts using an adaptation of Faigley & Witte (1981) taxonomy of revisions.	Students revised using both surface level and text-based changes. Slightly more text-based changes, only a few changes to macrostructure. Not all pairs contributed equally to group text, but wiki space provided opportunities for student explanations, teacher insight on student thinking, and for students to be writers and readers engaged in a peer review.

Appendix B

Informational Text Writing Assessment Prompts and Scoring Guide

Informational Writing Assessment Prompts

(Purcell-Gates et al., 2007; N. Duke, personal communication, June 15, 2017)

Prompt A

Hi, I own a bookstore in Provo. A lot of people ask me for books about animals, especially cats. They do not have a cat, and they do not know much about cats. They want to learn about cats. I already have a lot of books about how to take care of a cat, but I don't have any books all about cats. Please write a book that will teach people about cats. Make pictures, too, to help them learn. I can give it to people who ask for one. Thank you.

Prompt B

Hi, I work at the Best Museum and we have lots of creature exhibits. A lot of people ask me for books about the creatures, especially bugs. They do not know much about bugs. They do not want to take care of bugs, but they do want to learn about them. Please write a book that will teach people all about bugs. Make pictures, too, to help them learn. I can give it to people who ask for one. Thank you.

Scoring Guide (Purcell-Gates et al., 2007; N. Duke, personal communication, June 15, 2017)

Informational Text Writing

ENTIRE TEXT

- 0 No response, no written text
- 1 Text does not work at all as an information text
- 2 Text really does not work as an information text but has isolated moments of attempting to do so
- 3 Text is somewhat like an information text; it works somewhat as an information text
- 4 Text is close to working as an information text
- 5 Text works well as an information text

PRIMARY TRAIT ASSESSMENT

Looks Like an Information Text

- 0 No response, no written text
- 1 Does not look like an information text at all
- 3 Looks somewhat like an information text
- 5 Looks like an information text

Text is Organized Like an Information Text

- 0 No response, no written text
- 1 Is not organized at all like an information text
- 3 Has some of the organization of an information text
- 5 Text is organized like an information text

Text Sounds Like an Information Text

- 0 No response, no written text
- 1 Does not sound like an information text at all

- 3 Sounds somewhat like an information text
- 5 Sounds like an information text

FEATURE ASSESSMENT

- 1 Initial awareness and trying out the use of feature at least once in the text
- 2 Beginning to use feature but is not quite clear on how to use it and/or confused about how to use the feature
- 3 Transitioning to use of feature more often than not
- 4 Using the feature often and adequately for the text
- 5 Using the feature effectively to add to the quality of the text

Effectively uses description(s) of attributes/components (e.g., “ants have six legs.”) to inform the reader

- 1 Never uses this feature and could have to provide information reader may want.
- 2 Uses this feature 1-2 times, but not effectively. The attributes or components provided are not related to key topics or not complete enough.
- 3 Uses this feature 2-3 times; could have used it more.
- 4 Uses this feature 3-4 times, with the attributes or components related to key topics.
- 5 Uses this feature 4 or more times, quite effectively to inform the reader; attributes or components are provided and are informative and appropriate; and use of the feature is sufficient, given the textual content

Effectively includes definitions (e.g., “Ants have spiracles, which are openings on their bodies that help them breathe.”) to inform the reader

- 1 Does not use this feature and could have to provide information for the reader.
- 2 Uses at least 1 definition, but it does not really help to inform the reader about key topics
- 3 Uses at 1-2 definitions, which are minimally helpful to inform the reader about key topics
- 4 Uses 2 definitions which are helpful to inform the reader about key topics
- 5 Uses 3 or more definitions in an effective manner to inform the reader and add to the understanding of the text topic

Effectively uses compare and contrast (talking about ways two or more phenomena are alike and different) to inform the reader

- 1 Does not use this feature and could have to provide information for the reader.
- 2 Does not use this feature and would have been inappropriate to do so, given topic.
- 3 Uses this feature only fairly effectively; More use is called for by the textual context; or the use could have been more effective in making information clear to

- the reader
- 4 Uses this feature often and adequately for the text.
 - 5 Uses this feature enough and quite effectively to inform the reader.

Effectively uses denotative language (e.g., “Most worms are between 1 and 4 inches long.) to inform the reader

- 1 Never uses this feature and could have to provide information reader may want.
- 2 Does not use this feature and would have been inappropriate to do so, given the topic.
- 3 Uses this feature fairly effectively. A clear indication that writer knows that this feature is a way to inform the reader; some connotative language used also.
- 4 Uses this feature often and adequately for the text, only a little bit of connotative language used.
- 5 Uses this feature quite effectively to inform the reader; no connotative language used inappropriately

Effectively uses timeless verb constructions (e.g., “Ants eat sugar.” vs. “The ant ate sugar.” or “The ant is eating sugar.”) to inform the reader

- 1 Never uses this feature but uses timed verbs instead.
- 2 Does not use this feature and would have been inappropriate to do so, given the topic.
- 3 Uses this feature fairly effectively. Timed verbs also used but less than timeless. A clear indication that writer knows that this feature is a way to inform the reader
- 4 Uses this feature often and adequately for the text. Mainly timeless verbs, with only a couple timed verbs used.
- 5 Uses this feature quite effectively to inform the reader; no timed verbs used inappropriately

Effectively uses generic noun constructions (e.g., “Ants have legs.” vs. “That ant has legs.” or “Joe the ant has legs.”) to inform the reader

- 1 Never uses this feature. Specific nouns used instead.
- 2 Does not use this feature and would have been inappropriate to do so, given topic.
- 3 Uses this feature fairly effectively; specific nouns used but less than generic nouns. A clear indication that writer knows that this feature is a way to inform the reader
- 4 Uses this feature often and adequately for the text. If specific nouns are present, there are only a couple, and all generic nouns are used appropriately.
- 5 Uses this feature quite effectively to inform the reader; no generic nouns used inappropriately.

Effectively uses realistic illustrations and/or graphical devices (diagrams, tables, charts) to inform the reader.

- 1 Never uses this feature and could have to provide information to reader. May use fantasy or abstract pictures instead.
- 2 Does not use this feature and would have been inappropriate to do so, given topic.
- 3 Uses this feature some when more would have been better. Or uses a mixture of realistic and unrealistic illustrations.
- 4 Uses this feature often and adequately for the text. More realistic illustrations than unrealistic.
- 5 Uses this feature quite effectively and enough, given textual content, to inform the reader. No unrealistic and/or decorative illustrations

Effectively uses headings to assist reader in locating information or to orient reader to information to come.

- 1 Never uses headings and could have to help orient, focus, or point the reader to the information to come.
- 2 Does not use this feature and would have been inappropriate to do so, given the topic.
- 3 Uses at least one heading but could have used more; the heading(s) used were helpful to the reader.
- 4 Uses this feature often and adequately for the text. Uses more than one heading that is helpful to the reader.
- 5 Uses headings quite effectively and sufficiently to assist the reader.

Effectively uses specialized vocabulary to inform the reader.

- 1 Does not use this feature and could have to provide information for the reader.
- 2 Uses at least 1 specialized vocabulary word, but it does not really help to inform the reader about key topics
- 3 Uses at 1-2 specialized vocabulary word, which are minimally helpful to inform the reader about key topics
- 4 Uses 2 specialized vocabulary words which are helpful to inform the reader about key topics
- 5 Uses 3 or more specialized vocabulary words in an effective manner to inform the reader and add to the understanding of the text topic

Appendix C
Informational Writing Rubric

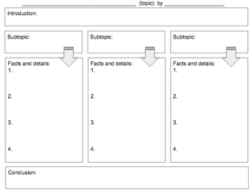
Informational Writing Rubric

	1	2	3	4
Focus	Writing has little or no focus on a single topic.	Many sentences and details in the writing do not relate to the topic.	Writing maintains a focus on a topic. One or two details may not closely relate to the topic.	Writing maintains a focus on a topic.
Content	Writing has less than 2 details, which make it difficult for the reader to understand the information.	Writing has clear ideas that are supported with 2 facts and/or definitions.	Writing has clear ideas that are well supported with at least 3 facts and/or definitions that inform the reader.	Writing has clear ideas that are well supported with more than three varied facts and definitions that inform the reader.
Organization	Writing is lacking organization and is missing components (i.e. introduction).	Writing has an introduction, body, and conclusion but they appear disorganized with few supporting details.	Writing has an introduction with supporting details used to support the body. A conclusion is present.	Writing has a clear introduction, and many supporting details used to support the body. A conclusion is clearly defined.
Style	Writing is lacking variety in sentence structure. Writing does not contain word choices that inform the reader.	Writing has a limited variety of sentence structures with some repetition. Limited (1-2) vocabulary words that inform the reader.	Writing uses some varied sentence structure with minimal sentence length. Writing contains a few (3) vocabulary words that inform the reader.	Writing uses a variety of sentence structure and length. Writing contains many (4+) vocabulary words that inform the reader.
Conventions	Writing contains incomplete sentences with many mistakes in spelling, punctuation, or grammar, making it difficult to read.	Writing contains some sentences that are complete, with many mistakes in spelling, punctuation, or grammar.	Writing contains mostly sentences that are complete with some (4-7) mistakes in spelling, punctuation, or grammar.	Writing contains only complete sentences with very few (0-3) or no mistakes in spelling, punctuation, or grammar.

Appendix D

Revision Protocol for Prompt 2

Revision Lesson Protocol for Prompt 2		
<p>Prompt 2 – At the planetarium, there is a room with many different things you can see in the night sky. There is a powerful telescope but no information about the planets, stars, sun, and moon. The planetarium director wants to print some posters with important information to hang up in the night sky room. She would like our help making these posters with important information about each of the planets. Choose a planet or other celestial body and write all about it on a poster.</p>		
Day / Writing Process Focus	Text Feature Focus / Anchor Chart and Writing Resources	Teaching Procedures
<p>1 –Reading and analysis of mentor text</p> <p>Prompt 2: <i>National Geographic Kids Reader: Planets</i> (Carney, 2012)</p>	<p>Genre: science informational text (Purcell-Gates et al., 2007)</p> <p>Features of Science Informational Text:</p> <ul style="list-style-type: none"> - Author clearly states the main idea. - The author includes supporting details that describe the main idea to provide a lot of information. - Author writes facts using “expert talk.” - Author uses specialized vocabulary and definitions. - Author organizes the text in a way so that the reader learns a lot about the topic. - Author includes realistic visuals like photographs. <p>How Does an Author Organize and Informational Text?</p> <ul style="list-style-type: none"> -introduction -headings -facts to support headings -conclusion 	<ul style="list-style-type: none"> - BACKGROUND: Remind students about the genre, its purpose, and the anchor chart listing genre features. - TO: Read mentor text as an example of the genre. Ask students to pay attention for what the author does to help inform the reader, <i>especially</i> how the author organizes the information in a way that helps us learn a lot. - WITH: Ask, “What does the author do in this text to organize the information?” Go back through the text and identify the organization. (Headings, every sentence on the page has to do with that heading, follows the informational paragraph structure with details and examples to support the main idea) List the identified organizational supports on a chart. - BY: Give students copies of science informational texts to read with a partner and look for how the text is organized. After they read, have students share examples they found and explain how the author organized the information in the book.
2 – Planning	Organizing a science informational text	<ul style="list-style-type: none"> - BACKGROUND: Remind the students about how authors can organize science informational text. Read prompt to the class and display the example of the prompt product. Have students tell what they notice about the product.

	 <p>Graphic organizer</p>	<ul style="list-style-type: none"> - TO: Model thinking about ideas to answer the prompt and organizing them onto the graphic organizer, listing different big ideas for the headings and then details/facts that would correspond to each heading. - WITH: Continue planning, asking students for input on ideas and organization and guiding them. - BY: Students create plans for their texts using their own graphic organizers. Have books available for them to find more information if they have written everything they can think of from their own mind.
3 – Drafting	<p>Informational paragraph structure</p> <p>Informational Paragraph Structure</p> <p>Main idea Detail Example/Explain Detail Example/Explain</p> <p>Informational drafting sheet with sections</p>	<ul style="list-style-type: none"> - BACKGROUND: Review one paragraph from the mentor text and discuss the paragraph structure. Point out the paragraph structure chart, and model identifying the different components of the paragraph. (This was taught in January to the students, so it will be a review.) - Provide pairs of students with paragraphs from the mentor text. Have them work together to identify components of the paragraph structure. - TO: Model writing sentences from the ideas on the graphic organizer, using the informational paragraph structure to guide the drafting of each section. - WITH: Students contribute input with using ideas from the planning organizer to continue composing the draft, using the informational paragraph structure as a guide. - BY: Students use the plans and ideas on their individual graphic organizers to draft their informational text with paper-pencil on the drafting sheet provided. <p><i>Note: After students complete their drafting on day 3, the teacher will type their drafts so they are ready to revise on day 4. The teacher will also make notes about their drafts and plan instructional revisions.</i></p>
4 – Revising	<p>Elaborations and adding details, including adjectives</p>	<ul style="list-style-type: none"> - BACKGROUND: Review what a “detail” and adjective are. Review the mentor text and identify a few details and adjectives together and discuss how they are used to inform the reader. - TO: Reread the modeled draft from day 3 (now typed), one sentence at a time, identifying any adjectives and descriptive details. If the sentence is missing adjectives and details, highlight it and model visualizing to add more specific details. - WITH: Using the highlighted sentences on the modeled draft, guide students in helping to add descriptive details

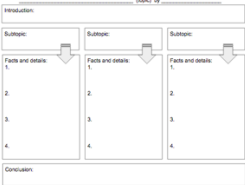
		<p>to better inform the reader about the topic.</p> <ul style="list-style-type: none"> - BY: Students reread their drafts from day 3, which are typed. They read each sentence, visualize, and add any more details or adjectives digitally to better inform the reader.
5 – Revising	<p>Specialized vocabulary and definitions</p> <p>-Anchor chart of vocabulary words and definitions specific to the topic of the prompt</p>	<ul style="list-style-type: none"> - BACKGROUND: Review the example poster and identify vocabulary words that are specific to this topic. Remind students that informational text uses specific vocabulary. In case readers don't know the meaning, the author often writes the definitions (in the text, in a word box, or in a glossary). Show the students the vocabulary anchor chart with specific words and definitions to the topic. - TO: Reread the working draft. Identify any specific vocabulary. Model adding definitions to any words that are specific to this topic. Model adding specific vocabulary if a more common word is used. - WITH: Guide students in adding specific vocabulary and definitions to the group text. - BY: Students reread their individual texts and revise adding specific vocabulary and definitions.
6 – Revising	<p>Considering organization and use of visuals</p> <p>Types of Visuals in Science Informational Text:</p> <ul style="list-style-type: none"> - Photographs - Drawings - Maps - Diagrams - Charts - Captions 	<ul style="list-style-type: none"> - BACKGROUND: Review mentor text and have students pay attention to what helps the reader organize and understand all of the information in the text (headings, visuals, table of contents). Explain that having realistic visuals in informational text is important for the reader to fully understand. Make a list of visuals that are helpful with this topic. - TO: Point out that there are no visuals in our working texts yet. Reread modeled draft and write which type of visual could be added next to each section. Model finding an online visual to add into the text with an accompanying caption or label. - WITH: Students help in writing headings for sections and identifying what type of visual each section could have, and how you could find one. - BY: Students work on revising their own informational text by adding visuals and captions/labels.
7 – Revising	<p>Peer revision and feedback</p> <p>Peer Revision Procedures.</p> <p>4. Read your texts</p>	<ul style="list-style-type: none"> - BACKGROUND: Discuss how authors often get feedback from other people to make their writing better. Discuss and model peer revision guidelines and procedures. - TO: Model peer revision procedures.

	<p>aloud to your partners while they follow along.</p> <p>5. Partners give at least three items of feedback including: one positive, and two things to make the writing better.</p> <p>6. Repeat steps 1 and 2 with your partner's text.</p>	<ul style="list-style-type: none"> - WITH: Students model peer revision procedures and teacher gives feedback. - BY: Students are in partners and follow peer revision procedures, then apply revisions based on the feedback they received from their partner.
8 – Editing and Finalizing	<p>Conventions</p> <p>Capitalization rules</p> <p>Punctuation marks</p> <p>Spelling word wall</p>	<ul style="list-style-type: none"> - BACKGROUND: Review spelling, punctuation, and capitalization rules. - TO: Model rereading text and editing. - WITH: Students reread text and edit. - BY: Students reread individual texts and edit then finalize their work.

Appendix E

Revision Protocol for Prompt 3

Revision Lesson Preliminary Protocol for Science Informational Text		
<p>Prompt 3 – The kindergarten and first grade students at our school love to learn about wild animals! But they don't have much time in class to learn about them. Their teachers saw your amazing informational writing projects, and they would like our help making animal books with interesting and important information about different wild animals! Choose one wild animal to write a book about!</p>		
Day / Writing Process Focus	Text Feature Focus / Anchor Chart and Writing Resources	Teaching Procedures
<p>1 –Reading and analysis of mentor text</p> <p>Prompt 2: <i>Rattlesnakes</i> (Matt Doeden)</p>	<p>Genre: science informational text (Purcell-Gates et al., 2007)</p> <p>Features of Science Informational Text:</p> <ul style="list-style-type: none"> - Author clearly states the main idea. - The author includes supporting details that describe the main idea to provide a lot of information. - Author writes facts using “expert talk.” - Author uses specialized vocabulary and definitions. - Author organizes the text in a way so that the reader learns a lot about the topic. - Author includes realistic visuals like photographs. 	<ul style="list-style-type: none"> - BACKGROUND: Remind students about the genre, its purpose, and the anchor chart listing genre features. - TO: Read mentor text as an example of the genre. Ask students to pay attention for what categories of information the author shares about the animal. - WITH: Ask, “What categories of information does the author teach us about the animal?” List responses (corresponding to heading topics) on the board. - BY: Give students copies of science informational texts to read with a partner and look for what categories of information the author uses. After they read, have students share some of the categories of information the author wrote about (animal’s food, habitat, what it looks like, etc).
2 – Planning	<p>Organizing a science informational text</p> <p>Chart paper for subtopics list</p>	<ul style="list-style-type: none"> - BACKGROUND: Remind the students about how authors can organize science informational text. Read prompt to the class and display the example of the prompt product. Have students tell what animal they would like to become the expert on and write a book about. - TO: Model thinking about categories (continuing on from the discussion yesterday) students can use to learn lots about their particular animal. Think aloud about a few facts you remember from yesterday’s reading of the mentor text and talk about what category they would go with. - WITH: Have students contribute to come up with the different categories/headings that they think are important to write about in the book. They can turn and

		<p>talk with a partner first, and then share out as a class. Write down the categories the class determines as important on an anchor chart. (Use these to create the organizer for their planning.)</p> <ul style="list-style-type: none"> - BY: Pass out informational books for students to read about their animals. Ask them to think about the different categories we came up with while they are reading.
2b – Planning, day 2	 <p>Graphic organizer with headings filled in</p>	<ul style="list-style-type: none"> - TO: Show students the graphic organizer and discuss how it will help them organize their facts for their book. Model writing a couple notes of facts under a section on the organizer, one you remember from reading the mentor text, and another one you find in a book right then. - WITH: Tell groups of students a particular section (such as the animal's food) from the list you came up with as a class to find/remember facts about. Have them write down their notes on a piece of paper. When all groups have at least 3 facts for their specific question, have them share with the class. - BY: Give each student a graphic organizer and their animal books. Remind the students that they can learn facts from their books, but they are not copying the sentences. Taking notes on the planning page can just be a couple of words. Let students plan facts for each section about their animal on their prewriting page.
3 – Drafting	<p>Informational paragraph structure</p> <p>Informational Paragraph Structure</p> <p>Main idea Detail Example/Explain Detail Example/Explain</p> <p>Informational drafting booklet with pages for each section</p>	<ul style="list-style-type: none"> - BACKGROUND: Remind students about informational paragraph structure. - TO: Choose one section from the planning page and model turning it into an informational paragraph on the drafting page. Think aloud writing the first sentence and then following it with the detail/explanation sentences. - WITH: Have students give input on drafting the second section of the organizer, following the paragraph structure. - Provide pairs of students with the third section from the class organizer (filled in with notes). Have them work together to turn it into an informational paragraph. Have each pair share their paragraph with the class. - BY: Students use the plans and notes on their individual graphic organizers to draft their informational text with paper-pencil on the drafting booklet provided.
3b – Drafting, day 2	Informational paragraph structure	<ul style="list-style-type: none"> - BACKGROUND: Have a few volunteer students share paragraphs they completed from their drafts yesterday.

	<p>Informational Paragraph Structure</p> <p>Main idea Detail Example/Explain Detail Example/Explain</p> <p>Informational drafting booklet with pages for each section</p>	<ul style="list-style-type: none"> - TO: Point out how the examples follow the pieces of the informational paragraph structure. - WITH: Divide up the remaining 3 sections from the class organizer to pairs of students and ask them to draft it into an informational paragraph. - BY: Students continue to work on drafting their animal books. If students finish all of the sections, they can illustrate the cover and pages. <p><i>Note: After students complete their drafting, the teacher will type their drafts so they are ready to revise on day 4. The teacher will also make notes about their drafts and plan instructional revisions.</i></p>
4 – Revising	<p>Elaborations and adding details, including adjectives</p> <p>Sentences on sentence strips from the class draft that need more details/description</p>	<ul style="list-style-type: none"> - BACKGROUND: Review what a “detail” and adjective are. Review the mentor text and identify a few details and adjectives together and discuss how they are used to inform the reader. - TO: Reread a couple sentences from modeled draft from day 3 (now typed) that have great details and description. Read a sentence that is missing adjectives and /or details, and model visualizing to add more specific details. - WITH: Give pairs of students each a sentence - on a sentence strip - from the class draft that needs more details and/or description. Ask them to work together to improve the sentence with more details and describing words. Have each partnership share with the class their improved sentence, and as they share, revise the sentence on the typed class draft. - BY: Students reread their drafts from day 3, which are typed. Ask them to identify a sentence where they did really well adding details / description, and then find any sentences that they need to improve. The students revise on the iPads by improving the selected sentences.
5 – Revising	<p>Specialized vocabulary and definitions</p> <p>-Animal vocabulary anchor chart</p> <p>-Students’ online dictionary</p> <p>-Pages from the class draft</p> <p>-Highlighters</p>	<ul style="list-style-type: none"> - BACKGROUND: Remind students that informational text uses specific vocabulary. In case readers don’t know the meaning, the author often writes the definitions (in the text, in a word box, or in a glossary). Explain that since we are writing a book for this prompt, we can make a glossary page. - TO: Show the students the vocabulary anchor chart with specific words and definitions to the topic. Reread a page from the working draft. Identify any specific vocabulary words that the reader may need a definition for and highlight them to add to the glossary. Model finding the definition on the vocabulary anchor chart

		<p>page and remind students that if the word is not on the anchor chart they can use the online dictionary to find the definition.</p> <ul style="list-style-type: none"> - WITH: Give groups of students a page from the class draft and a highlighter. Have them highlight any specific vocabulary words that we need to add to the glossary. They need to then discuss what the word means or find the definition on the vocabulary anchor chart. If students cannot find any specific vocabulary words on the page, have them discuss what vocabulary they could add to improve the text so the reader will learn a lot. Have students share the words they found and add them to the glossary page with a definition. - BY: Students reread their individual texts and revise by adding specific vocabulary and definitions to the text and creating the glossary.
6 – Revising	<p>Considering organization and use of visuals</p> <p>Types of Visuals in Science Informational Text:</p> <ul style="list-style-type: none"> - Photographs - Drawings - Maps - Diagrams - Charts - Captions 	<ul style="list-style-type: none"> - BACKGROUND: Review the list of visuals that are helpful in informational text and highlight the ones that students have seen in their books about animals. - TO: Point out that there are no visuals in our working texts yet. Reread modeled draft and write which type of visual could be added next to each section. Model finding an online visual to add into one page of the text with an accompanying caption or label. - WITH: Assign pairs of students a section of the class draft and have them find an image/visual that would be helpful to the reader to add to the text. If they have time, have them write a caption to go with the image. Ask a few pairs of students to share the image they found and explain how that image helps the reader understand the text and learn more. - BY: Students work on revising their own informational text by adding visuals and captions/labels.
7 – Revising	<p>Peer revision and feedback</p> <p>Peer Revision Procedures.</p> <ol style="list-style-type: none"> 7. Read your texts aloud to your partners while they follow along. 8. Partners give at least three items of feedback including: one positive, and two things to make 	<ul style="list-style-type: none"> - BACKGROUND: Discuss how authors often get feedback from other people to make their writing better. Discuss and model peer revision guidelines and procedures. - TO: Model peer revision procedures. - WITH: Students model peer revision procedures and teacher gives feedback. - BY: Students are in partners and follow peer revision procedures, then apply revisions based on the feedback they received from their partner.

	<p>the writing better.</p> <p>9. Repeat steps 1 and 2 with your partner's text.</p>	
8 – Editing and Finalizing	<p>Conventions</p> <p>Capitalization rules</p> <p>Punctuation marks</p> <p>Spelling word wall</p>	<ul style="list-style-type: none"> - BACKGROUND: Review spelling, punctuation, and capitalization rules. - TO: Model rereading a page of the class draft and editing it for conventions. - WITH: Pairs of students reread a page from the class draft and edit. Have a few students share anything they changed in their editing. - BY: Students reread individual texts and edit then finalize their work.

Appendix F

Common Core State Standards for Grade 2 Informational Writing

Common Core State Standards for Grade 2 Informational Writing

CCSS.ELA-LITERACY.W.2.2

Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

CCSS.ELA-LITERACY.W.2.5

With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.

CCSS.ELA-LITERACY.W.2.6

With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

CCSS.ELA-LITERACY.W.2.7

Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

CCSS.ELA-LITERACY.W.2.8

Recall information from experiences or gather information from provided sources to answer a question.




Common Core State Standards Initiative (2018)

Appendix G

Planning Sheet for Prompt 2

Planning Sheet for Prompt 2

_____ (topic) by _____

Introduction:		
Subtopic:	Subtopic:	Subtopic:
		
Facts and details: 1. 2. 3. 4.	Facts and details: 1. 2. 3. 4.	Facts and details: 1. 2. 3. 4.
Conclusion:		


Appendix H

Planning Sheet for Prompt 3

_____ (animal) by _____

Introduction:

What is a
_____?




Facts and details:
-

-

-

What _____
Look Like




Facts and details:
-

-

-

Habitats and Homes



Facts and details:
-

-

-

Food	Life Cycle	Dangers to
<p>Facts and details:</p> <ul style="list-style-type: none">---	<p>Facts and details:</p> <ul style="list-style-type: none">---	<p>Facts and details:</p> <ul style="list-style-type: none">---
<p>Amazing Facts:</p>		

Appendix I

Anchor Charts Created and Used During Writing Protocol

What is **SCIENCE** **INFORMATIONAL TEXT?**

Non-fiction text written to inform others about the natural world.

examples:

Features of SCIENCE INFORMATIONAL TEXT

- * Author clearly states the
MAIN IDEA
- * Author includes
SUPPORTING DETAILS
to describe the main idea
& provide lots of information
- * Author writes facts using
"EXPERT TALK"
- * Author uses
SPECIFIC VOCABULARY
and definitions
- * Author
ORGANIZES the text so the
READER LEARNS A LOT
about the topic
- * Author includes
REALISTIC VISUALS
like photos

NAME: _____

TOPIC: _____

SUPPORTING
DETAIL

SUPPORTING
DETAIL

SUPPORTING
DETAIL

SUPPORTING
DETAIL

MAIN IDEA

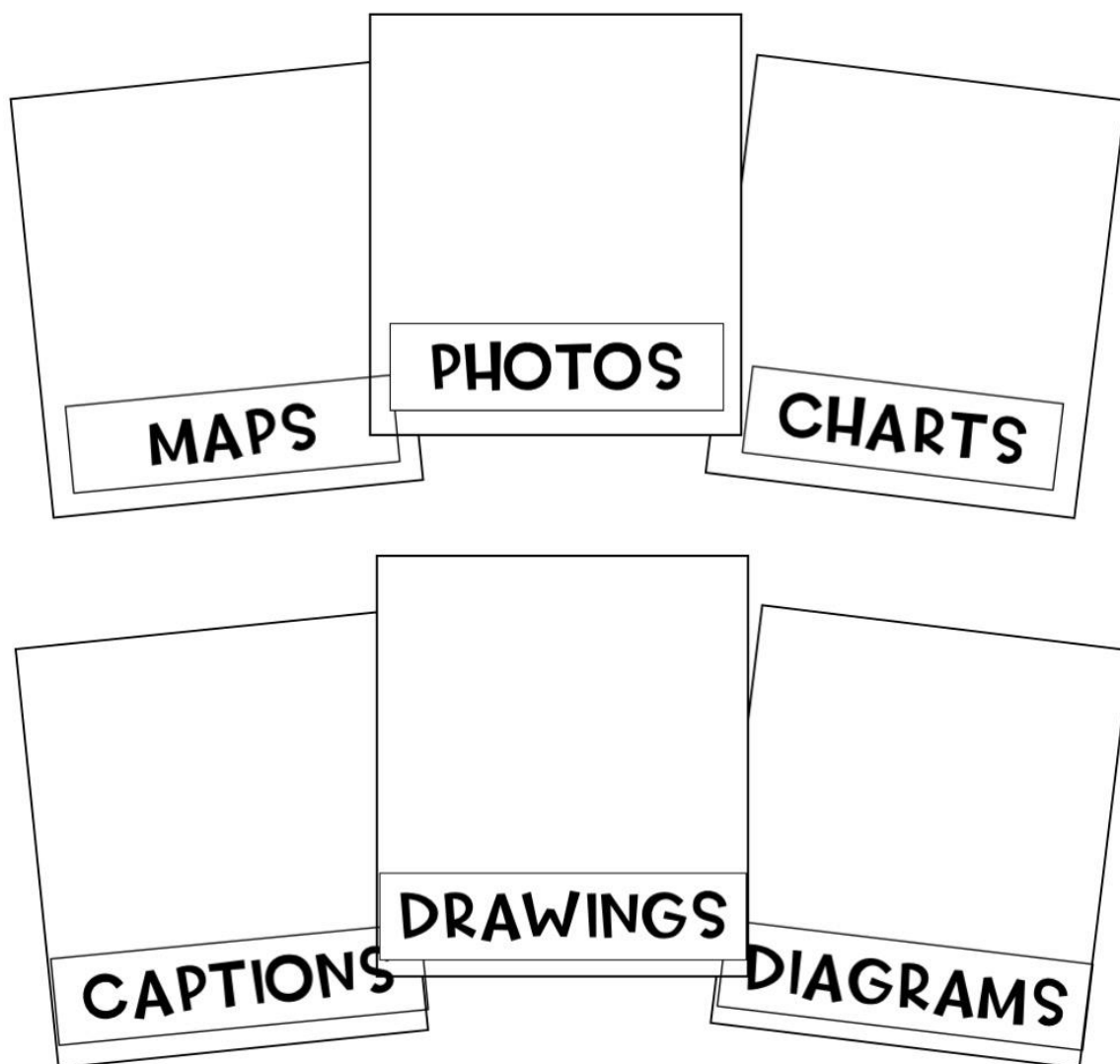
SUPPORTING
DETAIL

PRE-WRITING FOR A Science Informational Text



- Speak like a reporter
- Tell facts, not opinions
- Use declarative sentences
- Don't use the words "I," "you," or "we"
- Use specific vocabulary

Types of
VISUALS
in science informational text





PROCEDURES FOR PEER REVISION

1. READ YOUR TEXT

Partner A → Partner B

2. GIVE FEEDBACK ABOUT THE WRITING

Partner B → Partner A

- "You did really well with..."
- "Something you can improve is.... and"



3. SWITCH PLACES

Repeat steps 1 & 2 with Partner B's text

4. REVISE YOUR WRITING

based on feedback from your partner

Informational Text **EDITING CHECKLIST**

- ☐ My sentences begin with capital letters.
- ☐ My sentences end with a punctuation mark.
- ☐ I used commas in lists and dates.
- ☐ I used a capital letter for names, dates, headings, titles, and names of places.
- ☐ I put a space between sentences and after punctuation marks.
- ☐ I spelled words I know correctly.
- ☐ I tried at least one strategy to spell new words.

INFORMATION PARAGRAPH STRUCTURE

MAIN IDEA

DETAIL

EXAMPLE / EXPLAIN

DETAIL

EXAMPLE / EXPLAIN

DETAIL

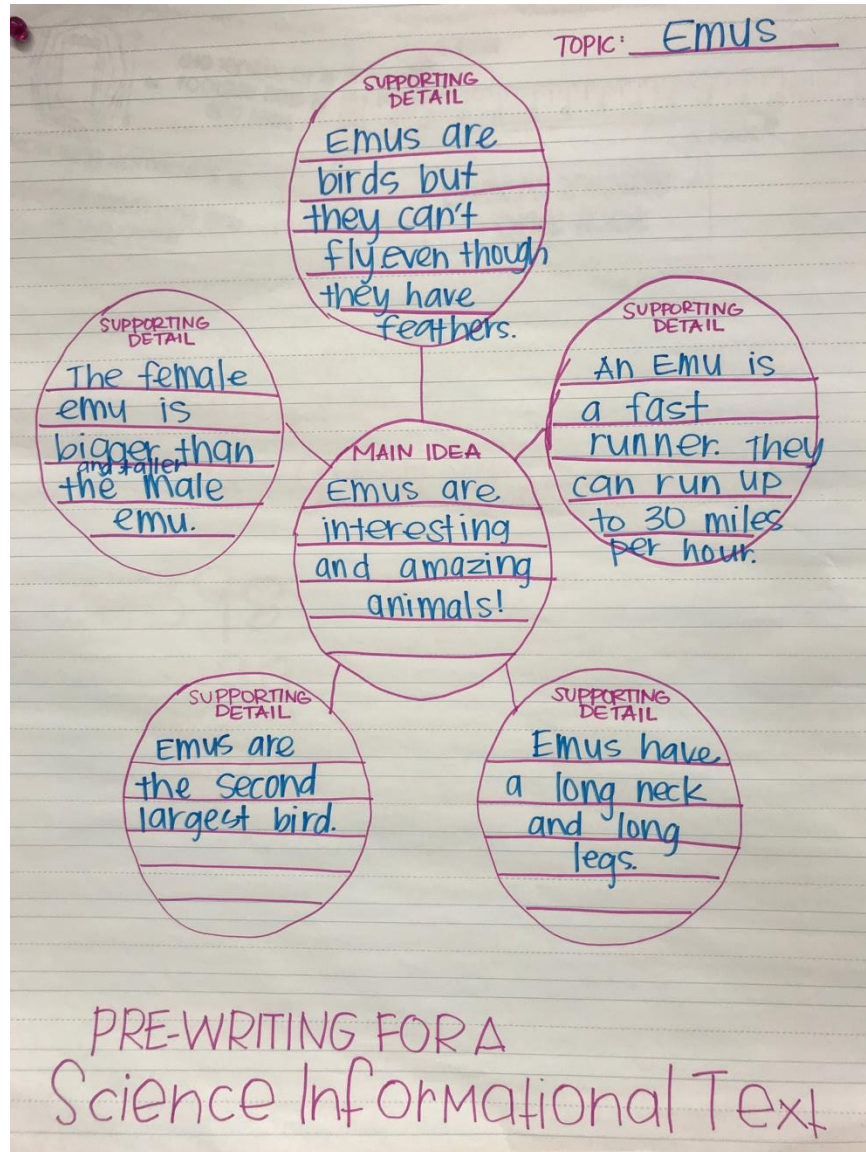
EXAMPLE / EXPLAIN

SPACE VOCABULARY

ORBIT	The path one object takes around another object
GRAVITY	Force that pulls objects
STAR	Huge ball of hot gas that makes heat and light
PLANET	Large object that orbits a star
GAS	Something that can spread out into the space around it
ASTEROID	Medium size chunk of rock and metal that orbits the sun
GALAXY	Large group of stars, dust, gas, and dark space held together by gravity.
COMET	Small object that orbits the sun and has a tail when it's close to the sun
METEROID	Small rock in the solar system, smaller than an asteroid
SOLAR SYSTEM	The sun and all the objects that orbit around it
SUN	A star, the biggest object in the solar system
UNIVERSE	Everything that exists in all of space
ASTRONAUT	Someone trained to travel into space
SPACECRAFT	Vehicles that can travel into space
ATMOSPHERE	The air all around a planet
ROTATE	When an object spins
SATELLITE	Small object orbiting a larger one
CONSTELLATION	Group of stars that make a shape
TERRESTRIAL PLANETS	Planets with solid surfaces, made of rock
MOON	Object that orbits a planet
GAS GIANTS	Planets made of gas that do not have solid surfaces

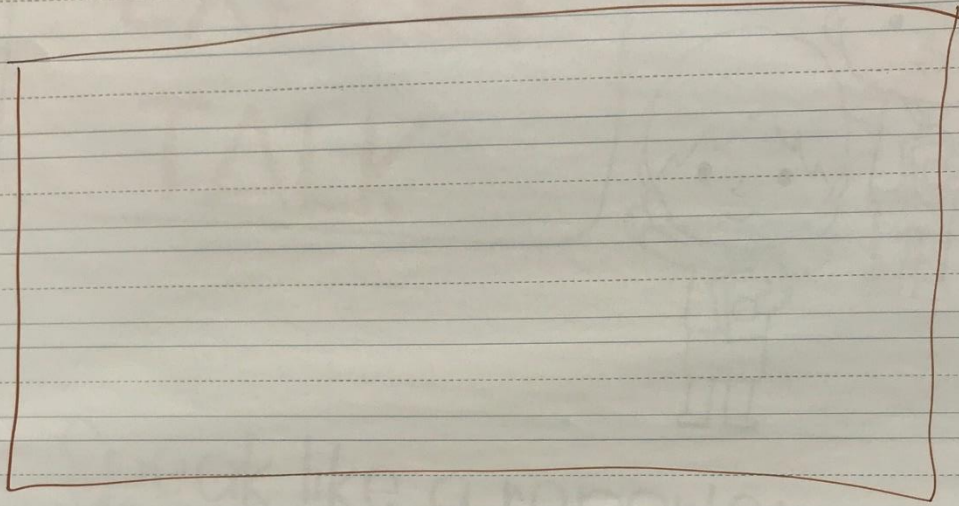
Appendix J

Class-Created Prompt 1 Planning, Draft, Final Product



Emus

by Mrs. Jorgensen



Emus are interesting and amazing animals. Emus are birds but they can't fly, even though they have feathers. Emus are the second largest bird. Emus have a long neck and long legs. The female emu is bigger and taller than the male emu. An emu is a fast runner. They can run up to 30 miles per hour. Emus live in Australia but there is one here in this petting zoo!

Amazing Emus

by Mrs. Jorgensen's Class



What is an Emu?

Emus are amazing and interesting animals! Emus are birds but they can't fly, even though they have feathers.



Emu Bodies

Emus are the second largest bird. Their height is about 6 feet, and they can weigh 100 pounds. The only bird that is bigger than the emu is the ostrich. Emus have red eyes. Emus have a long skinny neck and long thin black legs like flamingos. The female, or girl emu is bigger and taller than the male, or boy emu.



Life Cycle

The female emu lays eggs in a nest, and the male emu sits on the eggs to incubate, or keep them warm. They have green eggs. The male emu teaches the baby emus how to survive from predators, which are animals who hunt them. Both parents help protect the baby emus.



Fun Facts

Emus are omnivores. They eat bugs, leaves, seeds, lizards, flowers, and grass. An emu is a fast runner. They can run up to 30 miles per hour. Emus natural habitat is in Australia, but there is one here in this petting zoo in Springville City.

Appendix K

Class-Created Prompt 2 Final Product

Mars

by Mrs. J's Class

Do you want to learn about Mars? Read this poster to find out interesting facts about it!



This is the planet Mars, like you can see from a telescope.

What is Mars?

Mars is a planet in space. Mars is like a desert, all rocky and sandy. There are 12 different types of rocks on Mars. Mars has two moons. The names of the moons are Phobos and Deimos. People can't go on Mars yet because they could die since there's no

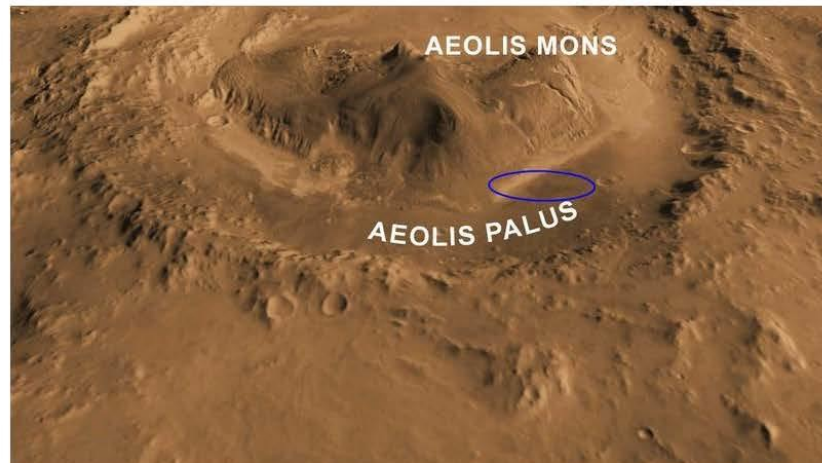
air. That's why they send robots to take videos and pictures.



This is what Mars surface looks like. The photo was taken by a robotic spacecraft that landed on Mars.

What Does Mars Look Like?

Mars is called the red planet. A planet is a large object in space that orbits the sun. It is a terrestrial planet, which means a rocky planet. It has a hill with a rock that looks like a face because of the craters, which are holes made by asteroids. Some scientists found out there used to be water on Mars so it was more like Earth.



These are mountains on Mars.

Cool Facts

1. Mars has the record for the tallest mountain in the solar system. It is named Olympus Mons, and it is 17 miles high!
2. Sometimes Mars has sandstorms that could cover up the whole planet.
3. Someday people will live on Mars.
4. It has huge boulders which are huge rocks.

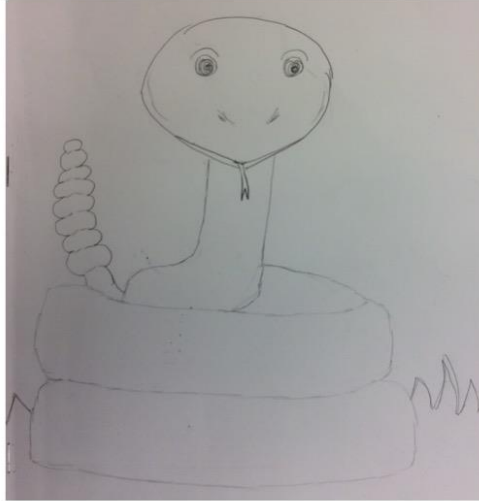
Make sure you learn more about Mars on the internet!

Appendix L

Class-Created Prompt 3 Final Product

Rattlesnakes

by Mrs. Jorgensen's Class



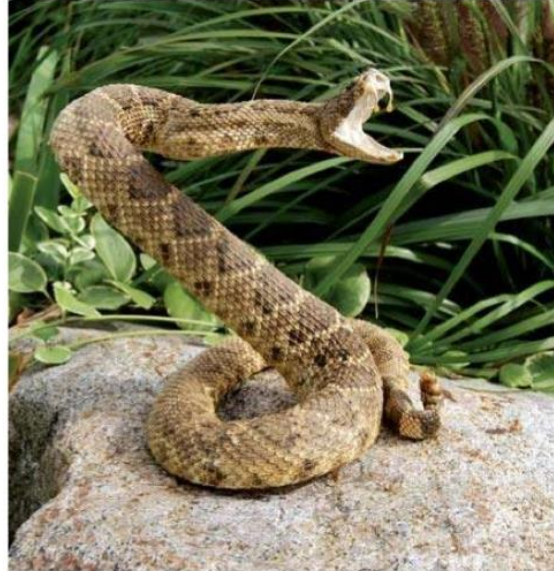
What Is A Rattlesnake?



A rattlesnake is a long, skinny reptile. A reptile is a type of animal. Reptiles are cold-blooded animals with scaly skin. A rattlesnake is a viper snake. Vipers are usually poisonous snakes. The rattlesnake got its name from the rattles on its tail. The rattles make a sound to warn its **prey**.

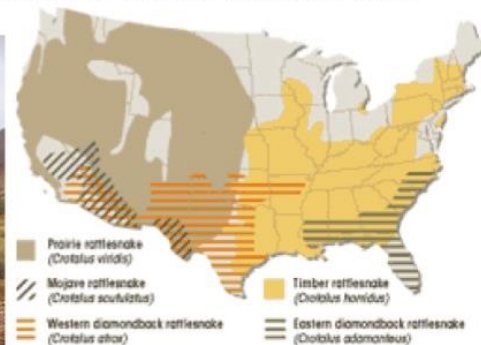
What Rattlesnakes Look Like

Rattlesnakes are brown or tan colors. Some are even pink or green or black. They have colors to blend in with their **habitat**. Their skin has scales all over. They can grow up to 7 feet long! That is as tall as basketball player Rudy Gobert. Rattlesnakes have a rattle on their tails. Rattlesnakes have sharp fangs and long tongues.



Rattlesnake Habitat

Rattlesnakes can be found in North America and South America. The habitats they live in are **grasslands**, deserts, and murky swamps. A murky swamp is a place full of mud and wet land. Some species of rattlesnakes live in prairies or high in the mountains. Species are types of rattlesnakes, and there are more than 30 different types. Rattlesnakes make their homes in burrows underground. A burrow is a hole where animals live.



Rattlesnake Food

They have **venom** in their **fangs** that goes into their prey to kill it. The venom starts to kill the prey before it even gets eaten. Rattlesnakes can use as much venom as they want. The animal dies before it can get very far away. They eat small animals like birds, lizards, rats, and mice. Rattlesnakes swallow their prey whole! Sometimes they eat other snakes.



Rattlesnake Life Cycle

Rattlesnakes are born alive in clear **sacs**. Groups of baby rattlesnakes are called broods. Female, or girl, rattlesnakes give **birth** to 8 to 30 babies at a time. They grow to be a young snake, which is like a teenager snake, then an **adult**. Then they find a **mate** to have more baby snakes!

Dangers to Rattlesnakes

Many **predators** hunt young rattlesnakes including badgers, hawks, skunks, and alligators. People hunt and kill rattlesnakes. Rattlesnakes also die when their habitats are destroyed. Rattlesnakes protect themselves by using their fangs and venom. Some kinds of rattlesnakes are endangered. Endangered means they could all disappear from the earth.

Amazing Facts

1. The rattles on rattlesnakes are made of keratin, which is hard stuff like what your fingernails are made of.
2. Rattlesnakes do not have ears. They lay on the ground to feel sound.
3. Some rattlesnakes live up to 20 years old!

Glossary

Adult - grown-up, fully grown animal

Birth - when new animals are born

Mate - partner to help make babies

Predators - animals that hunt and kill other animals

Sacs - like clear, soft eggs

Burrows- a hole in the ground that is an animal home

Fangs- pointy teeth

Grasslands- land covered in grass

Habitat- a place where an animal lives

Prey- the things an animal eats

Venom- poison

CURRICULUM VITAE

ALAYNE LEAVITT JORGENSEN

Education:**Ph.D.** Education, Utah State University, 2019

Emphasis: Curriculum and Instruction

Specialty: Literacy

Dissertation title: Exploring the Influence of Digital Writing on Primary Students' Revisions of Informational Text: A Formative Experiment

Committee Chair: Dr. Kit Mohr

Committee Members: Dr. Sylvia Read, Dr. Cindy Jones, Dr. Marla Robertson, Dr. Sandi Gillam

M.Ed. Education, Utah Valley University, 2012

Emphasis: English as a Second Language

Committee Chair: Dr. Bryan Waite

Committee Member: Dr. Mike Patch

B. S. Elementary Education, Utah Valley University, 2010

Summa cum laude

Professional License:*State of Utah, Level III Teaching License*

- Elementary Education
- ESL Endorsement

Teaching Experience:*Alpine School District, 2018-current***Instructional Coach and Partnership Facilitator**

Member of the administration and school leadership team.

Mentor, observe, evaluate, support, and coach provisional educators, student teachers, and interns in an elementary school.

Work with individual K-6 teachers and professional learning communities to achieve their goals for student learning.

Implement and oversee school-wide Tier II intervention programs.

Instructor, Utah State University, 2018-current

Elementary Reading Instruction

Teach evidence-based best practices for reading instruction to undergraduate students in the elementary education program.

Broadcast course to various distance sites.

Utilize Canvas and other online supports to facilitate student learning and engagement.

Responsible for lectures, assignments, quizzes, and grading.

Mount Mahogany Elementary, 2009-2018

Second Grade Teacher

Collaboration team leader, 2014-present

Alternative Language Services site coordinator, 2014-2016

Wrote and directed grade-level program, 2012-present

Mentored multiple student teachers and student field experiences, 2011-present

Taught professional development courses to staff on student behavioral interventions (2015) and using technology in the classroom (2014)

First Grade Teacher

One-year internship through Utah Valley University

Focused on developing students' early literacy skills through a balanced literacy approach: Guided reading, shared reading, read-aloud, independent reading, writer's workshop, shared writing, and word study.

Instructor, Utah State University, 2014

Content Area Literacy

Master's level course taught online. Responsible for lectures, assignments, and grading.

Teaching Assistant, Utah State University, 2013-2014

Elementary Assessment and Differentiation

Responsible for some lectures, grading tests and assignments, and working with all distance students in the course.

Scholarship:

Publications:

Jorgensen, A., & Read, S. (2016). Narrowing the Discourse Possibilities: An Examination of Second Grade Curriculum Materials for Teaching Writing. *Association of Literacy Educators and Researchers Yearbook*, 38, 103-116

Mohr, K., Read, S., & Leavitt, A. (2015). High Expectations: Increasing Productivity and Complexity in English Learner Writing. In M. Daniel & Kouider Mokhtari (Eds.),

Research and instruction that makes a difference in English learners' success (pp. 19-34). Rowman and Littlefield Publishers, Inc.

Leavitt, A. (2013). Teaching English language learners in the mainstream classroom: The methods teachers use. *The Researcher*, 25(1), 79-93.

Presentations:

National:

Jorgensen, A. et al. (2015, November). Doctoral Epiphanies, What We Thought We Knew, but Know Better Now. Presentation at the 59th Annual Conference of the Association of Literacy Educators and Researchers.

Read, S. & Jorgensen, A. (2015, November). The Effect of the Common Core on Second Grade Writing Curriculum: A Content Analysis of Two Core Literacy Programs. Presentation at the 59th Annual Conference of the Association of Literacy Educators and Researchers.

Mohr, K. & Leavitt, A. (2014, October). Understanding the Writing Development of English-only and English Language Learners in a Second-Grade Writing Program. Presentation at the 58th Annual Conference of the Association of Literacy Educators and Researchers.

Regional:

Mohr, K., Read, S., & Leavitt, A. (2014, September). Increasing Writing Productivity and Complexity. Presentation at the Annual Conference of the Utah Chapter of the International Reading Association.

Evans, M., Flory, M., Leavitt, A., & Kumar, T. (2013, September). Bridging the Gap Between Research and Practice. Presentation at the Annual Conference of the Utah Chapter of the International Reading Association.

Fellowships, Awards, and Grants:

Travel Grants, 2013-2015

Both the Utah State University Graduate School and Teacher Education and Leadership Department awarded a combined total of \$900 to fund travel for conference presentations.

Scholarship, Utah Valley University, 2008-2010

Full tuition scholarship was awarded each year based on academic merit.

Professional Affiliations:

Association of Literacy Educators and Researchers (ALER)
Utah Chapter of the International Reading Association (UCIRA)

Related Graduate Coursework and Professional Development:

- Content Area Reading and Writing
- Foundations of Language and Literacy
- Theories and Models of Reading
- Literacy Research Seminar
- Teaching & Learning Foundations in Education
- Historical, Social, and Cultural Foundations of Education
- Curriculum Theory
- Theories of Instructional Supervision
- Instructional Leadership
- Assessment and Data Issues for Instructional Leaders
- Theories of Second Language Acquisition
- Multicultural Education
- ESL Methods
- Assessment for ESL Learners
- Literacy and Linguistics for ESL
- Family and Community Involvement
- Research Methodology
- Action Research (Independent Study)
- Qualitative Methods I
- Program Evaluation
- Quantitative Methods I
- Literature Reviews
- Mixed Methods
- Applied Statistics for Education
- Education of Gifted and Talented Learners
- Positive Interventions for Problem Behavior
- Guided Math for the Common Core
- Taking Learning Outdoors
- Reading Recovery Advocacy
- Reading Fluency Seminar
- Alpine Instructional Coaching Academy