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Virtual Interactive Notebooking With Gifted Learners in an Inquiry-Based Social Studies Classroom: A Mixed-Methods Action Research Study on Higher-Order Thinking and Student Motivation

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VIRTUAL INTERACTIVE NOTEBOOKING WITH GIFTED LEARNERS IN AN INQUIRY-BASED SOCIAL STUDIES CLASSROOM: A MIXED-METHODS ACTION RESEARCH STUDY ON HIGHER-ORDER THINKING AND STUDENT MOTIVATION

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DEDICATION

This would not have been possible without the support and love of my family. Thank you to my children who, to this point in their lives, cannot remember their mom not being in school. Thank you for understanding and doing more than you should have when I was stressed, tired, or too busy. Thank you for understanding when I had to multitask at the softball field, drama performances, or at home. Bryan, you have always believed in and supported me in my aspirations and dreams. You see me through different eyes and have truly believed me into being. Thank you for your constant and unwavering encouragement, for turning the light off when I fell asleep from exhaustion, and for taking things off my plate to lighten my load. Thank you to my parents who proved to me that being an amazing and supportive parent and getting an education at the same time is possible. Thank you to my professors and classmates throughout my years at the University of South Carolina who have helped me to come to my own personal understanding of what truly matters and have assisted me in my meaning making process. Thank you, Dr. Morris, for guiding me through this process with your expertise. Thank you to the University of South Carolina PDS Network for being a support throughout my doctorate program and for encouraging me to let my classroom be a "sandbox" for research and innovation. Lastly, thank you to all of the students I have taught over the years. You have encouraged me to be a better teacher and have taught me what really matters about learning. You inspire me to be better and are the reason I continue to push myself as an educator. Thank you.

ABSTRACT

The purpose of this mixed methods action research was to implement and evaluate the use of virtual interactive notebooks with gifted students in a 4th-grade social studies classroom. Specifically, this study focused on two overarching research questions: (a) how does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom and (b) how does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?

This study utilized technology and an inquiry-based approach to learning as students (n = 23) created their own personalized virtual interactive notebooks. Qualitative and quantitative data were collected in order to determine the impact virtual interactive notebooks had on student use of higher-order thinking skills and student motivation Specifically, the data sources for this study included: (a) student interviews, (b) DOK Rubric, and (c) the MSLQ. All data were collected during the eight weeks of the study. Data in this study were analyzed through a convergent parallel mixed methods approach as it allowed for the merging of both types of data to provide a comprehensive analysis of the study (Creswell, 2014). Quantitative data were analyzed using descriptive statistics. Qualitative data were analyzed through inductive and deductive coding. A thematic analysis of codes resulted in five themes: (1) student perceptions of themselves as

learners evolved; (2) students experienced a shift in power from teacher to student; (3) students were empowered and motivated to learn through student choice; (4) students embraced, spoke, and lived the inquiry process; and (5) students experienced a shift in their knowledge acquisition process.

Findings indicate virtual interactive notebooks improved student use of higher-order thinking skills and student motivation. Students: (a) were able to create personalized notebook pages that demonstrated their understanding of each topic; (b) experienced individualized learning as they utilized choice in their personal inquiries; (c) found having the freedom to engage in inquiries motivating to them as learners; and (d) utilized higher-order thinking skills as they conducted research on their inquiry, synthesized information and formed a new understanding, and created their notebook pages. Implications and limitations of the study are provided.

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CHAPTER 1

INTRODUCTION

National Context

The National Council for the Social Studies (NCSS) states "the aim of social studies is the promotion of civic competence-the knowledge, intellectual processes, and democratic dispositions required of students to be active and engaged participants in public life" (2013, p. 3). In order to achieve this goal, students are encouraged "to use knowledge about one's community, nation, and world; apply inquiry processes; and employ skills of data collection and analysis, collaboration, decision-making, and problem-solving" (NCSS, 2013, p. 3). However, research shows that social studies has historically been taught in the United States through a teacher-centered format, where standards are often taught for memorization through the delivery of facts (Goodlad, 1984; Fitchett, Heafner, & Lambert, 2014; Saye, Kohlmeier, Brush, Mitchell, & Farmer, 2009). This low-level thinking does not require students to push themselves as learners and does not positively impact student motivation.

John Dewey (1916) called for the use of inquiry to teach content over one hundred years ago. Since that call for inquiry-based learning, many educators have encouraged and promoted the use of inquiry-based learning and autonomy instead of the accumulation and memorization of facts (Fitchett et al., 2014; Haas, 1977; Levstik & Barton, 2001; Mills, O'Keefe, Hass, & Johnson, 2014; Oliver & Shaver, 1966). The use

of inquiry-based learning leads to higher-order thinking (Buchanan, 2018; Laliberte, Gable, & Billups, 2016; Zimmerman & Kitsantas, 2005). According to Lewis and Smith (1993), "higher-order thinking occurs when a person takes new information and information stored in memory and interrelates and/or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations" (p. 132). If teachers were to use inquiry or autonomy as a way of notebooking in social studies, higher-order thinking and student motivation would naturally occur. However, even with this inquiry-based movement, a study conducted in 2013 by Saye and the Social Studies Inquiry Research Collaborative (SSIRC) found that most social studies classrooms still do not experience higher levels of thinking and learning.

Educators nationally have found that technology can positively impact inquiry in the classroom (Casey & Bruce, 2011; Land, Hannafin, & Oliver, 2012; Longo, 2016; McCormick, 2008; Patterson, 2016). However, not all teachers embrace the use of technology in the social studies classroom. The National Center for Educational Statistics (2005) reported a correlation between teachers with less experience using more technology in deeper and more meaningful ways than veteran teachers nationally. In order to encourage teachers to utilize technology in the social studies classroom, the College and University Faculty Assembly (CUFA) approved *Guidelines for Using Technology to Prepare Social Studies Teachers* in 2000 (Berson et al., 2000). In 2007, Franklin and Molebash named five principles to help guide social studies educators on how to appropriately infuse technology in the classroom:

> (1) Extend learning beyond what could be done without technology; (2) Introduce technology in context; (3) Include opportunities for students to study relationships

> among science, technology, and society; (4) Foster the development of the skills, knowledge, and participation as good citizens in a democratic society; (5) Contribute to the research and evaluation of social studies and technology (p. 155).

These guidelines emphasize using technology in the social studies classroom for the enhancement of content and to motivate students to learn in new and innovative ways.

Interactive notebooks are used by many teachers in elementary classrooms throughout the United States. The concept of an interactive notebook has been successful in science classrooms as they have become an essential tool in providing students with a place to record concepts, thoughts, findings, and data through scientific inquiry experiences (Miller & Martin, 2016). Chesbro (2006) believes an interactive notebook, when utilized correctly, is an "extremely effective constructivist innovation" to enhance and motivate student learning (p. 34). Utilizing interactive notebooks allows students to make meaning through writing, "personalization, and metacognition strategies, while simultaneously serving to promote more specific inquiry-based … instruction by which students focus, experiment, reflect, and apply based on their personal connections to learning" (Chesbro, 2006, p. 34). Using inquiry while notebooking naturally lends itself to higher-order thinking.

Teachers also use interactive notebooks as a type of formative assessment and to provide feedback to students in their notebook (Chesbro, 2006). In fact, some science educators have implemented the use of electronic notebooks, or virtual interactive notebooks, in science content classrooms as they have found that traditional interactive notebooks have limited the *interactive* possibilities. While researching the use of

interactive notebooks, Miller and Martin (2016) found "technology can be a valuable tool to enhance writing and equip students to be 21st-century learners, consumers, and producers of new information" (p. 84). There is a need to combine technology and interactive notebooks in the social studies content.

Meeting the needs of gifted and talented learners is a challenge felt by teachers nationally. Brain research conducted by Caine and Caine (1991) indicates that learning takes place when students' experience an appropriate level of being challenged that falls within their abilities and interests. When students are not provided with tasks that are appropriately challenging, their brain does not release enough dopamine, noradrenalin, serotonin, and other chemicals needed for learning (Schultz, Dayan, & Montague, 1997). In the classroom, gifted students often find that content and tasks that are appropriate for their grade level are not cognitively challenging, which results in a lack of motivation to learn (Stepanek, 1999). In 2007, Rogers synthesized research on teaching gifted learners from a span of 150 years. He made the following assertions about gifted learners: (a) gifted learners need to have learning experiences daily that challenge them as learners; (b) gifted learners need regular opportunities to be different and to work independently in areas that they are passionate about or possess a talent; (c) gifted learners need to be provided subject and grade-based acceleration; (d) Gifted learners need the opportunity to learn and socialize with other gifted and talented students; and (e) gifted learners need instruction to be differentiated in terms of pace, amount and type of assignments, and delivery of content. There is a need to rethink gifted education nationally, not just how to effectively challenge gifted students, but also meeting their needs as learners based on Rogers (2007) findings.

Local Context

According to the document *South Carolina Social Studies Academic Standards* (2011), the South Carolina Department of Education provides academic standards for each grade level in order to "provide the basis for the development of local curricula and statewide assessment" (p. 2). State testing is administered to fifth-graders for the social studies content area. According to the South Carolina Department of Education (2017), 29.1% of 5th graders did not have a *met* or *exemplary* score in 2017 on the state test. Specifically, in the school where the elementary in this study is located, 21.5% of fifth-graders scored a *not met* on the state social studies test in 2017. This data shows the need for districts, administrations, and teachers to rethink and evaluate the strategies they are currently implementing and think about the needs of the 21st century learners in their classrooms.

In order to meet the needs of 21st century learners, the school district in which this study took place encouraged the use of technology with students. At the elementary school in which this study took place, students were not one-to-one with technology during the 2017-2018 school year; therefore, they did not have personal access to technology daily. Beginning with the 2018 school year, students in fifth-grade had access to use Chromebooks on their own while other grade levels were two-to-one (two students to one device). Teachers were able to borrow Chromebooks from other teachers when they needed students to be one-to-one. This allowed teachers the opportunity to integrate technology into every content area, including social studies. However, many teachers were unsure of how to incorporate technology into social studies while encouraging students to use higher-order thinking skills.

Another strategy implemented by the school district during the 2018-2019 school year to meet the needs of 21st century learners was encouraging teachers to increase the levels of Depth of Knowledge (DOK) (Webb, 1997, 2002) required by students during classroom instruction. Webb's DOK refers to the depth and complexity to which teachers expect students to demonstrate understanding of the content (Webb, 2002). There are four DOK Levels, with Level One being the lowest and Level Four being the highest. Level One begins with recall of information. Level Two cognitively requires basic reasoning. Level Three requires the use of complex reasoning. Level Four, the highest DOK Level, cognitively requires extended reasoning by the learner. Teachers attended professional development on how to increase rigor through DOK and intentionally planned instruction to increase DOK levels.

Fourth and fifth-grade teachers in the school district in which this study took place are encouraged to use physical interactive notebooks as a way for students to record social studies content. Physical interactive notebooks provide a way for teachers to address the standards while also having the students record information pertaining to state standards. As a fourth and fifth-grade teacher, I used physical interactive notebooks to teach social studies. In my classroom, students used their notebook to record information from my notebook into their notebook. All pages were exactly the same. Students were expected to copy from my notebook, word for word, and to have the exact same pictures in the same place that I did.

Resources are available to teachers through the district intranet to assist in making notebook pages that address state standards. Teachers at the elementary school in which this study took place planned together to create notebook pages based on standards while

ensuring teacher pages looked the same, which in turn meant all student pages looked the same. Teacher reasons for doing this was to ensure the standard was addressed, it was covered, and the information provided to students was aligned with state and unit testing.

In my classroom, physical interactive notebooks were graded based on completion and accuracy and not for what I personally value in learning: inquiry and higher-order thinking. These physical interactive notebooks were identical and did not allow my students to think deeply as citizens in the world. I could not use notebooks as a formative assessment because there was no original student thinking on the pages. I also did not have a reason to provide feedback because there was no individualized student thinking involved to create each page. Physical interactive notebooks are more like a yearlong study guide of facts for state testing. For these reasons, I conducted research on the impact virtual interactive notebooks had on student thinking and motivation.

The school district in which this study took place allows each elementary school to serve gifted students as they see fit, either by pulling students our of class or by putting all gifted students in the same homeroom class. Gifted students at the elementary school in this study are grouped together in one class; they are not pulled out for services. Instead, two gifted-certified teachers serve the students. The students are with one teacher in the morning for math and social studies and with another teacher in the afternoon for language arts and science. Gifted curriculum is provided in math and language arts as students are taught using the standards for the grade above their current grade. However, South Carolina requires all fourth-grade students to be taught the state standards for social studies and science for their current grade level. It is up to the teacher to decide how to meet the needs of gifted students in these content areas, which can be challenging.

Statement of the Problem

Physical interactive notebooks do not meet the needs of gifted learners in 21st century classrooms. Physical interactive notebooks are a way for students to record content throughout the school year in a particular discipline. In social studies classrooms in my school, physical interactive notebooks are not *interactive*. Student pages are mostly identical to the teacher's notebook. The amount of time spent cutting, gluing, and copying information could be put to better use. These activities do not maximize the cognitive abilities of gifted students or contribute to student motivation.

Teacher beliefs and philosophy also play a part in why teachers in my school use what they consider to be *interactive* notebooks in social studies. Test scores met administration's desired goals and this was achieved while using physical interactive notebooks. Teachers are afraid to change their teaching style or approach when administrators are happy with test scores. Teachers are not given time to explore other options because they are pressured to cover content based on a pacing guide set by the district. Also, the administration also preferred for students to have a physical copy of their work and a physical interactive notebook met this request.

According to Marcarelli (2010) an interactive notebook should be a "tool students use to make connections prior to new learning, to revise their thinking, and to deepen their understandings of the world around them" (p.2). He also states that interactive notebooks should be "the culmination of a student's work throughout the year that shows both the content learned (input) and the reflective knowledge (output) gained" (p. 2). There is a variety of research on implementing and utilizing interactive notebooks in the classroom (Aschbacher & Alonzo, 2006; Waldman & Crippen, 2009). There is also

research on how to effectively implement technology in the social studies curriculum (Diem, 2000; Green, Ponder, & Donovan, 2014; Hammond & Manfra, 2009; Wright & Wilson, 2009). Research has been conducted on student motivation in the classroom (Godzicki Godzicki, Krofel, & Michaels, 2013; Heafner, 2004; Kirkendall & Kirshen, 2015; Lee, Song & Hong, 2019; Smith & Wilhelm; 2002). Although these topics have been studied and researched separately, there is limited research on implementing and utilizing virtual interactive notebooks as a way to increase higher-order thinking and motivation in gifted students. With the availability of technology in elementary classrooms, further research was necessary to analyze the impact virtual interactive notebooks had on student motivation and higher-order thinking of gifted students in the social studies content area.

Purpose Statement

The purpose of this mixed methods action research was to implement and evaluate the use of virtual interactive notebooks, based on the South Carolina fourth-grade social studies state standards, with academically gifted students.

Research Questions

1. How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?
2. How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?

Researcher Subjectivities and Positionality

Since becoming a teacher in 2012, I have been interested in the integration of technology in my lessons because I have witnessed how technology can provide opportunities for deeper thinking and positively impact student motivation. My desire to pursue a doctoral degree in curriculum and instruction was based on my desire to find effective ways to integrate technology in the content areas, challenge students to use higher-order thinking, and increase student motivation.

Personally, when I was in school, I found note-taking with pencil and paper boring. It was limiting and repetitive. I had my first interaction with the World Wide Web when I went to college. It was mind blowing to me the expanse of information that was so readily available. Although I was limited to a desktop computer, the ability to research on my own was liberating and motivating. When I went back to school ten years later, I upgraded from a desktop to a laptop with wireless capabilities. This opened the door to virtual notetaking and research as I was physically in class. Learning became fun and interactive. Due to these life experiences, I became interested in integrating technology into the elementary content I taught. I felt confident that if I allowed my students to learn while using technology, that students would experience an increase in motivation to learn. I was also interested in integrating technology into content lessons because I could forsee ways technology would allow students to utilize higher-order thinking skills (Coiro, Castek, & Quinn, 2016) and provide students with more choice and autonomy (Casey & Bruce, 2011).

The research problem of this study was centered on the limiting nature of physical interactive notebooks on student thinking and motivation. This research studied the

impact the use of virtual interactive notebooks had on students in regards to higher-order thinking and student motivation. My research paradigm was pragmatic because I was pursuing a solution to a problem I noticed in my own classroom (Creswell, 2014). A pragmatic research paradigm related to this study as I attempted to make sense of and interpret qualitative and quantitative data to determine the impact virtual interactive notebooks had on student use of higher-order thinking and student motivation. Utilizing a pragmatic approach to this research allowed me as the researcher to have choice in the methods, techniques, and procedures I implemented in order to discover what worked best with notebooking with my students (Creswell, 2014; Onwuegbuzie & Johnson, 2006). My positionality within this research is as an insider (Herr & Anderson, 2005) as I researched my own practice and implementation of virtual interactive notebooking. The research I conducted is considered a self-study as it took place in my own classroom as I integrated technology and notebooking in the social studies content area. Being an insider in this research process, who was committed to deepening student thinking and increasing student motivation, positioned me in the heart of this study. My desire to promote student thinking, motivation, and my willingness to conduct this research with my own students proves to students and stakeholders what I value in regards to learning and the need for this research to be conducted.

My beliefs that have developed through experiences in my childhood education, my career, and my time as a student at the University of South Carolina strengthened my research. For example, I believe that learning is social (Vygotsky, 1978) and that students need to have choice and ownership in their learning (Cambourne, 1984). My research topic gave students the power to use interactive notebooks as a way to pursue personal

inquiries in the social studies content area. I also believe that technology allows students to pursue personal inquiries and can assist students in developing their own understanding of content without it being delivered for memorization. My research provided students choice throughout their learning process, through the topics they pursued in their personal inquiries to how they demonstrated their understanding in their virtual interactive notebooks. However, I was aware that my desire to use technology as a way to motivate students and my personal belief that technology can assist students in using higher-order thinking could limit or allow for bias in my research. As I conducted this research, I continuously monitored for bias and utilized peer debriefing to minimize bias and to stayed aligned with the purpose of this research.

Definition of Terms

Constructivism – Constructivism involves construction of knowledge based on making meaning of new experiences through the use of prior knowledge (Baer, 2016; Isik, 2018; Miri, David & Uri, 2007; Porath, 2016).

Depth of Knowledge - Webb's Depth of Knowledge is a continuum of thinking complexity that includes four levels, starting with fundamental and simple knowledge to cognitively complex thinking, that relate to the depth of content understanding and the scope of the learning task, which is referred to depth and complexity (Anderson & Mills, 2015; Paige, Sizemore, & Neace, 2013; Paige, Smith, & Sizemore, 2015; Webb, 1997, 2002).

Gifted Learners – Gifted learners are students who are able to achieve at high levels and grow at an accelerated pace (Housand & Housand, 2012).

Higher-order Thinking - Higher-order thinking is a complex mode of thinking that thinking involves uncertainty, application, and self-regulation as the learner identifies a useful source of information, analyzes its credibility, reflects on the new information and aligns it with prior knowledge, forms new conclusions, and generates multiple solutions as the learner takes control and is responsible for their own thinking (Anderson & Mills, 2015; Miri et al., 2007).

Inquiry-Based Learning – Inquiry-based learning is a pedagogical approach to constructivism that promotes learning through asking, creating, discussing, and reflecting throughout the learning process in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and what they want to know (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014**).**

Interactive Notebooks - Interactive notebooks will be generally defined, according to Marcarelli (2010) as a "tool students use to make connections prior to new learning, to revise their thinking, and to deepen their understandings of the world around them" (p. 2).

Physical Interactive Notebooks - Physical interactive notebooks will be generally defined as interactive notebooks that are tangible in nature (usually a spiral or composition notebook), requires glue, scissors, pencils and other supplies to notebook information, and can limit the sharing of ideas, feedback opportunities, and possibilities of writing and showcasing understanding (Miller & Martin, 2016).

Self-regulated Learning Theory - Self-regulated learning is the result of engaging in self-directed metacognitive, cognitive, affective, and behavioral processes and skills (McCombs & Marzano, 1990).

Student Motivation - Pintrich and Schunk (2002) define motivation as a process, not a product, that occurs when "goal-directed activity is instigated and sustained" and cannot be directly observed but is inferred from the student's actions and behaviors (p. 5).

Technology – For the purpose of this study, technology will be defined according the ISTE (2019) student standards. Technology will be defined as digital tools students use to construct knowledge, make meaning of the world, and demonstrate their knowledge by producing creative artifacts. Examples of digital tools provided by ISTE include "digital posters, blogs, digital stories, assessments, e-portfolios, project showcase, research paper and works of art" (ISTE Standards for Students, 2019).

Virtual Interactive Notebooks - Virtual interactive notebooks will be generally defined as interactive notebooks that are digital in nature and are composed using technology, access to the internet, and software. Virtual interactive notebooks allow for the sharing of ideas, feedback opportunities, interactive possibilities for writing and showcasing understanding, and expand the possibility of student creativity and methods of expression (Miller & Martin, 2016).

CHAPTER 2

LITERATURE REVIEW

The purpose of this mixed methods action research was to implement and evaluate the use of virtual interactive notebooks, based on the South Carolina fourth-grade social studies state standards, with academically gifted students. The review of literature for this study is based on two research questions:

1. How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learn1qweing environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?
2. How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?

In order to guide the literature search, main variables were identified in the research questions. These variables include: inquiry-based learning, gifted learners, virtual interactive notebooks (technology integration), higher-order thinking, and motivation. The resources for this review were collected from various sources. For this literature search research, I periodically searched *Education Resources Information Center (ERIC), JSTOR*, and *Google Scholar* using the following key words and phrases:

(a) Webb's Depth of Knowledge, (b) DOK, (c) motivation, (d) student motivation, (e) Motivated Strategies for Learning Questionnaire, (f) MSLQ, (g) student interest, (h) choice, (i) student choice, (j) inquiry, (k) inquiry-based learning, (l) inquiry research, (m) PBL, (n) project-based learning, (o) reflection, (p) student reflection, (q) TPAK, (r) notebooking, (s) integration, (t) blended learning, (u) Google Slides, (v) rigor, (w) constructivism, (x) one-to-one, (y) higher-order thinking and (z) personalized learning. I systematically linked each these terms with the others and/or the terms education, technology, social studies, fourth-grade, and elementary using the Boolean operator *AND*. When I conducted a search, I used the same grouping of words in all of the databases listed above. I filtered the articles to show those published in the past five years and those that were "peer reviewed" in order to narrow the results. I also perused the articles tagged in "related articles" in Google Scholar. Another strategy I utilized was reading articles that were cited in the reference section in the articles I read.

The review of this literature is organized into seven major sections. The first section takes an in-depth look at constructivism, the theoretical foundation for this research, and what it looks and sounds like in the classroom. The second section examines inquiry-based learning, a constructivist pedagogical approach to teaching. Next, there is an in depth-look into the classification of gifted learners. The fourth section will examine the social studies content area and teaching in that content with an inquiry or technology approach. The next section provides a review of the use of notebooking in constructing knowledge in the content areas. The sixth section examines the importance of higher-order thinking in constructing knowledge, particularly with a focus on Webb's

Depth of Knowledge (DOK) (Webb, 1997, 2002). The final section examines the importance of student motivation in constructing knowledge.

Constructivist Approach to Learning

A theoretical foundation is important to have in action research as it provides the reader with a lens through which the research is based. For this study, the theoretical foundation is constructivism. This section takes an in-depth look into the definition of constructivism. Next, it will examine the role technology can play in a constructivist approach in the classroom. Then, it will discuss what attributes are included in a constructivist environment.

Definition of Constructivism

Constructivism is a complex theory that dates back many decades. This study views cognitive constructivism through the theoretical lens of Piaget who believed that students construct meaning based on experiences (Piaget, 1954). Therefore, in this study constructivism is defined as the construction of knowledge based on making meaning of new experiences through the use of prior knowledge (Baer, 2016; Isik, 2018; Miri et al., 2007; Porath, 2016). In constructivism, learning is often student directed and involves real-world learning (Baer, 2016; Isik, 2018). Furthermore, the teacher has the role of a facilitator as he/she scaffolds students as they make meaning (Baer, 2016; Isik, 2018). Therefore, learning that takes place in a constructivist environment is often referred to as being student-centered and active, rather than passive (Baer, 2016; Isik, 2018). Through this approach, students are encouraged to challenge and adjust their own thinking.

The Role of Technology in Constructivism

Technology can be used as a tool for students in constructing knowledge (Longo, 2016). For the purpose of this study, technology will be defined according the ISTE (2019) student standards. Technology will be defined as digital tools students use to construct knowledge, make meaning of the world, and demonstrate their knowledge by producing creative artifacts. Examples of digital tools provided by ISTE include "digital posters, blogs, digital stories, assessments, e-portfolios, project showcase, research paper and works of art" (ISTE Standards for Students, 2019). Teachers who utilize the constructivist approach tend to incorporate the use of technology in their classrooms as they allow students to construct their own meaning (Baser & Mutlu, 2011; Ertmer, 2005). Allowing students to be explorers and designers while using technology shows the students that the teacher believes in their ability to construct their own knowledge and to contribute to learning in the classroom community (Blair, 2012). Studies have found that technology usage in the classroom has enriched student learning and expanded students' access to recourses and information (Jing & Jong, 2008; Isik, 2018).

Constructivism and technology integration complement each other. Students become knowledgeable and effective democratic citizens as they access, construct and produce new found information due to the availability of technology (Isik, 2018; Molebash, 2002). Utilizing technology through the constructivist approach promotes critical thinking skills of students (Baer, 2016; Miri et al., 2007). Examples of these skills include identifying reliable sources of information, reflecting on new found information and aligning it with previous understanding, making multiple connections as students activate prior knowledge, and drawing conclusions as students make meaning and

construct their own knowledge (Baer 2016; Miri et al., 2007). These critical thinking skills allow students to construct meaning through the use of technology (Isik, 2018; Molebash, 2002).

Blended learning is a constructivist approach to learning that uses conventional methods (e.g. choice, engagement, collaboration, and scaffolding) along with technology (web-based or instructional technology) to enhance student learning experiences (Laurillard et al., 2013; Longo, 2016). Blended learning includes a mixture of learning opportunities that are both teacher-directed and student chosen and allow the student to act in the role of the expert (Pratt, 2019; Thibaut, Curwood, Carvalho, & Simpson, 2015). In a blended learning classroom, the focus should remain on the content while the technology is the tool through which the content is mastered (Franklin & Molebash, 2007). This is one type of constructivist learning approach that assists students in making meaning.

Constructivist Learning Environment

The environment of the classroom is an important part of constructivism. A constructivist learning environment is a place where students are exposed to purposeful experiences that enable them to construct their own knowledge as well as promote critical thinking skills (Godzicki et al., 2013; Miri et al., 2007). This type of learning environment requires higher-order thinking and results in deeper understanding as teachers facilitate students in their self-directed learning (Baer, 2016; Bolick, Berson, Friedman & Porfeli, 2007; Land et al., 2012). Students in a constructivist learning environment are provided the opportunity and are encouraged to utilize choice, independence, dialogue, interests, and to engage in self-reflection (Porath, 2016).

When technology is integrated in a constructivist learning environment, students can create, explore, discover and problem solve in innovative and individualized ways that provide for a more rigorous, open-ended, and student-centered approach to learning (Dunleavy, Dexter, & Heinecke, 2007; Ryan, 2017). When students utilize technology as a learning tool, it can assist students in actively learning and in constructing their own understanding through evaluation and synthesis. Students have the opportunity to collaborate with each other as they research and share new information (Baer, 2016; Isik, 2018)**.** Students can collaborate with experts online as technology makes this connection more accessible than ever before (Isik, 2018)**.** Including technology as a part of a constructivist learning environment impacts student learning and contributes to the student-centered aspect of this approach. Another important element of a constructivist learning environment inquiry-based learning.

Inquiry-Based Learning

Inquiry-based learning (IBL) is a branch of a constructivism that leads students towards being more motivated while also having a deeper understanding of content (Buchanan, 2018; Buchanan, Harlan, Bruce, & Edwards, 2016; Mills et al., 2014; Patterson, 2016). This section starts by examining the definition of Inquiry-Based Learning (IBL). Next, it will review research on IBL in the classroom. Then, it will take an in-depth look into the role technology can play in an IBL classroom and research will be provided on the role technology can play in an IBL classroom.

Definition of Inquiry-Based Learning

Inquiry is a stance that promotes learning in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and

what they want to know (Casey & Bruce, 2011; Mills et al., 2014). Students involved in IBL utilize the inquiry cycle as they meet curricular goals and participate in classroom discussions to ask, investigate, create, discuss, and reflect throughout their learning (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014). A key component of IBL is student choice or student autonomy (Buchanan, 2018; Campbell & Cox, 2018; Casey & Bruce, 2011). Students lead their own learning as they determine the topic, plan the research, synthesize multiple texts and perspectives, write, and then create and share new understanding they constructed (Buchanan, 2018; Casey & Bruce, 2011; Land et al., 2012).

Research on Inquiry-Based Learning

Mills et al. (2014) conducted research on elementary students at a school considers IBL to be the best way for students to make meaning through "authentic, intentional, and systematic learning" (p. 36). Teachers at CFI model what real-world IBL looks like using an apprentice model. The teachers position themselves and their students as readers, writers, scientists, mathematicians, and historians. As the students take on these inquiry-based roles, they become engaged and empowered to make meaning of and actively participate in the world in which they live. The teachers and administration at this school believe teachers should provide time and space for students to engage in inquiries that are rooted in curricular goals. Allowing students to engage in real-world inquires through student chosen research positions them to be creators of new knowledge. The researchers found that when they positioned students to question and research through the inquiry process, students did not just learn the content. IBL was life changing for their students as it also impacted the students' personal beliefs.

Buchanan (2018) conducted research on the use of IBL with middle school students. The purpose of Buchanan's research was to find the most common themes of their experiences while engaged in student-driven inquiry and to share them with K-12 teachers so that they would better understand and appreciate the use of IBL in the classroom. Buchanan, along with other researchers (Buchanan et.al, 2016), had previously recognized that even though there is research that supports the use of IBL, few teachers and institutions utilize it as a regular part of their teaching and curriculum. The most common theme Buchanan found in regards to IBL was autonomy. This theme emerged from analyzing student stories of their own inquiry projects. When students in this study were given choice driven by their own curiosity and interests, student engagement and motivation increased. The students also experienced deeper learning as they stretched themselves academically to master new skills and build knowledge.

The Role of Technology in Inquiry-Based Learning

Digital technology is vital to an IBL in a constructivist environment as it improves IBL skills and enhances the learning experience (Akgunduz & Akinoglu, 2016; Laurillard et al., 2013). Technology, the form of digital tools and online connectivity, allows students to employ various tools beyond the physical classroom as they make choices and decisions about their learning through the inquiry process (Thibaut et al., 2015). Using technology to enable, sustain, and enrich the inquiry cycle in a constructivist classroom results in higher level thinking as students (Casey & Bruce, 2011; Longo, 2016). Technology integration should be a part of IBL to allow students to truly live the inquiry-cycle.

When coupled with authentic teaching and learning, technology integration is more effective than standalone technology and is more student-centered (Brush & Saye, 2009; Hopson, Simms, & Knezek, 2001). When students are in an environment where they have opportunities to have some control, make choices, and participate in real-world learning, they are more likely to be engaged in their learning, which in turn can increase student use of higher-order thinking skills increase (Dietrich & Balli, 2014; Hopson et al., 2001). Thus, technology has the potential to contribute in meaningful ways when students use it to research for information and resources.

Technology supports student inquiry as it can be used to access to primary resources, a plethora of information, and provides a focus on extending learning through multiple perspectives, resources, and representations (Land et al., 2012; Patterson, 2016). For example, Web 2.0 tools expand student learning, procession, creation, and reflection throughout the inquiry process (Land et al., 2012; Patterson, 2016). Technology allows students to utilize the inquiry cycle as they ask questions, investigate or research a topic, evaluate the research, construct meaning, and reflect on their learning (McCormick, 2008; Patterson, 2016). Technology assists in student driven inquiry where students determine the topic, plan the research, synthesize multiple texts, write, and then create and share new understanding (Buchanan 2018; Casey & Bruce, 2011). Incorporating technology in an inquiry-based classroom results in student autonomy, greater engagement, deeper understanding, and individualization as students stretch themselves to discover new learning (Buchanan. 2018; Buchanan et al., 2016; McCormick, 2008). Technology has the ability to truly enhance the inquiry process.

Therefore, it is evident in an inquiry-based classroom where technology is utilized in constructing knowledge, student learning and technology go hand in hand. In these classrooms, learning is student-centered as the students utilize the inquiry cycle to master curricular goals and participate in classroom discussions to ask, investigate, create, discuss, and reflect throughout their learning (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014). The teacher acts as the facilitator in helping students in their inquiry process to discover knowledge for themselves (Longo, 2016; Pratt, 2019; Thibaut et al., 2015). Students in an inquiry-based classroom are viewed as problem solvers and are given choice as they collaborate, utilize critical thinking, and pose questions while increasing rigor (Longo, 2016; Pratt, 2019). Inquiry infused with technology is a powerful instructional strategy that is challenging, responsive, and equitable as students have an awareness of their learning and its process (Longo, 2016; Thibaut et al., 2015). IBL, when coupled with technology, is empowering to students in their learning process.

Coiro et al. (2016) created a framework that marries the use of digital technology with IBL in K-8 classrooms. Coiro et al. (2016) believe the "framework encourages teachers to consider purposes of technology use for knowledge acquisition, knowledge building, knowledge expression, and knowledge reflection" (p. 8). They believe the use of technology allows for deeper understanding and learning throughout the inquiry cycle (Corio et al, 2016). The four steps of the framework include: inquire, collaborate and discuss, participate and create, and reflect. Going through these four steps of the framework provides students a strategic method for utilizing technology during their IBL projects. Through the use of technology, students are able to not only ask real-world questions and research using the internet, but also create and share their learning with

others on a larger platform, collect feedback from other learners, and reflect on what they have learned.

Gifted Learners

This section will provide information on gifted learners. First, it will provide classifications of gifted learners. Then it will discuss the role inquiry and technology can play in knowledge acquisition of gifted learners. Next, research on the use of IBL and technology as parts of the learning process will be presented.

Classifications of Gifted Learners

Gifted learners are students who are able to achieve at high levels and grow at an accelerated pace (Housand & Housand, 2012). These students have higher metacognitive skills and are able to self-monitor during their learning process (Barfurth, Ritchie, Irving, & Shore, 2009; Eysink, Gersen, & Gijlers, 2015). Gifted learners prefer to work on meaningful and complex tasks (Eysink et al., 2015; Kanevsky, 2011; Scager, Akkerman, Pilot, & Wubbels, 2013). When gifted learners are appropriately challenged, they show an increase in engagement and motivation for learning (Eysink et al., 2015; Phillips & Lindsay, 2006). Gifted learners have advanced analytical skills and are effective problem solvers (Eysink et al., 2015; Steiner & Carr, 2003). These students can be characterized as curious, having an eagerness to discover new learning, and a desire to develop new learning (Eysink et al., 2015; Perleth & Wilde, 2009). Overall, students are identified as gifted when their ability is above that of the average student their age.

Using Inquiry-Based Learning with Gifted Learners

Eysink et al. (2015) conducted a study on the effects of IBL on knowledge acquisition of gifted learners in a Dutch elementary school with grades 3-6. Students

were assigned three different levels of support from the teacher heavily providing support in mastering content to allowing the students to use student driven inquiry to master the content. The results of the study showed that gifted learners benefit academically from being allowed to conduct an inquiry on their own with their teacher acting as a facilitator. The students in this study were given opportunities to learn in ways that met their needs as gifted learners. The IBL environment allowed them to push themselves beyond their comfort zone and to remain engaged in the learning process as they utilized their gifted cognitive abilities.

Van Deur (2011) conducted a study to examine the views of elementary gifted students on self-directed inquires. Interviews were conducted with ten students to identify how they described self-directed learning, their attitude towards self-directed learning, and to determine if gifted students saw self-directed learning as a tool that could be used in and outside of a school setting. The students in this study noted that self-directed inquiries allowed them to experience more engagement as they planned, researched, self-regulated, and reflected on their learning. The gifted students had positive attitudes about learning through self-directed inquires and enjoyed using critical thinking, problem solving skills, having choice and control over their learning, and participating in the evaluation of their final products.

Using Technology with Gifted Learners

A study was conducted by Zimlich (2015) by observing six gifted elementary teachers who were known for the integration of technology in their gifted classrooms. Specifically, Zimlich (2015) examined how the use of technology (which in this study was defined as electronic devices that allow for the transfer of information) in gifted

classrooms promotes student learning and shapes learning experiences. Results indicated that effective use of technology in the gifted classroom resulted in active learners. These active learners were able to conduct research, create presentations on their learning, publish their learning using Web 2.0 tools, problem solve, develop technology-based literacy skills, develop career and life skills, and utilize their creativity in productive ways. Zimlich (2015) credited the active learning that took place to that fact that the gifted students were the ones using the technology, providing the students with autonomy and the ability to be self-directed learners. Without technology the students were passive learners who were observing their teachers use technology.

Using Inquiry-based Learning and Technology with Gifted Learners

Educators of gifted learners have the challenge of finding ways to deliver content in an intriguing way with complexity and depth; IBL and technology usage are an answer to this challenge (Eysink et al., 2015). IBL and technology integration meet the needs and characteristics of gifted learners as they provide a way to challenge these students throughout the learning process by allowing the student to be focused on a challenging task while also having autonomy over their learning (Eysink et al., 2015). Technology allows gifted learners in an inquiry-based classroom to have limitless opportunities to foster their curiosity and find answers to personal wonderings as they explore at deeper levels, which in turns increases engagement (Housand & Housand, 2012; Siegle, 2004). In their research on technology in gifted education, Periathiruvadi and Rinn (2012) found that technology promotes innovative thinking for gifted students and provides an avenue for individualized instruction that is student-centered.

Periathiruvadi and Rinn (2012) conducted a literature review to explore the progression of technology use in gifted classrooms and the best practices of using technology with gifted learners based on empirical research. The literature review revealed that it is vital for gifted learners to utilize technology in the classroom because technology influences the everyday life of students outside of school; therefore, it should also be a part of everyday life in gifted classrooms (Periathiruvadi & Rinn, 2012). Another common theme that emerged from the literature review is that technology can promote higher-order thinking skills, innovative thinking, and allows for differentiation among gifted students (Periathiruvadi & Rinn, 2012). This can be accomplished with the integration of technology in the classroom.

Social Studies Content Area

This section will provide information on the use of technology in the social studies content area. First, the importance of teaching social studies in a constructivist environment will be addressed. Next, a position statement on the use of technology in social studies by National Council of Social Studies (2013) will be presented. Then, research on how to use technology effectively in the social studies content area will be presented. Studies on the use of technology in the social studies content area will be shared.

Constructivism in Social Studies Content Area

Effective teaching in social studies involves students constructing knowledge through teaching students to understand context, discover underlying meaning, identify biases, analyze information, and synthesize information (Curry & Cherner, 2016). The focus is not on the memorization of content but rather on reading, interpreting,

synthesizing and applying social studies content (Curry & Cherner, 2016; Porath, 2016). Powerful learning in social studies that is preparing students to be global citizens is meaningful, integrative, value-based, challenging and active (National Council of the Social Studies, 2013). Common Core State Standards (CCSS) in social studies require students to construct knowledge as they analyze, synthesize, and apply understanding to problems as they create solutions, collaborate with others, and communicate their thinking, all of which require higher-order thinking (Anderson & Mills, 2015). In a constructivist and student-centered approach to teaching social studies, the teacher's role is to create a learning environment where students can construct their own understanding of the content area through choice, independence, dialogue, interests, and engaging in self-reflection (Porath, 2016).

Inquiry-based learning in the social studies content area. IBL, a pedagogical approach to constructivism, in any content area promotes learning in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and what they want to know (Casey & Bruce, 2011; Mills et al., 2014). Students involved in IBL utilize the inquiry cycle as they meet curricular goals and participate in classroom discussions to ask, investigate, create, discuss, and reflect throughout their learning (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014).

McCormick (2008) conducted research on the effects of a six-week inquiry-based unit on the American Revolution on fifth-grade students. During the inquiry-based unit, the teacher presented broad questions to the students for them to research and develop a personal understanding of. These questions led to the students having questions of their

own that they then researched and shared with others. The results of the study showed that allowing students to participate in inquiry in the social studies content area allowed the students to be the deliverers of information instead of the teacher being the deliverer of information. The teacher's role became that of a facilitator who modeled ways that historians perform inquiries in the real-world for the students. As the students participated in student-centered, active, and challenging historical inquiries, their motivation increased and learning changed from something to memorize to something they wanted to learn for the purpose of gaining knowledge.

National Council of Social Studies

In 2013, the National Council for the Social Studies (NCSS) published a position statement on the use of technology in the social studies content area. This statement urged teachers to change their view on technology from that of a student support to that of something "much richer and deeper" (p. 160). NCSS stated that technology should be used in 21st century classrooms as educators are to prepare students to be "digital citizens in a global setting" (p. 161). Today's citizens need to understand how to utilize technology as they come to learn and encounter civic, economic, and social aspects of being a global and democratic citizen. Social studies teachers need to create an environment where students can make sense of the information they discover through the use of technology.

NCSS states in their position on technology that the integrative nature of the content area that stretches across time and space makes it well suited for the use of technology. Technology allows for powerful learning in the social studies content area that is "meaningful, integrative, value-based, challenging, and active" (p. 162). NCSS

provides several reasons why technology can enable youth to learn and be prepared for life as a democratic citizen in a global society. First, access to knowledge empowers students to research, use, and then create new information in democratic and purposeful ways. Second, online and blended settings allow students to participate in a civic, economic, and social manner in a global context. Another reason NCSS believes technology should be utilized in a social studies classroom is that students need time and space to nurture digital democratic experiences. The integration of technology is in itself a focal point of social studies curriculum. Providing students a place where they can use technology in their learning process will help them to understand the impact technology has had on life. NCSS believes teachers should assist students in making sense of the content by grounding them with experiences of the past. Technology makes this possible.

Technology Usage in the Social Studies Content Area

Curry and Cherner (2016) conducted a study on the effective use of technology in social studies classrooms of three high school teachers in the same school who were known for being highly effective social studies teachers in their district. Results of the study revealed that in order for real-world learning to occur, social studies teachers must incorporate the elements of literacy and technology in their teaching approach in order to help students become active global citizens (Curry and Cherner, 2016). This means social studies teachers should be helping students understand the "context, underlying meanings, and hidden biases" while also learning to read, analyze, interpret, synthesize, and apply new learning (Curry & Cherner, 2016, p. 133). These skills are important for social studies students to master as they encounter content on a daily basis in the modern world.

Lee (2008) provided a set of guidelines that should be used by educators to effectively integrate technology into the social studies curriculum. First, teachers should be able to locate and adapt digital technologies for use in the classroom. Another guideline Lee suggests is for teachers to act as a facilitator to students in their learning process in a nonlinear environment. Lee also believes teachers should assist students in developing digital literacy skills that will help them to become critical global citizens. Another guideline for integrating technology according to Lee is that teachers should provide students with time and space to present their new information using Web 2.0 tools as a way to increase engagement. The Internet should also be used to increase collaboration and communication about content related material among students. The last guideline Lee suggests is for the teacher to extend and promote active and real-world forms of interactions that are both in person and available via technology. These guidelines can assist teachers in effectively integrating technology in a social studies classroom.

Although there is research that support the use of technology in the social studies content area, the actual usage and integration of technology in social studies classrooms has been slow to gain a following (Ryan, 2017; Diem, 2000). Many teachers are unsure of how to use technology effectively in the classroom as a learning tool or the technology being used is not adding to learning experience (Ryan, 2017). Laurillard et al. (2013) created a project that promoted the use of technology for learning by creating a constructivist learning environment in any content area that uses technology as a learning enhancing tool. Although this project was not social studies specific, it provided evidence of the need for awareness about how to use technology as a learning tool in the social

studies content area. The creators of the project encouraged educators to use technology effectively to achieve the aims, learning objectives, mastery of content, and to only use digital technologies that added to the learning experience.

Harris and Hofer (2011) conducted a study of the effects of technology based professional development on the lesson planning of secondary social studies teachers. Harris and Hofer found that technology integration in the social studies content area was successful when the teachers considered the learning needs of their students and then found learning activities that supported the content that was being taught. This study showed that technology integration is successful when it is rooted in the curriculum and the learning process and is not focused on the technology itself.

Ryan (2017) recognized that the use of technology in social studies classroom was not very prevalent. For the purpose of this study, Ryan (2017) defined computer-based technology as "both computer hardware (i.e. a laptop) and software, such as the applications and programs on that laptop" (p. 5). Ryan (2017) examined the impact of technology based instructional approaches on sixth grade students' achievement during a unit on Ancient Greece. The end of the unit test scores were compared to show the impact of the implementation of technology in the unit impacted student achievement. Overall results proved that students performed better on the end of the unit assessments than students who were taught with traditional methods of instruction. Ryan found that when technology was implemented successfully into the content area, there were many positive outcomes which include: unlimited access to information, unlimited time to access information at more of an open-ended pace, requires students to use higher-order thinking skills as they analyze information more rigorously, and is more interactive for the

students. Another positive outcome Ryan discovered was the technology allowed the teacher to provide immediate feedback to the students and then provide enrichment for students who are ready for the next step or provide intervention for students who need assistance in understanding the content.

Importance of Notebooking

This section will provide information on the use of notebooking as a learning tool in the classroom. First, it will take an in-depth look into the definition of notebooking. Then, it will discuss the role of notebooking in constructing knowledge in an elementary social studies classroom. Studies on the use of notebooking in the classroom will be provided.

Definition of Notebooking

Marcarelli (2010) defines interactive notebooks as a "tool students use to make connections prior to new learning, to revise their thinking, and to deepen their understandings of the world around them (p. 2)". Notebooking in an inquiry-based classroom is defined as an activity for students in which they construct meaning on their own and then utilize a notebook to articulate their understanding and thinking into their own words (Alschbacher & Alonzo, 2006). Notebooks provide a safe place for students to align new found information with their background knowledge and to record their thoughts and reflections on their newly constructed knowledge (Doyle, 2017). A physical notebook is tangible and usually is a spiral or composition notebook and can limit the sharing of ideas, feedback opportunities, and possibilities of writing and showcasing understanding (Miller & Martin, 2016). A virtual notebook is a digital notebook that can be constructed using a variety of digital tools that allows for the sharing of ideas,

feedback opportunities, and interactive possibilities for writing and showcasing understanding (Miller & Martin, 2016). Virtual notebooks have the potential to expand student creativity and methods of expression (Miller & Martin, 2016).

The Role of Notebooking in Constructing Knowledge in an Elementary Social Studies Classroom

Aschbacher and Alonzo (2006) examined the use of notebooks in fourth and fifth-grade science classrooms for formative assessments. They found that notebooks have the potential to reveal student thinking when the teacher allows the student to create and record meaning. Using a notebook in this way allows teachers to use them as a formative assessment and then adjust instruction based on student needs (Aschbacher & Alonzo, 2006). However, Aschbacher and Alonzo discovered that teachers seldom use notebooks in this way. They found that teachers often have students copy notes word for word in their notebooks. When this occurs, performance expectations for summative assessments may be skewed due to the overestimating of their conceptual understanding during formative assessments of the notebook's content (Aschbacher & Alonzo, 2006).

When utilizing notebooks to construct knowledge, the teacher acts as the facilitator as students and teachers collaborate in discussing new understanding (Waldman & Crippen, 2009). Notebooking is empowering to the learner and their learning process as students are given choice in the creating of their notebooks and students view their notebook as a record of their understanding (Waldman & Crippen, 2009). Higher-order thinking is required when creating notebooks in an inquiry-based classroom as students are actively engaged in asking, investigating, creating, discussing, and reflecting throughout the notebooking process (Casey & Bruce, 2011; Campbell &

Cox, 2018; Mills et al., 2014; Waldman & Crippen, 2009). Students value sense making and become aware of their learning process, which results in increased student motivation which, in turn, results in higher achievement (Waldman & Crippen, 2009). Notebooks require students to be actively engaged, self-reflective, able to express thoughts and personal values, be organized, have pride in their products, demonstrate understanding, and self-regulate (Waldman & Crippen, 2009).

Rappolt-Schlichtmann et al. (2013) studied the use of virtual notebooks in a fourth-grade science classroom. The results of the implementation of virtual notebooks showed an improvement in learning outcomes in the science content area as compared to learning outcomes from the traditional composition/paper and pencil notebooks. The use of virtual notebooks in this study provided a place for students "to collect, organize, and display observations and data", "to reflect and make sense of inquiry experiences", and "multiple opportunities to demonstrate understanding and receive formative feedback" (Rappolt-Schlichtmann et al., p. 1211). As students constructed knowledge in this study, the use of virtual notebooks prompted students to reference data and observations they had collected while also using content specific vocabulary as they expressed their newly constructed understanding though a variety of multimedia options. This study proved that the use of virtual notebooks in an elementary classroom can impact the knowledge acquisition process and learning outcomes for students.

Miller and Martin (2016) implemented the use of virtual notebooks in an elementary setting through the use of a whiteboard application on the iPad called Educreations. Miller and Martin believe that science notebooks are vital to sustaining science inquiry as they provide an avenue to meet the needs of today's learners. Virtual

notebooks provide a better way for teachers to provide "multiple modes of communication, assessment, and differentiation for diverse students in the classroom" (Miller & Martin, 2016, p. 89). Miller and Martin (2016) found that the use of virtual notebooks took the sharing of information in the classroom to a new level as students could communicate their thinking, drawings, images, videos, etc., while also seeking feedback in an easier and more efficient manner compared to physical notebooks.

Importance of Higher-Order Thinking in Constructing Knowledge

This section will begin by providing a definition of higher-order thinking. Then, Webb's Depth of Knowledge (Webb, 1997, 2002) will be presented as a model for higher-order thinking. This section will provide classifications and verbs that are used to assess the cognitive level of students. Next, the impact of IBL on higher-order thinking will be presented, including how technology, student reflection, and notebooking in an inquiry-based classroom can impact DOK Levels. Finally, the use of higher-order thinking in the social studies content are will be discussed and studies on this topic will be presented.

Definition of Higher-Order Thinking

Higher-order thinking is a complex mode of thinking that generates multiple solutions as the learner takes control and is responsible for their own thinking (Anderson & Mills, 2015; Miri et al., 2007). Higher-order thinking involves uncertainty, application, and self-regulation as the learner identifies a useful source of information, analyzes its credibility, reflects on the new information and aligns it with prior knowledge, and then forms new conclusions (Anderson & Mills, 2015; Miri et al., 2007). Utilizing higher-

order thinking skills when learning is beneficial to students and their knowledge acquisition (Miri et al., 2007).

Model for Higher-Order Thinking: Webb's Depth of Knowledge

One model commonly used to measure the level of higher-order thinking required to complete an activity, assignment, or inquiry is Webb's DOK (Webb 1997, 2002). Webb's DOK is a continuum of thinking complexity that includes four levels, starting with fundamental and simple knowledge to cognitively complex thinking, that relate to the depth of content understanding and the scope of the learning task, which is referred to depth and complexity (Anderson & Mills, 2015; Paige et al., 2013; Paige et al., 2015). In 2013, Karin Hess developed a guide for using Webb's DOK with Common Core State Standards. This guide provided an in-depth explanation of what it looks and sounds like at each level of cognitive demand according to Webb's DOK.

Depth of Knowledge Level 1. DOK Level 1 is Recall (Webb, 2002; Hess, 2013; Paige et al., 2013). DOK Level 1 involves basic tasks that require the student to recall or reproduce knowledge and skills (Webb, 2002; Hess, 2013). Examples of DOK Level 1 activities include fill in the blank tests, decoding words, reproducing a map, and brainstorming related ideas (Webb, 2002; Hess, 2013). Examples of verbs used to describe what the student is doing at a DOK Level 1 include identify, recite, label and locate, to name a few (Hess, 2013). The teacher's role is to provide the students with the information they are to master in ways such as defining, providing examples, and demonstrating (Hess, 2013). DOK Level 1 is the least cognitively demanding level of the four levels.

Depth of Knowledge Level 2. DOK Level 2 is Application (Webb, 2002; Hess, 2013; Paige et al., 2013). DOK Level 2 involves tasks that require the student to compare, differentiate, sort, describe, explain, provide examples and non-examples, and apply multiple concepts in an explanation (Webb, 2002; Hess, 2013). Examples of DOK Level 2 activities includes simulations, explaining several steps used to find a solution, graphic organizers, relationship mind maps, and diary entries (Webb, 2002; Hess, 2013). Examples of verbs used to describe what the student is doing at a DOK Level 2 include infer, compare and contrast, classify, categorize, interpret, and predict (Webb, 2002; Hess, 2013). The teacher's role is to question students in order to differentiate, check for conceptual understanding, model content learning, and provide examples and non-examples as needed to scaffold students (Hess, 2013). This level is more complex than DOK Level 1 as students are asked to process newly learned knowledge and content before responding (Hess, 2013).

Depth of Knowledge Level 3. DOK Level 3 is Strategic Thinking (Webb, 2002; Hess, 2013; Paige et al., 2013). DOK Level 3 involves tasks that require the student to plan, use reasoning, evaluate and analyze as they solve real-world problems or try to find multiple outcomes as they explore questions (Webb, 2002; Hess, 2013). Examples of DOK Level 3 activities include participating in a debate, creating a video cast or vodcast, creating a Wiki or webcast, and writing an informational report with numerous subtopics (Webb, 2002; Hess, 2013). Examples of verbs used to describe what the student is doing at a DOK Level 3 include critique, investigate, revise, and assess (Webb, 2002; Hess, 2013). The teacher's role is to ask open-ended questions, act as a resource and a coach, to promote the use of multiple approaches, to encourage students to find multiple solutions,

to probe students to use reasoning in their learning process, and to explicitly state their thinking (Hess, 2013). This level logically is higher than DOK 1 and DOK Level 2 as students are expected to state their reasoning and provide evidence that supports their claims (Hess, 2013).

Depth of Knowledge Level 4. DOK Level 4 is Extended Thinking (Webb, 2002; Hess, 2013; Paige et al., 2013). According to Hess (2013), DOK Level 4 involves tasks that "demand extended and integrated use of higher-order thinking processes such as critical and creative-productive thinking, reflection, and adjustment of plans over time" (p. 18). Examples of DOK Level 4 activities include participating in a self-directed inquiry, project-based learning, solving real-world problems by using information across disciplines, and creating a documentary (Webb, 2002; Hess, 2013). The teacher's role is that of a facilitator who questions, helps broaden perspectives, encourages collaboration, and assists in student self-evaluation and reflection (Hess, 2013). DOK Level 4 is the highest level as it expands the possibilities of the tasks as students utilize multiple texts and find multiple sources across disciplines as they focus on deeper understanding in order to create a product or reach a solution (Hess, 2013). Teachers can intentionally plan for DOK Levels based on the cognitive complexity required by the standards (Paige et al., 2015).

Impact of Inquiry-Based Learning on Higher-Order Thinking

IBL is considered DOK 4 as the student gathers, analyzes, evaluates, and synthesizes information while the teacher takes on the role of a facilitator. Laliberte et al. (2016) examined the relationship between IBL and Webb's DOK (Webb, 1997, 2002). They did this by conducting conversations in focus groups with eight teachers selected in

grades K-12 from two different districts, with four teachers being elementary and four teachers being secondary. The teachers in these focus groups felt that students need time and space to embark on student-led inquiries and then be able to express their thoughts, feelings, and ideas about their new understanding. Laliberte et al. (2016) found that when students have the opportunity to embark on student-led inquiries, the level of Webb's DOK experienced by the students increased as the students were able to "extend their thinking beyond finite solutions to enter innovative mindsets" (p. 9). During the inquiry process, Webb's DOK Levels increased as students posed thoughtful questions, problem solved real-world issues, self-reflected, and utilized creativity routinely throughout the inquiry (Laliberte et al., 2016).

Longo (2016) believed that change needs to happen in the way that information is delivered in the classroom. He believed IBL positions the students to use higher-order thinking skills as they collaborate, question, research across content areas, and think critically. Real-world and problem-based inquiries encourage students to utilize graphic organizer, note-taking, create models and other visual representations to present their information, all of which are considered to be higher-order thinking skills (Longo, 2016).

Technology. When technology is used as a part of an inquiry-based classroom, the DOK can increase as students take ownership and have agency in their learning (Barrow, Anderson & Horner, 2017; Godzicki et al., 2013). Ertmer (2005) reported that although teachers are utilizing technology for low-level student assigned tasks, the use of technology for tasks requiring higher-order thinking is not as common. The use of technology allows students' to be active learners as they access multiple sources of information (Coiro et al., 2016). The DOK Level increases as students use digital tools to

create products to express their convergent and divergent knowledge and allows for collaboration with others (Coiro et al., 2016).

Tally and Goldenberg (2005) conducted research on the use of digitized primary sources in middle and high school social studies classrooms. Students were able to have interactive experiences with these sources as they completed IBL through the use of open-ended analysis activities. Students were given a questionnaire based on their learning experience using IBL and technology as compared to the previous method of instruction they experienced. Tally and Goldenberg (2005) analyzed the data for common trends and several themes emerged based on the student responses. First, the students found it beneficial to use technology as it helped them to learn in different ways and to utilize different skills. Second, they enjoyed using technology to view primary resources and to learn about history. Students also felt that the technology used in this study increased their use of higher-order thinking skills as they were able to take their time to observe, analyze, make inferences, gather information, and pose questions based on the primary resource.

Reflection. Reflection, the power of metacognition, is considered DOK Level 4 and is an important part of an inquiry-based classroom as students are able to ask additional questions, seek improvements, are prompted to conduct further investigations, and continue the inquiry cycle (Barrow et al., 2017; Casey et al., 2009). Students need opportunities to reflect on their feelings, thoughts, weaknesses, misconceptions, and understanding of new learning and experiences as they find personal relevance in the content (Casey et al., 2009; Laliberte et al., 2016; Waldman & Crippen, 2009).

Technology provides a place for students to publicly and critically reflect on their learning (Coiro et al., 2016; Godzicki et al., 2013).

Notebooking. Notebooking in an inquiry-based classroom can be used to increase higher-order thinking skills. Waldman and Crippen (2009) believe that student reflection should be an integral part of notebooking. This high-order thinking skill allows students to understand the value of sense making as they have autonomy in their learning (Waldman & Crippen, 2009). Waldman and Crippen (2009) also believe that when students are working on an interactive notebook, they experience motivation as they participating in metacognitive (high-order thinking) activities. Each student's notebook is an expression of their new-found knowledge, creativity, and self-regulation that is evident through the "personal, organized, and documented record of their understanding" (Waldman & Crippen, 2009, p. 53). Waldman and Crippen (2009) found that interactive notebooks become a treasured item to students because they are personal, individualized, and contain their own thinking and reflection.

Use of Webb's Depth of Knowledge in Social Studies Instruction

Patterson (2016) recognized that social studies teachers face a challenge every year as they are asked to cover a broad amount of content during a short period time while also helping students to become critical and active citizens. Patterson (2016) argues for the importance of IBL in the social studies content area that allows for critical and higher-order thinking. Patterson believes that teaching social studies through an inquiry approach, when supported by a technological and a sociocultural approach, allows for student-centered instruction. Student-centered, personalized instruction leads to a greater

depth of understanding through the use of higher-order thinking skills, enhancement of student personal competencies, and mastery of social studies content (Patterson, 2016).

Today's social studies standards require students to utilize critical thinking, quantitative reasoning, and solve complex problems while completing higher-order thinking tasks (Anderson & Mills, 2015). Increasing the DOK in social studies instruction allows students to think outside the box and extend their thinking to things that have infinite solutions as it requires students to be active participants in the learning process (Baer, 2016; Laliberte et al., 2016). With a goal of having students being career and college ready when they graduate high school, standards today emphasize higher DOK Levels such as critical thinking, complex problem solving, and quantitative reasoning (Anderson & Mills, 2015).

Anderson and Mills (2015) conducted a study to determine the cognitive complexity of lesson plans created by pre-service elementary social studies teachers using Webb's DOK. 235 lesson plans and assessments created by the pre-service elementary teachers were coded using Webb's DOK model. The results of the study showed that the majority of lesson plans and assessments created by the pre-service elementary teachers were at a DOK Level one or two (Anderson & Mills, 2015). The elementary students involved in this study provided feedback and reported feeling bored and disengaged when participating in a DOK Level 1 or 2 lesson or assessment. However, the students reported that they felt the most engaged when they had the opportunity to create or discover new learning at a DOK Level 3 or 4. Anderson and Mills (2015) believes that with today's demands on students, there is a need in the social

studies content area to plan instruction that meets the DOK Levels of the standards in order to prepare them to be active citizens and ready for the world's demands.

Importance of Student Motivation in Constructing Knowledge

This section will first provide a definition for motivation. Then, it will discuss the Self-Regulation in Learning Theory, the theory that will be used to provide a lens through which motivation will be viewed for this study. Next, the Motivated Strategies for Learning Questionnaire (MSLQ) will be presented and an in-depth look at the motivation section of the questionnaire will be provided. Following this section, the relationship between IBL, DOK Levels, and student motivation will be discussed. Then the relationship between student motivation and technology will be presented. Finally, it will discuss the importance of motivating students when teaching gifted learners.

Definition of Motivation

Motivation has been defined in different ways by different researchers. Weiner (1992) defines motivation as the "study of the determinants of thought and action - it addresses why behaviour is initiated, persist, and stops, as well as what choices are made" (p. 17). According to Ryan and Deci (2000), being "motivated means to be moved to do something. A person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated" (p. 54). Pintrich and Schunk (2002) define motivation as a process, not a product, "whereby goal-directed activity is instigated and sustained" (p. 5). Pintrich and Schunk (2002) believe that motivation cannot be directly observed but is inferred from the student's actions and behaviors. For the purpose of this study, Pintrich and Schunk's (2002) definition will be used for motivation.

Self-Regulation in Learning Theory

Self-regulated learning, as defined by Pintrich (1999), provides a cognitive theoretical view. Pintrich (1999) defines self-regulated learning as "the strategies that students use to regulate their cognition (i.e., use of various cognitive and metacognitive strategies) as well as the use of resource management strategies that students use to control their learning" (p. 459). According to Zimmerman (1989), self-regulated learners can be described to the degree they are actively participating in their own learning process through the use of metacognitive, motivational, and behavioral processes and skills (p. 329). Students who are participating in self-regulated learning are able to originate, guide, and sustain their own efforts in knowledge acquisition instead of relying on teachers and other adults to guide instruction (Zimmerman, 1989). Zimmerman (1990) describes self-regulated learning strategies as "actions and processes directed at acquisition of information or skills that involve agency, purpose, and instrumentality perceptions by learners" (p. 5). Self-regulated learners are aware of the relationship between their actions and processes and their learning outcomes as well as their use of self-regulated learning strategies in achieving their academic goals (Zimmerman, 1990). Therefore, self-regulated learning is the result of engaging in self-directed metacognitive, cognitive, affective, and behavioral processes and skills (McCombs & Marzano, 1990).

There are three components of self-regulated learning: cognition, metacognition, and motivation. Cognitive and metacognitive processes and skills cannot stand alone in self-regulated learning as motivation is infused throughout the process. In short, students must be motivated "to use the strategies as well as promote their own cognition and effort" in their learning process (Pintrich & De Groot, 1990).

Motivation Component of Self-Regulated Learning Theory. For this study, the focus is on the motivation component of self-regulated learning. Motivation plays a vital role in initiating and sustaining self-regulated learners (Pintrich, 1999; Zimmerman, 2011). According to this theory, motivation and student learning are interdependent processes that cannot be analyzed fully in isolation (Zimmerman, 1989). Self-regulated learners pay attention to their learning process, make choices, and put forth effort to learn (Zimmerman, 2011). As students originate, guide, and sustain their own efforts in knowledge acquisition, they experience self -motivation (Bandura, 1989). The student's self-motivation is evident in their actions and processes as they meet their goals, set higher goals for themselves, and seek out and profit from their learning (Zimmerman, 1989). Cognitively based theories of self-regulation focus on intangible outcomes (e.g. self-actualization, self-efficacy, or reduced cognitive dissonance) (Zimmerman, 1989).

McCombs and Marzano (1990) believe that skill and will contribute to student motivation as part of self-regulation theory. McCombs and Marzano (1990) define skill as one's ability or the "metacognitive and cognitive information processing strategies" one possesses (p. 63). Marzano et al. (1988) created a Dimensions of Thinking model with four parts that support the skill aspect of self-regulation. These parts include: "(a) thinking that establishes and maintains the context for learning, (b) thinking that facilitates initial information acquisition, (c) thinking that facilitates knowledge development and change, and (d) thinking that renders learning higher order in nature" (McCombs & Marzano, 1990, p. 64). Although a skill component can add to a student's self-motivation, a student's will, is not only necessary, but primary in self-regulation. McCombs and Marzano (1990) define will as an internal, self-generated desire that is

based on self-awareness and values, personally set goals, and affect and mood. In order to increase the will aspect of student motivation, "students must realize they are creative agents, responsible for and capable of achieving self-development and self-determination goals, and understand their capabilities for reaching these goals" (McCombs & Marzano, 1990, p. 51). In order to engage in self-regulated learning, students should believe they have the confidence in their ability to learn (self-efficacy) and that there is purpose in their learning (task-value) (Pintich & De Groot, 1990). One way to quanitiatively measure student motivation, or student will, is through the Motivated Strategies for Learning Questionarie (Pintrich, Smith, Garcia, and McKeachie, 1993).

The Motivated Strategies for Learning Questionnaire

The Motivated Strategies for Learning Questionnaire (MSLQ) was developed by Pintrich, Smith, Garcia, and McKeachie (1993) as a quantitative way to assess motivational orientations and learning strategies of college students. The MSLQ differs from other motivation instruments as it is based on the cognitive theoretical framework of motivation and learning strategies (Pintrich et al., 1993). With this cognitive view, the "student is represented as an active processor of information whose beliefs and cognitions are important mediators of instructional input" (Pintrich et al., 1993, p. 801).

Motivational constructs and subscales. Specifically, the motivational subscales are based on three motivational constructs: expectancy, value, and affect strategies (Pintrich et al., 1993). Expectancy pertains to a student's belief in themselves that they can accomplish a task (Pintrich, Smith, Garcia, & McKeachie, 1991; Pintrich et al., 1993). The reasons why students engage in academic tasks pertains to the value component. Affect pertains to student concerns and anxiety in regards to taking tests

(Pintrich et al.,1991; Pintrich et al., 1993). Each component in the motivation section has subscales. There are two subscales related to expectancy: perceptions of self-efficacy and control over learning beliefs. Self-efficacy refers to performance expectations and the student's personal judgements about their own ability to finish a task., as well as confidence in the skills they possess that are required to complete the task (Pintrich et al., 1991). Control over learning beliefs refers to a student's belief that there will be positive outcomes from the effort they put into their learning (Pintrich et al, 1991). There are three subscales related to value: intrinsic goal orientation, extrinsic goal orientation, and task value beliefs. Intrinsic goal orientation refers to a student's view of learning and mastery (Pintrich et al.,1991; Pintrich et al., 1993). Extrinsic goal orientation refers to a student's view of grades and approval from others (Pintrich et al.,1991; Pintrich et al., 1993). Task value refers to the student's personal judgements based on interest, usefulness, and importance of the content being taught (Pintrich et al.,1991; Pintrich et al., 1993). There is one subscale related to affect: test anxiety. There are 31 questions in the motivation section of the MSLQ (Pintrich et al., 1993).

The Relationship between Inquiry, DOK Levels, and Motivation

Self-regulated learners are motivated to learn in an inquiry-based classroom at higher DOK Levels as they are able to set and reflect on learning goals, plan and carry out a course of action, select and utilize appropriate skills and strategies, self-monitor and self-evaluate throughout their learning process, are intrinsically motivated to learn, and report high self-efficacy for learning and performance (Zimmerman & Kitsantas, 2005). Kuisma (2018) conducted research on IBL in geography classrooms in a middle school setting. Kuisma (2018) found that learners who have self-efficacy beliefs that are positive

and realistic and also possess self-regulated learning skills benefit from an inquiry-based approach to learning as they are motivated in the learning process.

Smith and Wilhelm (2002) conducted research on the literacy lives of middle school boys who were considered low, middle, and high achievers. They found that the boys were not motivated to read because they did not find the activity relevant or purposeful. However, when the activities were presented through an inquiry lens, student motivation increased and the young men participated in the literacy and learning experience. Wilhelm and Wilhelm (2010) believe that IBL increases student motivation as it encourages student ownership of their learning, allows students to feel an aspect of control in their learning process, allows for student and autonomy, makes the purpose for learning explicit, allows for student collaboration, and makes learning personally relevant. A study by Kirkendall and Kirshen (2015) found similar results as Smith and Wilhelm (2002). Student's in the study by Kirkendall and Kirshen (2015) attributed their increased student motivation and higher DOK Levels to the use of choice in class assignments and topics which in turn allowed them to be more creative and to further their thinking.

Students are more likely to be motivated when challenged to complete tasks at a higher DOK Level (Godzicki et al., 2013). Buchanan (2018) found that students in an IBL environment experienced motivation and higher DOK Levels as they stretched themselves to discover and construct new knowledge through autonomy, curiosity, and individualization. The results in a study conducted by Paige, Sizemore and Neace (2013) showed that higher-order thinking activities were accompanied with increased student

motivation. These studies prove that there is a relationship between student motivation, IBL, and DOK Levels.

The Role of Technology in Motivating Students

When a learner is engaged while using technology, they have a motivation to learn, use their prior knowledge, and manage their time well (Lee et al., 2019). Technology promotes cognitive engagement by giving students access to a plethora of material they can use to discover new information (Arguello, 2018). Technology promotes behavioral engagement by getting students involved in classroom community learning and in their own learning (Arguello, 2018).

Heafner (2004) studied the impact technology had on student motivation ninth and tenth grade social studies classrooms. During this study, students were assigned a PowerPoint presentation as part of an assignment. Results of the study showed a difference in student behavior between the classroom itself and the computer lab where the PowerPoint was being created. Heafner (2004) noted that students became excited about learning when they were in the computer lab. They had a sense of pride in their work and students reported a sense of motivation and enjoyment in the technology assignment.

Godzicki et al. (2013) conducted action research to increase student motivation through the use of technology with elementary and middle school students. Surveys were given to the teachers and the students. Survey results were analyzed to discover ways that technology impacted student engagement. Godzicki et al. (2013) believed this study was necessary because engagement is necessary in order for students to experience achievement. The results indicated that technology allowed students to take ownership in

their learning process, which increased student motivation. The survey results also showed that students are more motivated when they see an authentic and real-world connection to what they are learning.

Halat (2013) conducted research on the effects of using technology, specifically Webquests, on student motivation in 4th and 5th grade social studies classrooms. The students were introduced to Webquests and were given a Webquest to complete on their own. Students were given a questionnaire to complete after finishing their Webquest assigned. Results showed that students enjoyed learning and experienced increased motivation when completing a social studies Webquest.

Self-Regulation, Motivation and Gifted Learners

When gifted learners are appropriately challenged, they show an increase in engagement and motivation for learning (Eysink et al., 2015; Phillips & Lindsay, 2006). Schwanenflugel, Stevens, and Carr (1997) described gifted students as possessing greater metacognitive abilities, suggesting that they are more aware of their own mental capabilities as opposed to regular ed students. Self-regulation is an aspect of metacognitive knowledge and is essential when working on learning tasks, as students make decisions throughout their learning process, plan a course of action, select and utilize strategies, monitor the use of strategies and implementation of the plan, and abandon or revise the use of strategies and the plan (Garafalo & Lester, 1985).

Van Deur (2004) interviewed ten gifted students about their ability to be self-regulated and self-directed learners and then compared the results with ten randomly selected regular ed elementary students and with four elementary students who learning difficulties. The gifted students who were interviewed by Van Deur (2004) verbalized a

positive connection between IBL, self-regulation, and motivation. The students enjoyed planning and carrying out an inquiry and experienced motivation during the learning process.

In providing challenge to meet gifted students' needs, Patrick, Gentry, Moss and McIntosh (2015) suggest that educators should substitute (not add) appropriately challenging assignments and content. These assignments should allow for interesting and meaningful learning with opportunities for inquiry and choice. When gifted students are allowed to participate in inquiry-based and self-regulated learning, students are able to use higher-order thinking skills that they crave (Kanevsky, 2011). Gifted students find it motivating to learn through inquiry about complex topics in authentic ways and appreciate being able to personally find connections between ideas and topics (Kanevsky, 2011). Gifted students enjoy the level of challenge that more advanced opportunities present and experience motivation when allowed to participate in this type of learning (Foust, Hertberg, Davis, & Callahan, 2009).

Housand and Housand (2012) explored the overlap between what has historically been noted to increase motivation of gifted learners and the affordances that technology offers gifted learners. They found even though technology alone may not be motivating to students, there is a relationship between motivation of gifted learners and the opportunities made possible by technology tools. Housand and Housand (2012) found that motivation of gifted students increases as they are able to use technology to collect information, synthesize information, and then communicate their new understanding with others by using Web 2.0 tools. Housand and Housand (2012) also found that curious gifted students are able to use technology to get immediate answers to their questions

through the use of technology devices. Therefore, gifted students can be motivated learners as they research to find answers to their own personal inquiries.

Chapter Summary

The purpose of this research is to implement and evaluate the use of virtual interactive notebooks in a 4th grade gifted social studies classroom. With the availability of technology in elementary classrooms, further research needs to be conducted to analyze the impact virtual interactive notebooks have on higher-order thinking and student motivation in the social studies content area.

Many teachers implement notebooking in their classroom as a way for students to copy notes from the board. Every student has the exact same information and pictures on the same pages in their notebooks. However, this is not what notebooking in a constructivist environment should look like. Notebooking in a constructivist classroom involves the teachers giving students the opportunity to construct meaning on their own, with help from the teacher who is a facilitator in their learning, and to articulate their understanding and thinking into their own words onto pages in their notebooks (Alschbacher & Alonzo, 2006).

Utilizing notebooking in an inquiry-based classroom also allows students to question and explore topics within the content on their own. Inquiry is a stance that promotes learning in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and what they want to know (Casey & Bruce, 2011; Mills et al., 2014). Allowing time for students to have choice and providing them with self-directed learning opportunities assists the students in constructing knowledge.

The use of virtual notebooks in the science content area is becoming more prominent. Students are able to use technology to record their thinking and try to find answers to questions they have as they conduct labs and use the scientific method in conducting research. Technology integration in the content areas allows for students to use technology as a tool to conduct research and record their thinking. While the use of virtual notebooks in the science content area is becoming more prominent, the use of virtual notebooks in the social studies content area has not been researched.

Higher-order thinking is a complex mode of thinking that generates multiple solutions as the learner takes controls and is responsible for their own thinking (Anderson & Mills, 2015; Miri et al., 2007). Webb's DOK (Webb, 1997, 2002) is one method to measuring higher-order thinking. The DOK Level needed to complete classroom activities can increase based on several factors. The use of technology allows for higher DOK Levels as students are able to construct knowledge on their own while the teacher acts as a facilitator. Students are able to use Web 2.0 tools to showcase their learning, which in turn increases DOK Levels. Another factor that contributes to higher DOK Levels is student reflection. Student reflections are considered DOK Level 4, which is the highest level of higher-order thinking according Webb's DOK. Reflection requires students to ask additional questions, seek improvements, conduct further investigations, and continue the inquiry cycle (Barrow et al., 2017; Casey et al., 2009). This study will research the impact of virtual notebooks in the social studies content area on higher-order thinking based on Webb's DOK.

Student motivation occurs when students instigate and sustain goal-directed activities (Pintrich & Schunk, 2002). Pintrich and Schunk (2002) believe that motivation

cannot be directly observed but is inferred from the student's actions and behaviors. Student motivation can increase based on several factors. The use of technology contributes to student motivation. Another factor that increases student motivation is when students participate in IBL. Student motivation is important because it is associated with higher-order thinking skills. This study will study the impact of virtual notebooks in the Social studies content area on student motivation.

Students who are identified as gifted learners achieve at higher levels and grow at a faster pace than their peers. Gifted students can be characterized as curious, active learners. However, meeting the needs of gifted learners can be a challenge for teachers. Gifted students need the opportunity to engage in self-directed learning opportunities that encourage the use of higher-order thinking skills. This can be accomplished with the integration of technology in the classroom. Technology integration and IBL are two ways educators can meet the needs of gifted students. This study will research the impact of technology integration and IBL (through the use of virtual notebooking) on student motivation and higher-order thinking skills of gifted learners.

CHAPTER 3

METHODOLOGY

The purpose of this action research was to implement and evaluate the use of virtual interactive notebooks as a way to promote higher level thinking and motivation in gifted students. This action research was guided by two questions:

1. How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?
2. How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?

Research Design

Utilizing an action research approach for this study was an appropriate tool to gain insight into how virtual interactive notebooks in an inquiry-based social studies classroom impacted higher-order thinking and motivation of gifted students. This action research took place in my own classroom. I implemented a new approach to notebooking in order to study the impact it had on student learning, specifically, student use of higher-order thinking skills and student motivation. I had a desire to conduct this action research because I wanted to increase my students' understanding and motivation for learning

social studies content through notebooking. The results of this study have impacted my approach to notebooking with current and future students.

Action Research

According to Mills (2018), "action research is any systematic inquiry conducted by teacher researchers . . . in the teaching/learning environment to gather information about how their particular school operates, how they teach, or how well their students learn" (p. 10). Mertler (2017) and Johnson (2008) believe action research is a systematic inquiry into a teacher's own practice. Therefore, action research allows a teacher to study and better understand their own students and their own teaching practices in order to improve their own methods. During action research, a teacher is allowed to study their own classrooms "in order to better understand them and be able to improve their quality or effectiveness" (Mertler, 2017, p. 4). Action research allows the researcher to identify a problem in education and then devise a method and implement a change that addresses the problem. Next the researcher observes, collects, and analyzes data pertaining to their implemented action. This requires daily data collection, reflection, and developing and adjusting of an action plan (Mills, 2018). The final step in action research is to reflect and share the findings. Therefore, action research was an appropriate tool for my study because it allowed me to implement an action into my own classroom and conduct a systematic inquiry on the impact the action had on the classroom.

Research Method Design

Specifically, I utilized a convergent parallel mixed methods approach to my research. According to Creswell (2014), a convergent parallel mixed methods approach allows the researcher to merge both types of data to provide a comprehensive analysis of

the study. During this study I collected qualitative and quantitative data simultaneously. I used both types of data to check for accuracy and validity of the data collection methods within each research question. I utilized the information collected from the qualitative and quantitative data sources in the interpretation of the results of the study.

Research Setting

The innovation occurred in a social studies fourth-grade classroom with gifted learners in a K-5 elementary school in an elementary school in the state of South Carolina. The school district in which the elementary school is located prides itself in being one of the top districts in the state and has been nationally recognized for outstanding academics, Magnet programs, and extra-curricular achievements. According to greatschools.org (2017), the elementary school in which this study took place enrolled approximately 650 students, with a population of 68% White students, 19% African American students, 4% Hispanic students, 4% Asian American students, and 5% other students.

The community in which the elementary school is located is predominantly economically affluent, consisting of residential neighborhoods with single family homes. The elementary school is a choice school, meaning parents can apply for their students to attend if they do not live in the school boundaries, but do live in the school district. These parents must provide transportation for their child to attend. The parents at the school are extremely supportive of the school and the teachers. Administration expects teachers to build relationships and have open communication with families.

During the time of this study, the school district had an initiative to increase student test scores. The district required teachers during the 2019-2020 school year to

promote and require deeper thinking by students in the content areas. In response, the administration at the elementary school where this study took place implemented their own initiative that encouraged teachers to design lessons that went beyond DOK Level 1 and 2.

The school district was in the process of implementing one-to-one technology for enhanced student learning during the 2019-2020 school year. Middle and high school students were one-to-one as each student had access to their own school provided Chromebook. Some elementary schools in the district were also one-to-one. The elementary school in which this study took place was not yet one-to-one as a school, however, teachers had access to Chromebooks and Ipads and could check them out for student use. Administration at the school expected students and teachers to use technology daily. During the 2019-2020 school year, all classrooms were equipped with a laptop, desktop computer, Smart Board, and 12 Chromebooks. Teachers in fourth and fifth-grade were expected to use Google Classroom with their students, along with Google add-ons such as Google Docs and Google Slides. In order to conduct this study, administration provided me a class set of Chromebooks, making my student to Chromebook ratio one-to-one.

During 2019-2020, I was teamed with another gifted certified teacher. She taught language arts and science while I taught math and social studies. There were 23 students in the gifted class in which this study was conducted. The gifted students were in my classroom for a total of two hours and fifteen minutes. The layout of my classroom was designed around promoting group work and collaboration. My classroom was made up of five tables, with four students sitting at each table. I also had three students sit at the back

counter. This set-up also allowed for a large area on the floor to gather as a group and to allow for movement when working.

Participants

The 23 fourth-grade students selected for this study were in enrolled in the same gifted class. They were served by two gifted certified teachers, including myself.

Gifted students in the school district where this study was situated are identified by meeting two out of three dimensions (see Figure 3.1). The first dimension in reasoning. Students must score in the 93rd percentile or above on a nationally normed aptitude test. The second dimension is achievement. Students may qualify to meet this dimension in two ways: (a) the study must score in the 94th percentile or above on MAP testing in ELA or math or (b) score at the performance standard level set by the state department on the South Carolina end of year tests in ELA or math. The last dimension is academic performance. A cognitive ability test is given to select student who have met either Dimension A or B in order to check for eligibility. Students must achieve a performance standard set on verbal or non-verbal performance tasks on the South Carolina Performance Task Assessment in order to meet this dimension. However, students may qualify for gifted services by scoring in the 96th national age percentile or above on a nationally normed aptitude test in Dimension A. These students only need to meet one dimension to be identified.

Screening/Referral/Assessment Profile	Criteria	Examples of Qualifying Test(s)
Dimension A: Reasoning Ability	93rd age percentile or higher on a nationally normed aptitude test (Verbal (V), Nonverbal (NV), Quantitative (Q), Composite (C))	CogAT (V, NV, Q, C) OLSAT (V, NV, Q, C) Raven or NNAT (NV only)
Dimension B: High Achievement in Reading and/or Mathematical Areas	94th percentile or higher on nationally normed achievement test or Qualifying score on SC state test set annually by the state	MAP(Fall/Spring) Iowa Test of Basic Skills TerraNova MAT8 Stanford 10 ACT Aspire (2015) SC Ready
Dimension C: Intellectual/Academic Performance	Qualifying score on South Carolina Performance Tasks (Verbal or Nonverbal) Rising grades 3-6 **OR** 3.75 GPA for Rising 6th and above	SC Performance Tasks (administered annually in February/March) GPA on 4.0 scale for core content classes and yearlong world language

Figure 3.1. Gifted Identification Chart.

The students in this study experienced learning in the social studies content area using a physical interactive notebook previously during the school year. The class and the students chosen for this study were purposely selected as they were identified as gifted learners enrolled in my gifted fourth-grade social studies class (Creswell, 2014). As a gifted social studies teacher, I had access to the names of the students in the sampling population because they were students I taught daily. I utilized purposeful sampling to choose students to participate in the interviews for data collection. These students were chosen based on a hierarchy of criteria including gender, their highest national aptitude score in Dimension A or Dimension B in gifted identification, and their social studies grade for the first nine weeks in fourth-grade. Table 3.1 provides a class profile of the participants. Student names were replaced with student pseudonyms in order to protect student identity. Some students were not enrolled in the school district when tests were administered. These students do not have data to report in the table.

Table 3.1 *Participant Profile*

Student	Qualifying COGAT percentile	Highest MAP % fall 2019 reading(R) and/or math(M)	Highest 2019 state rank for SC Ready language arts (LA) and/or math	SS grade 1st nine weeks	Gender	State identified gifted
Kim	93	73 (R)	94 (LA)	95	F	NO
Lily*	93	71 (R)	85 (LA)	90	F	YES
Izzy	95	93 (R/M)	98 (M)	99	F	YES
Neil	--	91 (R)	99 (LA)	90	M	YES
Mel	--	96 (R)	--	100	F	YES
Orion	87	93 (R)	96 (LA/M)	98	M	YES
Emma	99	81 (M)	68 (M)	95	F	YES
Lindsay	99	83 (M)	91 (LA)	90	F	YES
Kate	88	94 (R)	96 (LA)	93	F	NO
John*	86	81 (M)	89 (M)	93	M	YES
Luella	91	81 (R/M)	79 (LA)	98	F	NO
Evan	--	97 (M)	92 (M)	96	M	NO
Cindy	--	88 (R)	--	99	F	YES
Brad	95	98 (M)	96 (LA)	100	M	YES
Nolan	98	64 (M)	82 (M)	88	M	YES
Paul	94	64 (M)	48 (M)	94	M	YES
Aaron*	97	96 (R)	96 (LA)	99	M	YES
Gray	92	79 (M)	92 (M)	96	M	NO
Mylie	99	87 (R)	96 (LA)	98	F	YES
Bryan	95	97 (M)	96 (LA)	95	M	YES
Beth*	99	81 (M)	98 (M)	98	F	YES
Brent	97	97 (M)	89 (M)	98	M	YES
Harris	94	94 (M)	85 (M)	98	M	YES

Note. An asterisk next to the student numbers represents the state identified gifted student will participate in the student interview.

There were 12 males and 11 females in this class. Due to the fact that the number of males and females were fairly equivalent and in order to equally represent learners, I chose four students with whom I conducted interviews: two males and two females. Specifically, I chose one male (Aaron) and one female (Beth) who were higher achievers on the tests (scores represented in the table). I also chose one male (John) and one female (Lily) who were lower achievers on the tests represented in the table. It is important to

note that these students are not considered low achievers and are state identified gifted students. However, within the gifted class they did not score as high as Aaron and Beth.

Innovation

The innovation of implementing a virtual interactive notebook occurred during one social studies unit (five weeks) of the school year in a fourth-grade gifted classroom. A virtual notebook is a digital notebook that can be constructed using a variety of Web 2.0 tools that allows for the sharing of ideas, feedback opportunities, and interactive possibilities for writing and showcasing understanding (Miller & Martin, 2016).

In the past, I have had students create physical interactive notebooks to record content in social studies. In these notebooks, every page for every student is identical. They each have the same words, either: (a) glued into their notebook from papers I have passed out or (b) copied from an example I have provided. Students have the same picture I provided so the notebooks are identical in nature. There is no space on these pages for student inquiry or student thought. This approach to notebooking allows for Depth of Knowledge (DOK) Levels 1 or 2 (Webb,1999, 2002). Student motivation is not maximized because they are reproducing products and are given no choice in their learning process instead of creating products or having choice over their learning.

Using technology for notebooking, instead of a physical interactive notebook, in the social studies content area allowed students to create, explore, discover and problem solve in innovative and individualized ways that provided for a more rigorous, open-ended, and student-centered approach to learning (Dunleavy et al., 2007; Ryan, 2017). Virtual interactive notebooks have the potential to expand student creativity and methods of expression by providing choice, increasing DOK Levels (Webb, 1999, 2002), and increasing student motivation (Waldman & Crippen, 2009). Students in this study were

given a checklist (Appendix A) at the beginning of the unit with the expectations for each of the virtual interactive notebook pages. Students used this checklist daily as a way to ensure they completed the pages thoroughly before submitting them via Google Classroom at the end of the unit.

Google Slides

Everyday students were expected to create a notebook page on the topic they learned about in social studies. Each slide had three sections: synthesis, inquiry, and image. The synthesis was a summary of the various materials and information presented along with information they encountered during their own personal research. The inquiry section included information they learned from their student-led inquiry based on their personal questions, connections, and feelings on the topic. The visual representation connected with the information students provided on the page and could be in the form of an image, video, or other media. This was the minimum required of students for each slide. Students were free to expand on this model if they chose. A template/example is provided in Figure 3.2.

Students were taught how to create a virtual interactive notebook page and the expectations for each page the week preceding the start of the innovation. This was taught through the creation of a mini Google Slides presentation over the span of two days (see Appendix B). On the first day, students were taught how to take information, synthesize it, write it in their own words on the notebook page for that topic, and find an image that supported their writing. On the second day, students were taught how to find answers to the questions they had on a topic and then write about them to demonstrate their understanding. Throughout both lessons, I provided personalized feedback for the

students. At the end of the second day, students had created their first virtual interactive notebook page and were aware of the process and expectations for creating each page.

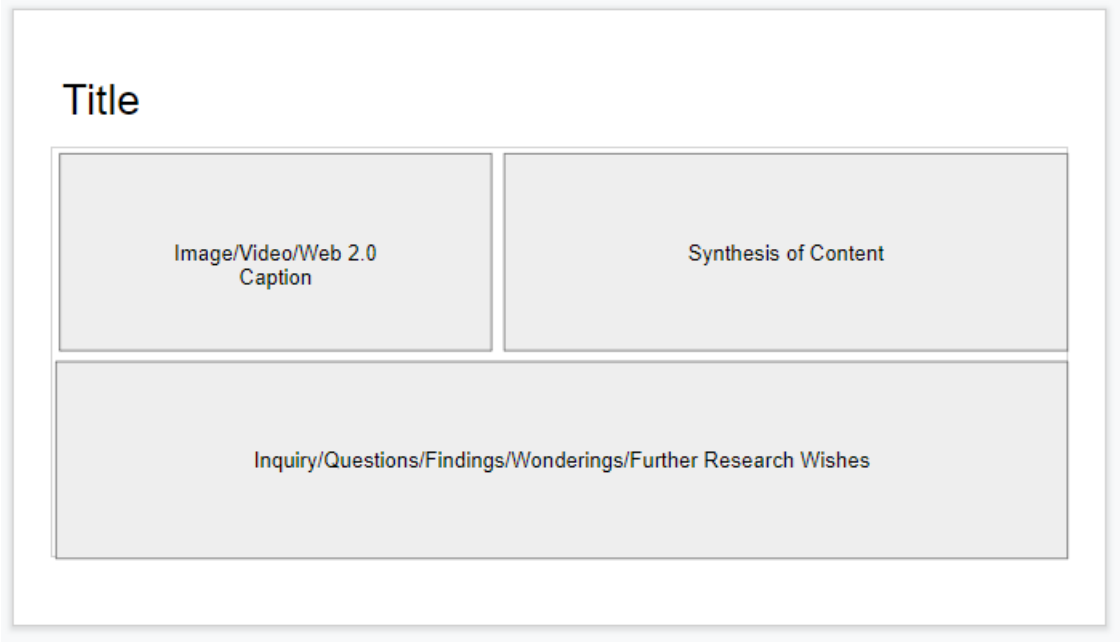

Figure 3.2. Google Slide format for the virtual interactive notebook.

Providing a Synthesis

An expectation for each notebook page was to include a synthesis of the topic that was discussed that day. Synthesizing is considered DOK Level 4, the highest level. The synthesis required students to combine various sources of information into their own words to produce a new, complex, personal way of explaining the topic. The synthesis allowed me to check for student understanding of the content. Synthesizing information from multiple sources was taught during language arts and social studies earlier in the 2019-2020 school year. For the purpose of this study, synthesizing information to formulate a new, complex, personal way of explaining the topic was reviewed with students before the implementation of the virtual interactive notebook.

Images

An expectation for each notebook page was to include some sort of image that connected to the information they provided. Before the implementation of the virtual interactive notebook, students were taught the importance of purposefully choosing an image that enhanced and supported the thinking they constructed in their synthesis and/or inquiry sections. Students were instructed that images should not take up more than one quarter of each individual slide. Examples of images students could use include pictures, videos, gifs, and student created artifacts using Web 2.0 tools. Students creating their own image or type of media aligns with DOK Level 4, the highest level. If students chose to use an image from another source, their process of assessing the image for alignment with their synthesis or inquiry section aligns with DOK Level 3.

Student Choice and Inquiry-Based Learning

Choice was given to students as they created each virtual notebook page. Students were given choice in the writing they created and the images they chose. They also had choice in determining how and when to incorporate Web 2.0 tools that allowed students to better represent their understanding of the topic. Students exercising choice in the selection of an image or choosing to create their own image is considered DOK Level 3 or 4, respectfully. Choice was also provided as students pursued their personal inquiries based on the topic introduced each day. Students exercising choice in their inquiries required higher DOK Levels (Webb, 1999, 2002) than copying notes from the board (as they had done with the physical interactive notebook). Student choice is associated with DOK 3 or 4, depending on the choices the student makes in their learning process.

Having this study take place in a constructivist, inquiry-based learning (IBL) environment allowed students to have their virtual interactive notebook facilitate their personal inquiries. IBL is a pedagogical approach to constructivism that promotes learning through asking, creating, discussing, and reflecting, throughout the learning process in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and what they want to know (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014). Creating a virtual interactive notebook in this setting impacted our social studies classroom environment as it looked and sounded different than it did when creating the physical interactive notebook. Students in this student were conditioned to inquiry as they had conducted inquiries in other content areas in our classroom. The transition to taking an IBL approach to notebooking in the social studies content area was easily implemented as the students were comfortable with utilizing the inquiry process. IBL in this study looked and sounded like students questioning, researching, comparing sites and information, discussing their findings and thoughts with others, sharing resources, and providing feedback to others. Students would often modify their thinking and rewrite their understanding in their notebook. They took on the role of historians and tried to perfect their notebook pages in order to convey their understanding of the content with others in our class. I was able to meet with students and facilitate them in their inquiry process. During these meetings, I would question their thinking, provide guidance as to where to find information, or pose possible questions they could research. I would provide feedback on their notebook pages and push them in their thinking.

Students having choice and utilizing an IBL approach to learning as they created their virtual interactive notebooks impacted student motivation. Learning was student-centered and I (the teacher) became a facilitator in helping students discover knowledge for themselves (Longo, 2016; Pratt, 2019; Thibaut et al., 2015). Student choice directly falls under the Control of Learning Beliefs subscale on the MSLQ (Pintrich et al., 1991). IBL falls under the Intrinsic Motivation subscale on the MSLQ (Pintrich et al., 1991), as inquiry allows for students to be curious.

Data Collection Methods

Quantitative and qualitative data were collected during this study to evaluate the impact virtual interactive notebooks had on higher-order thinking and student motivation. Quantitative data is important to this study as it provides a measurement and statistical analysis of the research conducted. Qualitative data is important to this study as it "uses narrative, descriptive approaches to data collection to understand the way things are and what the research means from the perspectives of the participants in the study" (Mills, 2018, p. 28). The quantitative and qualitative data in this study were triangulated in order to provide an accurate and comprehensive interpretation for each research question (Creswell, 2014; Mills, 2018). Table 3.2 shows the alignment of the three data collection sources utilized in this study with the corresponding research question. Specifically, the data sources for this study included (a) student interviews, (b) DOK Rubric, and (c) the MSLQ. All data were collected during the eight weeks of the study.

Table 3.2 *Research Question and Data Collection Sources Alignment*

Research question	Data collection sources
RQ 1: How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?	-student interviews -DOK Rubric
RQ 2: How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?	-student interviews -MSLQ

Student Interviews

Semi-structured interviews were conducted with four students, two boys and two girls. These interviews took place before the implementation of the virtual interactive notebooks and at the end of the study. The purpose of these interviews was to analyze student perceptions of virtual interactive notebooks. These interviews lasted approximately 10-15 minutes and particularly focused on the impacts interactive virtual notebooks had on student motivation and higher-order thinking. All interviews were recorded and transcribed. The interviews were coded using Delve (2021) software. Rounds of inductive coding occurred first, followed by deductive coding using a priori codes.

Questions asked were in alignment with the research questions for this study. Table 3.3 provides an alignment of the research questions with corresponding interview questions. Interview questions for Research Question 1 (Appendix C) were intentionally created to illicit information regarding the cognitive requirements of students when

Table 3.3 *Research Question and Student Interview Questions Alignment*

Research questions	Preintervention questions	Postintervention questions
RQ 1: How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?	-How has using a physical interactive notebook impacted you as a learner? - What parts of a physical interactive notebook allow you to think deeper as a learner? -Can you describe the types of thinking you do as a learner while using your physical interactive notebook? -Give an example of a time you pushed yourself in your thinking when creating your physical interactive notebook.	-How has using a virtual interactive notebook impacted you as a learner? -What aspects of using a virtual interactive notebook allow you to think deeper as a learner? -Can you describe the difference in the thinking required of you as a student to create a virtual interactive notebook versus a physical notebook? -Give an example of a time you pushed yourself in your thinking when creating your virtual interactive notebook.
RQ 2: How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?	-What parts of a physical interactive notebook motivate you as a learner? -How does using a physical interactive notebook challenge you as a learner? - Does the use of your physical interactive notebook impact your belief in your ability to do well in this class? Explain. -How does using a physical interactive notebook influence your interest in what we are learning? -What parts of the physical interactive notebook allow you to have student choice and control in your learning? How does this influence your motivation to learn?	-What aspects of using a virtual interactive notebook motivate you as a learner? -How did using a virtual interactive notebook challenge you as a learner? -Does the use of the virtual interactive notebook impact your belief in your ability to do well in this class? Explain. -How does using a virtual interactive notebook influence your interest in what we are learning? -What parts of the virtual interactive notebook allow you to have student choice and control in your learning? -How does the use of student choice and control when creating an interactive notebook influence your motivation to learn?

creating a physical or virtual interactive notebook. Interview questions for Research Question 2 (Appendix C) were intentionally created to provide clarity on questions from the MSLQ (Pintrich et al, 1991). Pre- and postintervention questions were designed to illicit feedback from students on the impact notebooking had on their use of higher-order thinking skills and motivation before the intervention began and then during the intervention. The semi-structured nature of these interviews allowed the researcher to ask clarifying questions to provide further information on the questions asked. The semi-structured nature also allowed the researcher to ask questions in the postinterview that arose from collecting data during the study.

DOK Rubric

Quantitative data on DOK Levels were collected through the use of a pre- and posttest that measured the impact virtual interactive notebooks had on higher-order thinking. Using Webb's Web Alignment Tool in Appendix D (Webb, Alt, Ely, & Versperman, 2006), a rubric was created to determine the DOK Level utilized by students for each notebook page (Appendix E). The DOK Rubric was used as a pre- and posttest for 15 students in this study. While all 23 notebooks were pretested, only 15 students fully completed their notebooks due to the interruption caused by COVID-19. Therefore, the scores from the pre- and posttest for the 15 students who completed their notebooks were used in this study.

The pretest was conducted before the implementation of the virtual interactive notebooks. The DOK Level for all pages in the unit students had just finished in their physical interactive notebook were determined using the rubric in Appendix E. The level assigned to each notebook page reflected the highest level of thinking the student work

represented (Hess, 2013). The posttest was conducted at the end of the implementation of the virtual interactive notebooks. The DOK Level for all pages in the unit students had just finished in their virtual interactive notebook were determined using the rubric in Appendix E. The level assigned to each notebook page reflected the highest level of thinking the student work represented (Hess, 2013).

Motivated Strategies for Learning Questionnaire (MSLQ)

Quantitative data on student motivation were collected through the administration of the MSLQ (Pintrich et al., 1991). The MSLQ is an 81-question instrument developed by Paul Pintrich and Bill McKeachie in the early 1980s. It was designed to measure the motivational orientations and learning strategies of college students (Pintrich et al., 1991). The 81 items on the MSLQ are divided into two categories: motivation and learning strategies. Each category is broken into subscales: (a) six motivation subscales and (b) nine learning strategies subscales.

For the purpose of this study and to adjust the use of this instrument to meet the needs of fourth-graders and to align the instrument to the purpose of this research, five of the motivation subscales and none of the learning strategy subscales were used in the questionnaire that was administered to students. The motivation subscales that were used included: (a) intrinsic goal orientation, (b) extrinsic goal orientation, (c) task value, (d) control of learning beliefs, and (e) self-efficacy for learning and performance. The focus was on these motivation subscales in order to analyze the motivation component of self-regulated learning. Appendix F includes a list of the subscales with the question numbers that pertain to each subscale. Using these five motivation subscales resulted in a total of twenty-six questions. Students answered the questions using a Likert scale. The scale

ranged from a seven, meaning that the statement is very true of the learner, to a one, meaning the statement is not at all true of the learner. The MSLQ (Appendix G), with the five selected subscales and questions aligned for this research) was administered before the implementation of the virtual interactive notebooks and after the implementation of the virtual interactive notebooks. Questions that did not align with the language of the research questions or the language of the students were rewritten to meet the needs of this study (Appendix H). A pilot was then conducted to check for question clarity. Two students who were not being interviewed for data collection were asked the questions and adjustments were made based on student feedback. Appendix I, J, and K record the changes made to the MSLQ questions based on student feedback.

The validity of the MSLQ occurred through various statistical tests and data collection events. Pintrich and McKeachie utilized confirmatory factor analysis to calculate parameters and to test the use of theoretical models for the motivation section, including all subscales that pertain to the motivation section (Pintrich et al., 1993). Confirmatory factor analysis allows the researcher(s) to determine the "utility of the theoretical model and the operationalization of the MSLQ scales" (Pintrich et al., 1993, p. 805). Reasonable factor validity was indicated through the confirmatory factor analysis of the MSLQ.

The reliability of the MSLQ was conducted by Pintich and McKeachie through the calculation and estimation of internal consistency (Cronbach's alpha) (Pintrich et al., 1993). The Cronbach's alphas for individual subscales are provided in Table 3.4. Overall, these results indicate that the reliability for the MSLQ is fairly proficient.

Table 3.4 *Cronbach's Alphas for each Motivation Subscales used in this Study*

Subscale	Cronbach's alpha
Intrinsic goal-orientation	.74
Extrinsic goal-orientation	.62
Task value	.90
Control of learning belief	.68
Self-efficacy for learning and performance	.93

Data Analysis

Qualitative data in this study were analyzed using inductive and deductive coding. There were two quanitative data sources in this study. Pre- and posttest data from the DOK Rubric was analyzed using a paired t-test. Pre- and postsurvey data from the MSLQ was analyzed using a Wilcoxon signed-rank test. Table 3.5 provides an alignment of research questions, data collection methods, and data analysis methods.

Table 3.5 *Alignment of Research Questions, Data Collection, and Data Analysis*

Research questions	Data Collection	Analysis
RQ 1: How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?	Quantitative: • DOK Rubric Qualitative: • Student interviews	Quantitative: • Paired t-test Qualitative: • Inductive coding • Deductive coding
RQ 2: How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?	Quantitative: • MSLQ Qualitative: • Student interviews	Quantitative: • Wilcoxon signed-rank test Qualitative: • Inductive coding • Deductive coding

Quantitative Analysis

Two different dependent repeated-measures tests were utilized in this study: a paired t-test and a Wilcoxon signed-rank test.

Paired t-test. According to Johnson and Christensen (2014), a repeated measures t-test, or paired t-test) is a quantitative data collection method in which the same participants participate in entire study and are measured repeatedly. The use of repeated-measures t-tests are appropriate for this study because of the use of a pretest before the intervention and a posttest after the intervention. The pretest results of the DOK rubric were compared with the posttest results for the same group of students to determine the difference in DOK Levels utilized by students and to measure the impact virtual interactive notebooks had on DOK Levels.

Wilcoxon signed-rank test. A pre- and postsurvey using the MSLQ (Appendix G) was conducted to measure the impact virtual interactive notebooks had on student motivation. After the means and standard deviations were calculated for the pre- and postsurvey, the results from the Shapiro-Wilk normality test suggested the results significantly deviated from normality. Therefore, a nonparametric Wilcoxon-signed rank test was conducted on the pre- and postsurvey data. This test was appropriate for this study because the same group of students participated in the creation of physical and virtual interactive notebooks (Ary, Jacobs, Irvine & Walker, 2018). Information on the reliability and validity of the MSLQ can be found in the Methods section.

Qualitative Analysis

Coding is a way of indexing data “to provide an overview of disparate data that allows the researcher to make sense of them in relation to their research questions”

(Elliot, 2018, p. 2851). Inductive and deductive coding were utilized in this study to analyze student interviews. After thoroughly completing inductive and deductive coding of student interviews, codes were then categorized and themes emerged.

Inductive coding. After the interviews were conducted and transcribed, the interviews were analyzed using inductive analysis. According to Miles, Huberman, and Saldaña (2014), inductive analysis involves coding data and then finding ways to make codes conceptually and structurally unified. When going through the analysis process, "codes should relate to one another in coherent, study-important ways; they should be part of a unified structure" (Miles et al., 2014, p. 82).

In this study, I first conducted a round of open coding as a part of the inductive analysis in order to search for codes that were relevant and vital to this research (Corbin & Strauss, 1990). After searching through the data for information that was important to this study and needed to be coded using open coding, I analyzed the codes to identify the types of codes represented in this study. After identifying the types of codes utilized, I then conducted subsequent cycles of coding, searching for lines or phrases that I missed that represented one or more of these types of coding. After combing through the data, I conducted multiple rounds of coding in which I refined the codes. All coding was conducted in alignment with the research questions in Table 3.6. Evidence of the codes that emerged, along with supporting data, was organized through the use of Delve (2021) software.

Deductive coding. Qualitative deductive coding was used to analyze student interviews for evidence regarding higher-order thinking and student motivation. A priori codes were predetermined purposefully before the study commenced and were deducted

from Webb's Web Alignment Tool and MSLQ subscales. In order to intentionally formulate a priori codes for Research Question 1, I took Webb's Web Alignment Tool (Appendix D) and looked intently at the verbs in each level. I conducted a textual analysis of the tool and looked for similarities between key verbs in each DOK Level. I then put the verbs into categories and found six overarching verbs for each section that encompassed the other verbs. These overarching verbs became the a priori codes for the corresponding level. Table 3.6 provides a list of the a priori codes for research question 1.

Table 3.6 *A Priori Codes for Research Question 1*

Research questions	Category/subscale	A priori codes
RQ 1: How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?	Level 1: Recall	Respond Explain Restate Interpret Recognize Describe
	Level 2: Application	Solves problems Calculates Completes Constructs Compiles Illustrates
	Level 3: Strategic Thinking	Debates Examines Justifies Uncovers Questions Compares
	Level 4: Extended Thinking	Designs Takes risks Proposes Formulates Modifies Creates

In order to intentionally formulate a priori codes for Research Question 2, I conducted a textual analysis of the questions in each subscale of the MSLQ utilized in this study (Appendix G). For each subscale, I searched for similarities between the questions and identified key words in the individual questions. I decided on four a priori codes for each subscale using this process. These codes allowed me to clarify quantitative data derived from the paired t-test. Table 3.7 provides a list of the a priori codes for research question 2. Evidence of the codes, along with supporting data, was organized through the use of Delve (2021) software.

Table 3.7 *A Priori Codes for Research Question 2*

Research questions	Category/subscale	A priori codes
RQ 2: How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?	Intrinsic Goal Orientation	Challenge Arouses Curiosity Understanding Desire to Learn
	Extrinsic Goal Orientation	Grades Belief in Ability Proud Fulfilling
	Task Value	Transferable Important/Useful Interesting Enjoyable
	Control of Learning Beliefs	Choice Ownership Endeavour Control
	Self-efficacy	Complex Excellence Mastery Confident

After all of the inductive and deductive coding was completed in Delve (2021), codes were then grouped together based on similarities. I conducted four rounds of

grouping codes to allow categories to emerge from the data (Parsons & Brown, 2002; Mertler, 2017). Categories were then grouped together based on similarities in order to allow themes to emerge.

Procedures & Timeline

The timeline for the procedures of this action research include four phases: Phase I: Participant Identification, Phase II: Introduction to Virtual Notebooking, Phase III: Data Collection, and Phase IV: Data Analysis. Each phase is described and a timeline for each phase is provided in Table 3.8.

Phase I : Participant Information

The collection of participant information for this study began in the spring of 2020. The students for this study were my gifted social studies classroom. Students and parents were informed about the research taking place in my classroom. A consent form was given to parents to provide parental permission for their child to participate in this study. After reviewing consent forms to account for parental permission, I then obtained permission to conduct the study from my school district. Next, I piloted the MSLQ and interview questions in order to ensure the language of the questions was understandable to the students. After getting feedback on the wording of questions from two fourth-grade students who were not chosen to be interviewed in this study, I edited the wording of the questions. Changes made to the wording of the questions for the MSLQ will be noted in Appendix I. Changes made to the wording of the interview questions for the preintervention questions will be noted in Appendix J. Changes made to the wording of the interview questions for the postintervention questions will be noted in Appendix K.

Table 3.8 *Timeline of Participant Identification, Data Collection & Data Analysis*

Phase	Expectation	Time frame
Phase I: Participant Information	• Contact participants • Collect consent forms • Pilot interview and MSLQ questions • Administer preintervention MSLQ • Conduct preintervention student interviews	2 weeks
Phase II: Introduction to Virtual Notebooking	• Students understand the purpose of virtual notebooking • Students understand the use of virtual notebooking • Students understand how to utilize Student Checklist	1 week
Phase III: Implementation and Data Collection	• Transcribe preintervention interviews • Implementation of virtual interactive notebooks • Administer postintervention MSLQ • Conduct postintervention student interviews	5 weeks
Phase IV: Data Analysis	• Transcribe postintervention interviews • Conduct inductive and deductive analysis of student interview • Conduct descriptive and inferential analysis of MSLQ • Conduct descriptive and inferential analysis of DOK Rubric	8 weeks

After adjusting the wording of the questions on the MSLQ, I administered it to students. During Phase I, I also interviewed the four students selected previously (Aaron, Beth, John, and Lily) in order to collect preintervention data. These students were chosen based on gender, ability, and grades in social studies in order to provide a fair representation of fourth-grade gifted students.

Phase II: Introduction to Virtual Notebooking

In order to prepare students for the implementation of virtual notebooking in the social studies content area, I taught two lessons that assisted students in being successful

with this new task (see Appendix B). The lessons had two main objectives: for students to understand the purpose of virtual notebooking and for students to be able to use the template to create an individualized notebook page for a virtual notebook (Figure 3.2). These lessons took place during our social studies block for the duration of two class periods. Students completed an initial page for their interactive notebook with scaffolding from the teacher. During this phase, students utilized the checklist (Appendix A) to guide the creation of their notebook page and to self-evaluate and reflect on their process.

Phase III: Data Collection

During the data collection phase, full implementation of virtual notebooks in the social studies content area occurred. The expectation was for students to create a notebook page daily on the topic we discussed in class using Google Slides as the technological tool. Students were expected to provide a synthesis of the topic that merged classroom discussion and personal research, use inquiry skills to further research questions and wonderings they had on the topic, and provide an image that illustrated their understanding (see Figure 3.2). At the end of the intervention, the MSLQ (Appendix G) was administered to students to collect postintervention data. A posttest on DOK Levels for each page in the student's virtual interactive notebook was assessed using the DOK Rubric (Appendix E). Student interviews with the same four students selected previously (Aaron, Beth, John, and Lily) were conducted to collect postintervention data. These students were chosen based on gender, ability, and grades in social studies in order to provide a fair representation of fourth-grade gifted students. Each postintervention interview was transcribed.

Phase IV: Data Analysis

After completing the data collection phase, qualitative and quantitative data were analyzed. The pre- and postintervention interviews were then imported into Delve, a coding software. First, inductive analysis of student interviews was utilized in order to allow for new understanding in the study and to allow codes to emerge that were vital to the study. After searching through the data for information that was important to this study and needed to be coded using open coding, I analyzed the codes to identify the types of codes represented in this study. After identifying the types of codes utilized, I then conducted subsequent cycles of coding, searching for lines or phrases that I missed that represented one or more of these types of coding. After combing through the data, I conducted multiple rounds of coding in which I refined the codes. All coding was conducted in alignment with the research questions in Table 3.6. Evidence of the codes that emerged along with supporting data will be organized through the use of Delve software. Next, qualitative deductive coding of the interviews occurred using a priori codes. A priori codes were determined based on Webb's Web Alignment Tool (Appendix D) and questions for each subscale of the MSLQ (Appendix G). Codes were then grouped together based on similarities. This happened four different times in order for categories to emerge from the data (Parsons & Brown, 2002; Mertler, 2017). Categories were then grouped together based on similarities. From these groupings, themes emerged.

Quantitative data from the DOK rubric (Appendix E) and the MSLQ (Appendix G) were then analyzed. A paired t-test was conducted using the pre- and posttest data from the DOK rubric to determine the impact virtual interactive notebooks had on student DOK Levels. Analysis of the data collected from the MSLQ (Appendix G) from both the

pre- and postadministration of the questionnaire was then analyzed using a Wilcoxon signed-rank test.

Rigor & Trustworthiness

This study utilized both quantitative and qualitative data. The rigor and trustworthiness of the data collected in this study was established through: (a) thick, rich descriptions; (b) peer debriefings; (c) triangulation, (d) member checking, and (e) an audit trail.

Thick, Rich Description

In this study, a small, purposefully selected sample was chosen to research the impact of virtual interactive notebooks on DOK Levels and student motivation in a social studies classroom. A thick, rich description is utilized to provide the reader with a "clear and in-depth understanding" of the setting and the participants (Mertler, 2017, p. 140). By providing sufficient detail in regards to the setting and participants in this study, the readers can reflect on the results of this study and evaluate how to apply the research in another setting and with other participants (Merriam, 1998). In this study, thick, rich descriptions were also provided through: (a) the use of quotes from student interviews and (b) through images of student work samples.

Peer Debriefing

Peer debriefing occurred with my dissertation chair throughout the research process. During the peer debriefing meetings, my dissertation chair reviewed and critiqued the analysis and interpretation of the data I collected (Mertler, 2017). Having my dissertation chair ask questions and make observations based on my data or process provided a way for me to refine my research methods, "develop a greater explanation of

the research design," and strengthen my "arguments in the light of the comments made" (Shenton, 2004, p. 67). Having another expert in my field provide feedback, challenge assumptions, ask for justification, and provide suggestions and guidance added to the trustworthiness of this study and ensure the findings will resonate with others (Creswell, 2014).

Triangulation

Triangulation is the process of comparing and analyzing multiple data sources and is conducted in order to establish the trustworthiness of the data collected (Bogdan & Biklen, 2007; Glesne, 2006; Mertler, 2017). In this study, the triangulation of data occurred by comparing and analyzing quantitative and qualitative data for consistency among the data sources. Triangulation included comparing inductive and deductive coded data with quantitative data collected through the DOK Rubric (Appendix E) and the MSLQ (Appendix G). Although each set of data collected provided insight that assisted in answering the research questions, data sources were also used to provide clarity into the findings and results of individual data sets. The rigor and trustworthiness of this study is strengthened as the multiple data sources in this study converged and allowed me to make assertions regarding the research questions.

Member Checking

Data collected during the study was shared with the participants to ensure the data collected fully represented the ideas and beliefs of the participants (Glesne, 2006; Mertler, 2017). The accuracy of the final findings and assertions were shared with the students and the rigor and trustworthiness of the data was validated by the participants (Creswell, 2014). Participants were able to review how they were portrayed in the study

based on the data collected. Students were also given transcripts of the interviews soon after the interviews were completed to review and clarify what that said or change responses if they saw fit. This event occurred during a one-on-one meeting between the participant and myself.

Memo-Writing

According to Creswell and Miller (2000), researchers should "provide clear documentation of all research decisions and activities" by providing an audit trail (p. 128). The method that was utilized to provide an audit trail in this study was memo-writing. Memo-writing was used to record initial impressions of qualitative data and to note patterns as they emerged, adding to the rigor and trustworthiness of the study (Shenton, 2004). Memo-writing provided a record of the research and analytical process as it assisted in the progression from data collection to interpretation and representation of the data (Charmaz, 2006). For this study, I utilized Delve (2021) for memo-writing.

Plan for Sharing and Communicating Findings

The results of this study will be used to increase the use of higher-order thinking and student motivation when notebooking in social studies. Results and findings were shared during class time with the student participants in this study. Findings were also shared with students and parents via Google Meet. Students also shared their notebooks with parents during student-led conferences. I will share the results of my study with teachers, administrators, district technology specialists, and the district social studies coordinator. The findings will be reviewed and revised by these stakeholders and then will be presented to other teachers, administrators, and leaders in the district through a compiled report.

Data in this study were analyzed for themes and assertions regarding DOK and student motivation. Therefore, any data shared in this study is done with regards to the participant's anonymity and confidentiality (Mertler, 2017). Data associated with individual students is provided to support the themes and assertions, however student identities will be kept confidential in the report by having a pseudonym assigned to each student.

CHAPTER 4

ANALYSIS AND FINDINGS

The purpose of this action research is to evaluate the implementation of virtual interactive notebooks as a way to promote higher-order thinking and motivation in gifted students. This action research is guided by two questions:

1. How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher-order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?
2. How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?

This chapter presents findings from both qualitative and quantitative data collected during this study. The first part of this chapter reports quantitative results from two sources. First, student motivation and learning strategies data were collected through the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1993). Second, the level of higher-order thinking, or Depth of Knowledge (DOK) Level, students utilized in their virtual interactive notebook creation was measured using a rubric that was created for this study and derived from Webb's Web Alignment Tool (Webb et al., 2006)**.** The second part of this chapter provides the qualitative findings from the pre- and postinterviews.

Five themes that emerged from the analysis of the interviews are presented and explained.

Quantitative Analysis and Findings

Quantitative data in this study were collected through two different methods. The Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1993) was utilized to assess student motivation and learning strategies the in social studies content area. A rubric created for this study and was derived from Webb's Web Alignment Tool (Webb et al., 2006) was utilized to measure student DOK Levels for individual notebook pages**.** All analyses of data in this study were conducted using JASP (Version 0.11.1; 2020), an open-source statistical analysis 92 software program supported by the University of Amsterdam. This section contains the method of analysis and findings using these data collection methods.

MSLQ Description and Reliability

The MSLQ (Pintrich et al., 1993) was administered as a pre- and postsurvey. The MSLQ assesses student motivational orientations and learning strategies. The MSLQ is divided into two sections: motivation and learning strategies. For the purpose of this study, only five subscales in the motivation section were utilized to collect data: intrinsic goal orientation, extrinsic goal orientation, task value beliefs, control over learning beliefs, and self-efficacy. These five motivation subscales were utilized in order analyze the motivation component of Self-Regulated Learning Theory in students (Pintrich, 1999.

Each participant answered questions regarding motivation using a Likert scale with a seven meaning the statement is very true of the learner and a one meaning the

statement is not at all true of the learner. The published validity and reliability of this instrument were reported in Chapter 3.

MSLQ Results

Descriptive statistics. The MSLQ pre- and postsurvey results (n = 23) are reported in Table 4.1. The table includes the pre- and postsurvey results for each subscale in the questionnaire. Results include the median, standard deviation, and standard error for each subscale.

Table 4.1 *Descriptive Statistics for MSLQ*

	Presurvey			Postsurvey		
Subscale	*M*	*SD*	*SE*	*M*	*SD*	*SE*
Intrinsic	5.71	0.74	0.15	6.50	0.42	0.09
Extrinsic	6.01	1.00	0.21	6.59	0.56	0.12
Task Value	5.84	0.98	0.20	6.67	0.37	0.08
Control	5.87	0.94	0.20	6.55	0.56	0.12
Self-Efficacy	6.03	0.86	0.18	6.61	0.32	0.07

Presurvey and postsurvey comparison. Results from a normality test (Shapiro-Wilk) suggested the results of the MSLQ significantly deviated from normality. A p value of less than .05 was used to determine if the results of the MSLQ deviated significantly from the normal bell curve. Based on this p value, the data sets from three subscales resulted in non-normal data: extrinsic, control, and self-efficacy. Therefore, nonparametric Wilcoxon signed-rank tests were conducted on the data from the pre- and postsurveys.

Because multiple tests were conducted under the same hypothesis, the Bonferroni type adjustment was applied to correct the alpha and reduce the reporting of false positives (Streiner & Norman, 2011). When multiple tests are conducted on the same data, the type I error rate rises. This study conducted five similar tests, one for each

subscale of the MSLQ. Therefore, the alpha level used in this study to determine if the test results were statistically significant was adjusted from .05 to a .01.

The Wilcoxon signed-rank test indicated that the intrinsic motivation subscale posttest ranks (*Mdn* = 6.50) were statistically significantly higher than the intrinsic motivation subscale pretest ranks (*Mdn* = 6.00, *p* = .001). The test also indicated that the extrinsic motivation subscale posttest ranks (*Mdn* = 6.75) were statistically significantly higher than the extrinsic motivation subscale pretest ranks (*Mdn* = 6.50, *p* = .002). The Wilcoxon signed-rank test showed the task value subscale posttest ranks (*Mdn* = 6.67) were statistically significantly higher than the task value subscale pretest ranks (*M*dn= 6.17, *p* = .001). The test also indicated the control subscale posttest ranks (*Mdn* = 6.75) were statistically significantly higher than the control motivation subscale pretest ranks (*Mdn* = 5.75, *p* = .001). Lastly, the Wilcoxon signed-rank test indicated the self-efficacy subscale posttest ranks (*Mdn* = 6.75) were statistically significantly higher than the self-efficacy subscale pretest ranks (*Mdn* = 6.38, *p* = .001).

Overall, the results showed the participants (*n* = 23) increased in each subscale of the MSLQ from the pretest to the posttest. The subscale with the greatest increase from the presurvey (*Mdn* = 5.75) to the postsurvey (*Mdn* = 6.75) was control.

Depth of Knowledge Rubric Description

DOK Levels of notebook pages were analyzed using a rubric created for this study and derived from Webb's Web Alignment Tool (Webb et al., 2006). Webb's DOK (2002) refers to the depth and complexity to which teachers expect students to demonstrate understanding of the content. There are four levels higher order thinking according to Webb's DOK, with Level One being the lowest and Level Four being the

highest. Level One begins with recall of information. Level Two cognitively requires basic reasoning. Level Three requires the use of complex reasoning. Level Four, the highest DOK Level, cognitively requires extended reasoning by the learner. To assess student DOK Levels for individual notebook pages in their physical and virtual interactive notebooks, levels were assigned to each page using the DOK rubric (Appendix E).

Scoring Process using the DOK Rubric

In order to score the notebooks, each page of each student's notebook was assigned a DOK level which represented the depth and complexity of thinking of the student as represented on the notebook page. Figure 4.1 provides an example of DOK Level 1 thinking as the students were asked to repeat or restate the information that we presented on the board. Figure 4.2 provides an example of DOK Level 2 thinking as the student constructs and organizes the process for passing a bill. Figure 4.3 provides an example of DOK Level 3 thinking as the student assessed and examined the creation of the Constitution. Figure 4.4 provides an example of DOK Level 4 thinking as the student critiqued a party's beliefs and stances, connected it to himself, and proposed his own stance based on the happenings during that time period.

After I scored all of the notebooks in this study, I met with a colleague with expertise in DOK levels to verify my scoring. The colleague reviewed the scores and provided feedback in order to establish interrater reliability of the scores. The final scores were agreed upon by both parties.

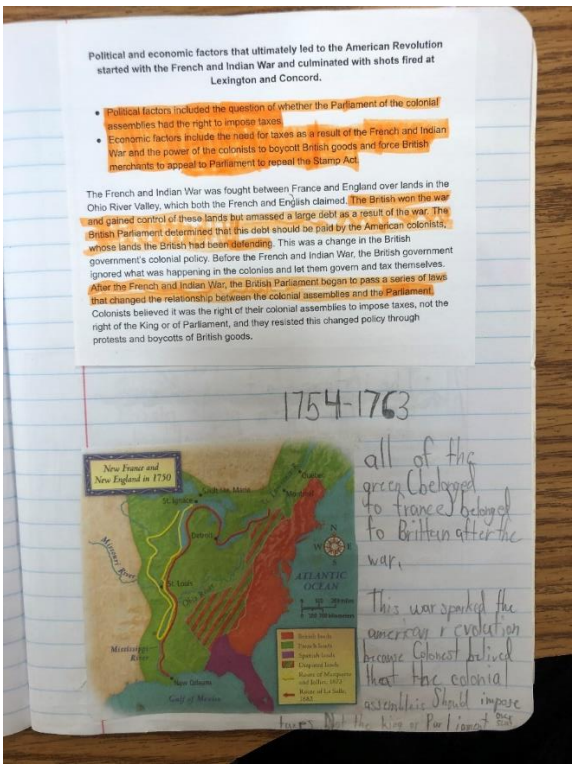

Figure 4.1. Example of DOK Level 1

Figure 4.2. Example of DOK Level 2

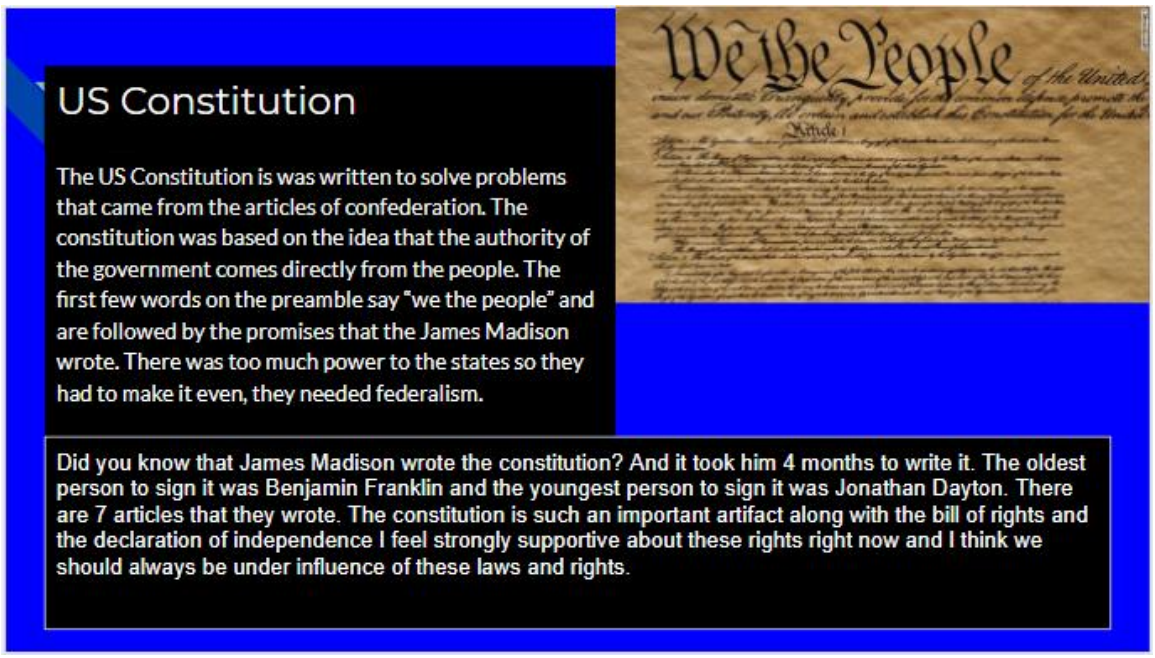

Figure 4.3. Example of DOK Level 3

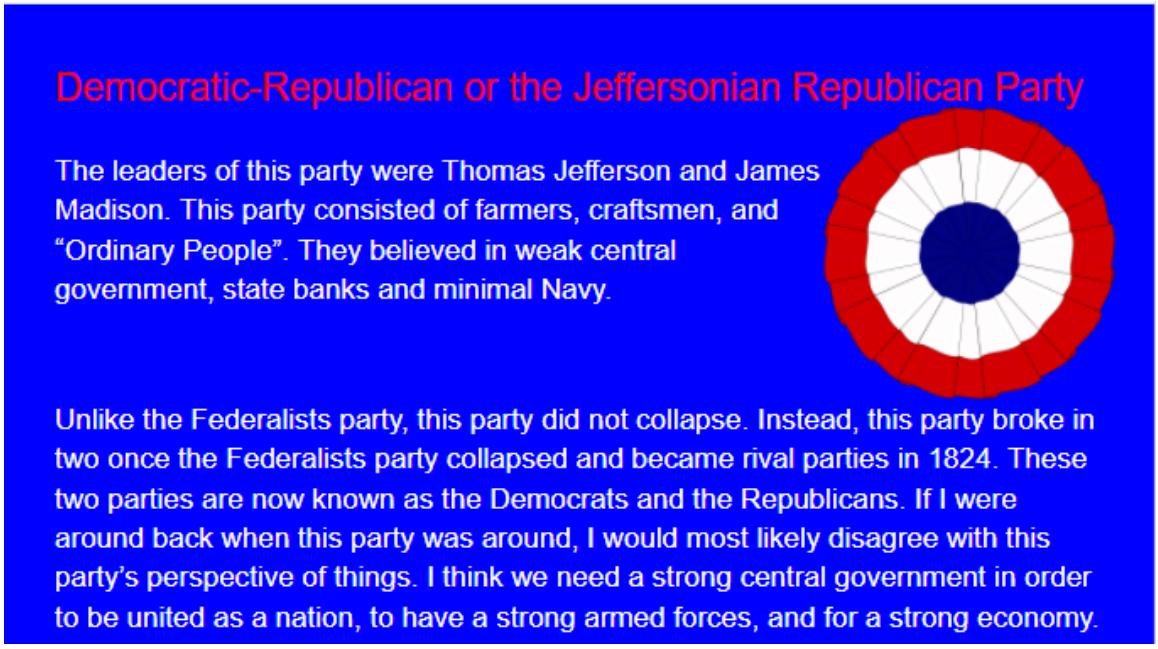

Figure 4.4. Example of DOK Level 4

DOK Rubric

Descriptive statistics. For the DOK rubric, the physical interactive notebook and virtual interactive notebook results (n = 15) are reported in Table 4.2. The table includes

overall physical interactive notebook and virtual interactive notebook means. The DOK Level of the physical interactive notebook resulted in a mean of 1.11 with a standard deviation of 0.03. The DOK Level of the virtual interactive notebook resulted in a mean of 3.27 with a standard deviation of 0.34.

Table 4.2 *Descriptive Statistics for DOK Levels of Interactive Notebooks (N=15)*

	M	*SD*	*SE*
Physical Interactive Notebook	1.11	0.03	0.01
Virtual Interactive Notebook	3.27	0.34	0.09

Note. Maximum DOK Level = 4.

Table 4.3 provides the average DOK Level for each student's physical interactive notebook and virtual interactive notebook. Table 4.4 provides a deeper look at the DOK Levels for the different types of pages in the virtual interactive notebook for each student. There are two types of pages: vocabulary-based pages and content-based pages. This data shows that vocabulary-based pages in the virtual interactive notebook resulted in lower DOK Levels than the content-based pages for every student.

Physical and virtual interactive notebook comparison. The Shapiro-Wilk Normality Test suggested the results of the DOK were normal ($p = 0.26$). This assumption was based on using a p value of less than .05 to determine if the results of the DOK Rubric deviated significantly from the normal bell curve. Based on this p value, the data set resulted in normal data.

After checking for data normality, a paired *t*-test was used to determine the significance of the difference in DOK Levels between the physical interactive notebook scores and virtual interactive notebook scores. Table 4.5 displays the results of this analysis. The paired *t*-test indicated that students scored significantly higher on the virtual

interactive notebook (M = 3.27) than they scored on the physical interactive notebook (M = 1.11), $t(14) = -24.731$, $p < .001$.

Table 4.3 *Average DOK Level per Student for Interactive Notebooks (N=15)*

Student	Physical interactive notebook	Virtual interactive notebook
Kim	1.11	3.23
Lily*	1.11	3.14
Izzy	1.11	3.41
Neil	1.11	3.55
Mel	1.11	3.64
Orion	1.11	3.50
John*	1.11	2.91
Luella	1.11	3.86
Evan	1.11	3.27
Cindy	1.11	3.27
Brad	1.11	3.41
Aaron*	1.11	3.32
Mylie	1.11	2.64
Beth*	1.11	2.64
Brent	1.11	3.27

Note. An asterisk next to the student numbers indicates the student participated in the student interview. The maximum DOK Level = 4.

Table 4.4 *Average DOK Levels for the Virtual Notebook (N=15)*

Student	Vocabulary pages average (8 pages)	Content pages average (11 pages)	Average of the entire virtual notebook
Kim	2.13	3.86	3.23
Lily*	2.00	3.79	3.14
Izzy	2.38	4	3.41
Neil	2.75	4	3.55
Mel	3.00	4	3.64
Orion	2.63	4	3.50
John*	2	3.43	2.91
Luella	3.63	4	3.86
Evan	2.00	4	3.27
Cindy	2.00	4	3.27
Brad	2.38	4	3.41
Aaron*	2.13	4	3.32
Mylie	2	3	2.64
Beth*	2	3	2.64
Brent	2	4	3.27

Note. An asterisk next to the student numbers indicates the student participated in the student interview. The maximum DOK Level = 4.

Table 4.5 *Summary Results of Paired t-test on DOK Rubric (N=15)*

	Physical interactive notebook	Virtual interactive notebook	*t (14)*	*p*
Mean	1.11	3.27	-24.73	.001
SD	0.03	0.34		

Note. Maximum DOK Level = 4.

Qualitative Analysis and Findings

In this study, qualitative data were collected by conducting inductive and deductive coding on student interviews. A total of four students in this study were interviewed before and after the implementation of virtual interactive notebooks. Table 4.6 provides a summary of the data sets. Overall, there were 92 inductive codes and 35 deductive codes. Four codes overlapped, resulting in a total of 123 codes.

Table 4.6 *Summary of Qualitative Data Sources*

Qualitative data source	Number of sources	Type of coding	Number of codes applied
Preinterviews	4	Inductive	37
Preinterviews	4	Deductive	20
Postinterviews	4	Inductive	67
Postinterviews	4	Deductive	32
Totals	16		123

Student Interviews

Four students participated in two semi-structured interviews during this study. Each student participated in one interview before their use of a virtual interactive notebook and one interview after the use of a virtual interactive notebook. Individual interviews lasted approximately fifteen minutes. Preinterviews were conducted in person in my classroom during non-instructional times. Preinterviews included questions regarding student perceptions of their use of a physical interactive notebook. Postinterviews were conducted virtually over Google Meet, due to students attending

school virtually because of COVID 19. Postinterviews included questions regarding student perceptions of their use of a virtual interactive notebook.

Analysis of Qualitative Data

Student interviews were recorded and then transcribed. I transcribed the audio recordings exactly as they were spoken using Google Docs. I conducted the transcription process multiple times to ensure the transcriptions were accurate. After transcribing the interviews, I made a table of all of the responses to each question (see Figure 4.5).

What parts of a physical interactive notebook allow you to think deeper as a learner?

	Drawing pictures because you can see it instead of having to imagine it.
	The diagrams and passages.
	Filling out a graphic organizer. I sometimes have to really listen and think to fill those out.
	The charts and diagrams we fill in.

Can you describe the types of thinking you do as a learner while using your physical interactive notebook?

	I have to analyze the text. Then you can read it to make sure you are correct.
	It requires me to read it first and then I can look back over it. I learn more when I read back over it. The first time I read it, I just read it but then I read it deeper as I look back over the pages.
	Understanding charts and filling out graphic organizers.
	I try to think above and beyond what the notebook wants me to do.

Figure 4.5. Example of interview questions and student responses**.**

Inductive Analysis

During the first round of coding, I utilized open coding (Glaser, 2016; Saldaña, 2016) as I went line by line and sentence by sentence. No codes were generated prior to this first round of coding. This approach allowed me to attach more than one code to any line or sentence, permitting the deeper meaning of the line or sentence to be conveyed. For example, the highlighted sentence in Figure 4.6 received the codes: *allowed to think*

on their own, *demonstrating understanding*, *higher-order thinking*, *inquiry*, *own*, *own words*, *personalized product*, *research*, and *synthesizing*.

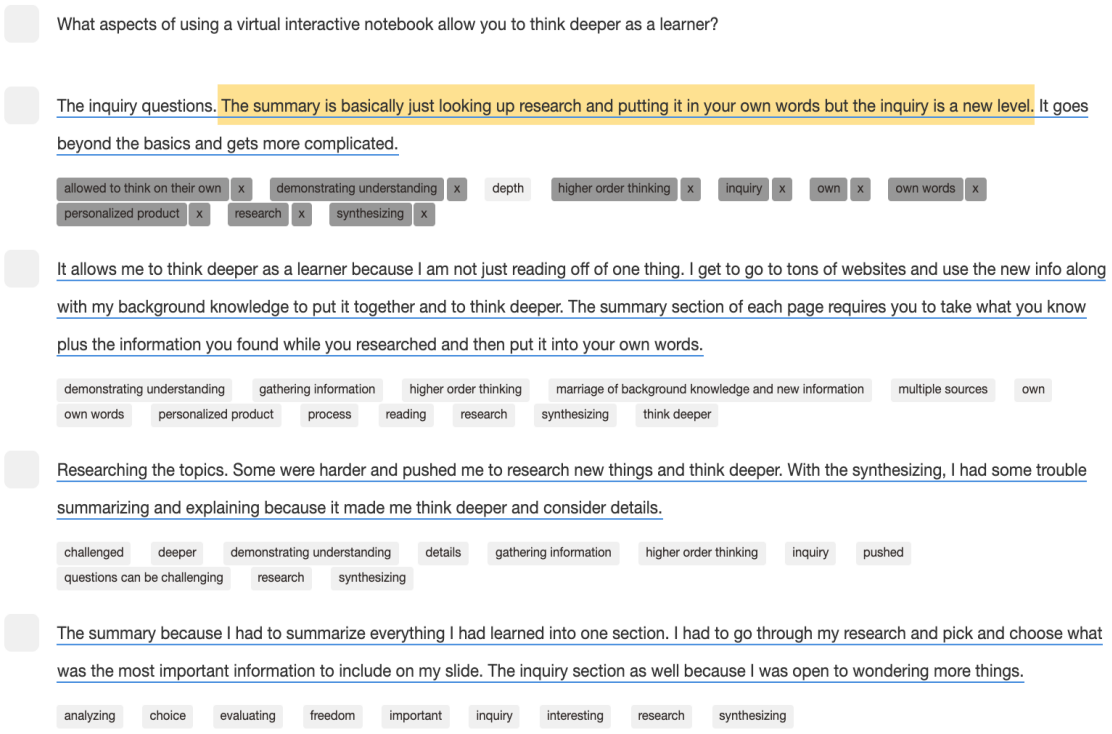

Figure 4.6. Example of open coding in Delve.

After completing the first round of open coding, I analyzed the codes to determine the types of coding employed. The types of coding represented by the codes were value coding, in vivo coding, and process coding. After identifying the types of codes I had employed, I then conducted subsequent cycles of coding, searching for lines or phrases I had missed that represented one or more of these types of coding. I completed a round of coding where I assigned value codes based on the student's attitude towards a topic or themselves, belief in or of something, and the value in a thing, idea, or themselves (Saldaña, 2016). This yielded codes such as *accomplishment*, *confidence*, and *proud*. I utilized the students' own words and phrases as codes through the use of in vivo coding (Charmaz, 2014; Manning & Kunkel, 2014; Saldaña, 2016). This yielded such codes as

choice, *own*, and *the one*. I assigned process codes based on the actions the student described themselves doing (Saldaña, 2016). This yielded codes such as *analyzing*, *evaluating*, and *synthesizing*. After combing through the data, I conducted multiple rounds of coding in which I refined the codes. This process involved exporting and printing the codes from Delve and then editing the codes on paper. I looked for codes that could be renamed or were better represented by a code I had already used during the coding process. This process is represented in Figure 4.7.

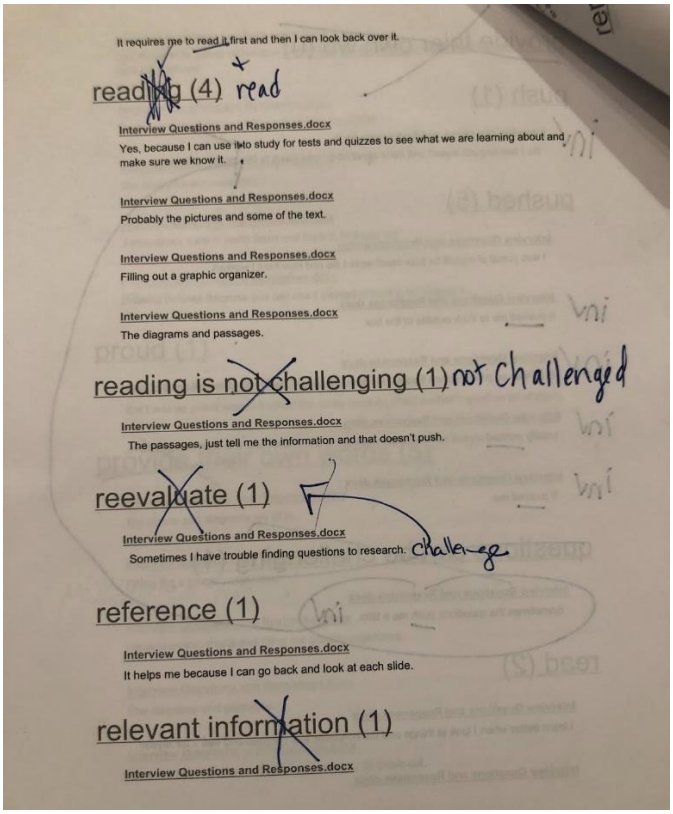

Figure 4.7. Process for refining codes.

I then went back to Delve and recorded the changes I had made. I repeated this process multiple times to refine the codes as much as possible. During the initial round of coding, I named 140 inductive codes. After refining the codes through multiple rounds of coding, I determined 92 total inductive codes.

Deductive Analysis

After thoroughly completing the inductive coding process, I conducted a deductive analysis of the data using codes generated before the data were collected based on Webb's DOK (2002) and the MSLQ (Pintrich et al., 1993). The process for generating the deductive codes is described in Chapter 3. 44 codes were determined based on these measurements: 24 DOK codes and 20 MSLQ codes. 9 DOK codes were not utilized during the deductive process, resulting in 35 predetermined codes (see Figure 4.8).

arouses curiosity (13)	desire to learn (3)	mastery (7)
belief in ability (5)	endeavour (11)	modifies (1)
challenge (24)	enjoyable (13)	ownership (20)
choice (34)	examines (9)	proud (4)
compares (3)	excellence (5)	questions (18)
compiles (6)	formulates (10)	recognize (1)
complex (10)	fulfilling (6)	restate (3)
confident (2)	grades (2)	takes risks (3)
constructs (4)	illustrates (4)	transferable (3)
control (10)	important/useful (11)	uncovers (30)
creates (12)	interesting (16)	understanding (18)
designs (3)	interpret (8)	

Figure 4.8. Predetermined deductive codes.

Multiple cycles were performed on the interviews to thoroughly assign codes to the data. After an initial round of coding the interviews were then coded individually based on DOK codes followed by MSLQ codes. 20 codes were utilized on the preinterviews and 32 codes were utilized on the postinterviews. Multiple codes were assigned to a sentence when the wording represented more than one code. This process is evident in the highlighted sentence in Figure 4.9. Codes were then examined individually

and memos were written that provided depth into the experiences the students were explaining (see Figure 4.10).

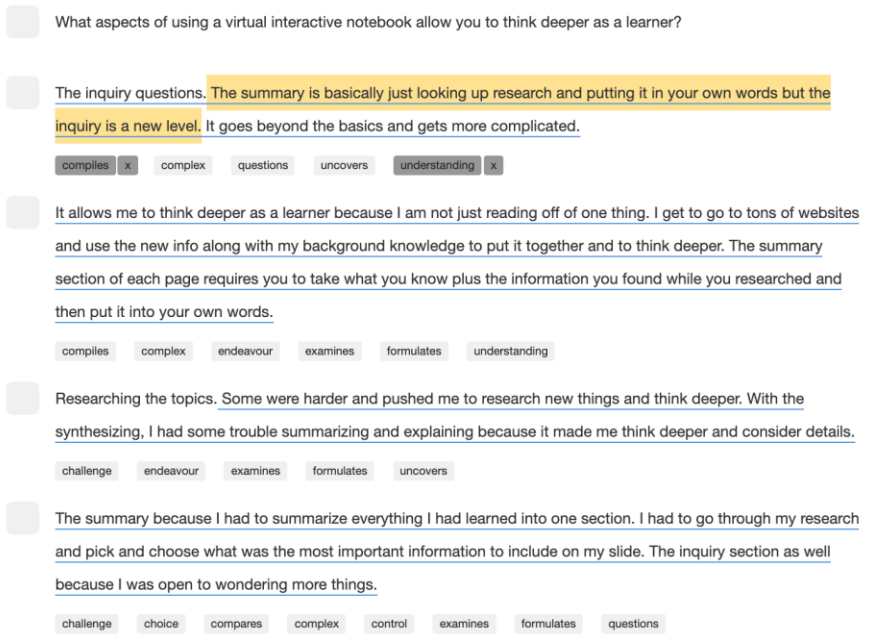

Figure 4.9. Example of assigning multiple codes to the same sentence.

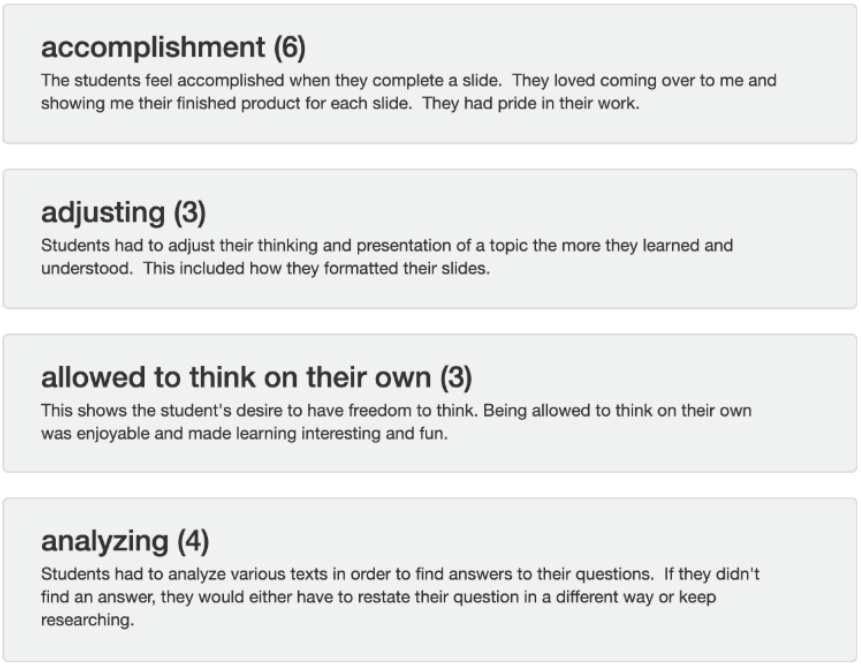

Figure 4.10. Example of memo writing.

From Codes to Categories

After solidifying the inductive codes and conducting a deductive analysis using a priori codes, I placed all of the codes into categories. To sort the codes efficiently, I wrote each code on a notecard and manually placed the codes into groups based on similarities. I then named the categories and recorded my sortings for Round 1 on a table. Round 1 produced categories such as *challenge*, *autonomy*, and *achievement* (see Figure 4.11).

Round 1

Flow	Challenge	Higher-order Thinking	Constructing Understanding	Autonomy	Easy	Achievement	Reproduction
new information is interesting (5)	invested (2)	think deeper (3)	gathering information (6)	self paced (1)	illustrating (3)	accomplishment (6)	information is provided (9)
interesting (13)	pushed (6)	higher order thinking (29)	electronically (1)	personalized product (13)	image (3)	confidence (2)	memorize (8)
exciting (1)	push (1)	form follows function (1)	reference (1)	own (14)	image was easy (1)	proud (2)	lower-order thinking (26)
enjoy learning (2)	self motivated (11)	expand knowledge (8)	research (27)	own words (9)	images help visualize information (1)	grades	boring (3)
desires choice (3)	motivated (4)	better understanding of content (1)	demonstrating understanding (13)	ownership in learning (8)	hands on (2)	fulfilling	effortless (1)

Figure 4.11. Categories that emerged during Round 1.

I then completed three more rounds of categorization, following the exact same process. Round 2 produced categories such as *control*, *creativity* and *ways to form an understanding* (See Figure 4.12) Round 3 produced categories such as *depth*, *teacher is provider of information*, and *student is provider of information* (see Figure 4.13). Round 4 produced categories such as *teacher actions*, *student motivation*, and *independence* (see Figure 4.14). In total, 30 categories were derived from the codes.

Round 2

Control	Learning Events	Relevant	Accomplishment	Creativity	Student Wants	Apathetic	Ways to Form an Understanding
choice (28)	analyzing (4)	important (2)	accomplishment (6)	adjusting (3)	challenged (15)	effortless (1)	background knowledge (2)
choice is fun (5)	illustrating (3)	images help visualize information (1)	invested (2)	demonstrating understanding (13)	desires choice (3)	boring (3)	deeper (3)
allowed to think on their own (3)	gathering information (6)	impact (3)	focus (1)	evaluating (6)	explore (2)	no choice (3)	depth (4)
enjoy learning (2)	hands on (2)	interesting (13)	proud (2)	explored (1)	freedom (14)	no product (2)	details (5)
individualized (4)	inquiry (36)	motivating (8)	challenging (3)	own words (9)	fun (4)	no impact (2)	electronically (1)
ownership in learning (8)	memorize (8)	motivates (1)	comfortable (1)	form follows function (1)	independent (5)	not challenging (12)	image (3)

Figure 4.12. Categories that emerged during Round 2.

Round 3

Process	Student Feelings of Virtual Notebook	Depth	Student is provider of information	Individualized	Challenge	Teacher is provider of information	
Reread	impact	important	Form follows function	Hands on	Challenged	What needs to be learned	
adjusting	Desires choice	Think deeper	Expand knowledge	Ownership in learning	push	tells	
Multiple sources	interesting	focus	comprehend	independent	challenging	Information in provided	
details	invested	deeper	Marriage of background knowledge and new information	freedom	Questions can be challenging	told	
read	exciting	depth	Knowledge acquisition	choice	pushed	Teacher tells	
synthesizing	New information is interesting	Takes risks	Demonstrate understanding	Personalized product	challenge	reference	
analyzing	motivate	formulates	Higher-order thinking	own	endeavour	tell	
explore	fun	modifies	Better understanding of content	Allowed to think on their own	excellence	memorize	

Figure 4.13. Categories that emerged during Round 3.

Round 4

Student Motivation	Student process	Aids in Knowledge Acquisition	Independence	Teacher actions	Physical Notebook Perceptions	Virtual Notebook Perceptions	
motivate	Expand knowledge	Details	Personalized product	Information in provided	No impact	Form follows function	
Desires choice	inquiry	Images help visualize information	confidence	Teacher tells	memorize	comprehend	
challenged	process	research	freedom	tell	Lower-order thinking	analyzing	
Choice is fun	explored	visual	Ownership in learning	told	routine	synthesis	
focus	cycle	electronically	Allowed to think on their own	tells	Copy information	Knowledge acquisition	
pushed	adjusting	image	individualized	reading	Not challenged	deeper	
interesting	Think deeper	illustrations	Self motivated	read	No choice	depth	
push	explore	Multiple sources	own		effortless	evaluation	
Questions can be challenging	choice	design	Self paced		Not motivated by teacher telling	synthesizing	
impact	Hands on		The one		No product	Higher-order thinking	

Figure 4.14. Categories that emerged during Round 4.

The initial categories from the four rounds of coding were then refined and combined into 17 total categories (see Figure 4.15). This process was carefully executed to keep the categories in alignment with the codes. The following categories warranted the need to not be grouped or placed as a subcategory: *independence*, *student wants*, *challenge*, *relevant*, *control*, *autonomy*, *creativity*, *individualized*, *depth*, *constructing understanding*, and *higher-order thinking*. Some categories were grouped together and had subcategories put underneath them. *Accomplishment* remained a category with a subcategory of *achievement*. The categories *teacher is provider of information* and *student is provider of information* were grouped together as *teacher is provider of information vs student is provider of information* with a subcategory of *teacher actions*. The categories *physical notebook perceptions* and *virtual notebook perceptions* were grouped together as *physical notebook perceptions vs virtual notebook perceptions* with the following subcategories falling underneath this category: *easy*, *apathetic*,

reproduction, and *student feelings of virtual notebook*. *Student motivation* remained a category with a subcategory of *flow*. *Aids in knowledge acquisition* remained a category with a subcategory of *ways to form an understanding*. *Learning events* remained a category with subcategories of *process* and *student process*. These categories and subcategories were shared with Dr. Morris, dissertation chair, for peer debriefing.

Final Categories

- Accomplishment
  - Achievement
- Independence
- Student wants
- Teacher is provider of information vs. Student is provider of information
  - Teacher Actions
- Physical Notebook Perceptions vs. Virtual Notebook Perceptions
  - Easy
  - Apathetic
  - Reproduction
  - Student feelings of virtual notebook
- Challenge
- Relevant
- Control
  - Autonomy
- Student Motivation
  - Flow
- Aids in knowledge acquisition
  - Ways to Form an Understanding
- Creativity
- Individualized
- Depth
- Learning Events
  - Constructing Understanding
- Higher-order thinking
  - Process
  - Student Process

Figure 4.15. Final categories and subcategories.

Presentation of Findings

Using the refined categories and codes, I began to formulate themes that represented multiple categories while also ensuring alignment with the codes those

categories enveloped. This process involved multiple rounds of peer debriefing with Dr. Morris. He provided feedback and we discussed how to best represent the categories and data through the wording of the themes and assertions. In total, five themes and assertions emerged from the qualitative data (see Table 4.7).

Table 4.7 *Themes, Assertions, and Categories from Qualitative Data*

Theme	Assertion	Categories
Student perceptions of themselves as learners evolved.	Student participants who were interviewed cited a shift in the way they viewed themselves as learners through the use of a virtual notebook.	-Accomplishment -Independence -Desires
Students experienced a shift in power from teacher to student.	Student participants who were interviewed noticed they were the ones finding information on topics, not the teacher, when they had choice and control over their virtual notebook and were allowed to engage in the inquiry process.	-Teacher is provider of information vs. student is provider of information -Physical notebook perceptions vs. virtual notebook perceptions
Students were empowered and motivated to learn through student choice.	Student participants who were interviewed cited a difference in their learning experience when not given choice with a physical notebook versus when given choice with a virtual notebook.	-Challenge -Relevance -Control -Student motivation
Students embraced, spoke, and lived the inquiry process.	Student participants who were interviewed cited specific ways that the inquiry process helped them as learners.	- Aids in knowledge acquisition -Creativity -Individualized -Depth
Students experienced a shift in their knowledge acquisition process.	Student participants who were interviewed cited a transformation in their learning process as they created their virtual notebook.	- Learning events -Higher-order thinking

Through the use of a virtual notebook, participants described the following: (a) student perceptions of themselves as learners evolved, (b) students experienced a shift in

power from teacher to student, (c) students were empowered and motivated to learn through student choice, (d) students embraced, spoke, and lived the inquiry process, and (e) students experienced a shift in their knowledge acquisition process.

Each theme and assertion were supported by prior research and rich, detailed narratives (Mertler, 2017). The narrative was shared with Dr. Morris for peer debriefing. They narrative was also shared with participants for member checking to ensure that their experiences were accurately represented in the writing. Participants are referred to using pseudonyms to ensure confidentiality.

Student Perceptions of Themselves as Learners Evolved

Student participants who were interviewed cited a shift in the way they viewed themselves as learners. Students were not asked directly about how their view of themselves as learners changed during this study. Interview questions were designed to allow the differences in the learning experience between a physical interactive notebook and a virtual interactive notebook to surface. Students were not asked to compare their experiences of creating a physical interactive notebook and a virtual interactive notebook. Instead, students were only asked about the physical interactive notebook during the preinterview and were only asked about the virtual interactive notebook during the postinterview. In this study, student responses indicated changes in their perceptions of themselves as learners in the following areas: (a) accomplishment, (b) independence, and (c) desires.

Accomplishment. Participants expressed a sense of accomplishment through their use of a virtual notebook. During the preinterview, students did not cite a time when they had felt a sense of accomplishment as learners when creating their physical

interactive notebook. All of the information on each page of the physical interactive notebook was provided by me, the teacher. The effort required by the student to complete a notebook page in their physical interactive notebook included cutting, gluing, or copying information. Every notebook page looked exactly the same. However, during the postinterview all of the students interviewed cited feeling a sense of accomplishment while creating their virtual interactive notebook. All of the information on each page of the virtual interactive notebook was provided by the students. The effort required by the student to complete a notebook page in their virtual interactive notebook included learning events such as researching, synthesizing, questioning, evaluating, and creating. Every notebook page looked different because it was created individually by the student.

This sense of accomplishment was directly correlated with the learning events they experienced. The students in this study felt good about themselves as learners. John and Beth shared their sense of accomplishment as they did their own research and were able to engage in inquiry. He said, “It helped me to research harder and learn more about it, which made me feel good about it.” Beth shared, “I didn’t just look at a certain thing. I explored a lot of things and knew a lot about the topic.” Lily felt accomplished because she had challenged herself and met or surpassed her own expectations of herself, which made her proud. She said, “I was so proud when I finished the slides because I had pushed myself on all of them.” Aaron felt accomplished in his learning process and in the amount of knowledge he gained. Engaging in inquiry allowed him to conduct his own research, which allowed him to learn more. He said, “With the inquiry section, I looked up more and knew more. I definitely gained more knowledge than I would have using a regular notebook. The learning more part is the interesting part of it.” The variety of

learning events the students participated in while creating their virtual interactive notebook allowed them to feel a sense of accomplishment in their learning process.

The students shared their feelings of accomplishment with me as they were creating their virtual interactive notebooks; they often came up to me with a virtual interactive notebook page they had created or to share an image they found that truly represented their thinking. They were excited to share their accomplishment with me and were proud of themselves for how they had pushed themselves as learners.

Students felt a sense of accomplishment throughout the process of creating their virtual interactive notebook. Overall, the feelings of accomplishment the students experienced were associated with the research they conducted, the synthesizing of information from different resources, being able to ask questions about the topic and then finding answers to those questions, and finding an image that represented their thinking and new understanding. Feeling a sense of accomplishment changed the way the students viewed themselves as learners. The more they became comfortable with the inquiry process, the more they pushed themselves to learn and discover new information. They became aware of what they were capable of achieving as learners and felt accomplished as they met the challenges they placed before themselves.

Independence. Participants experienced a sense of independence through the creation and use of their virtual notebook. Students were not independent learners when they used a physical interactive notebook as all of the content information was provided for them. Students were independent learners when they created their virtual interactive notebook as they personally created each notebook page. When students were introduced to virtual interactive notebooking, they were unsure of themselves and needed a

considerable amount of guidance with the inquiry process while creating a notebook. By the end of the unit, students became independent historians who had a variety of inquiry tools to help them learn and discover new information.

Students in this study felt a sense of independence as they took ownership in their learning. An in vivo code found 14 times in the postinterview was the word “own”. Independence in this study looked like students forming their own questions and conducting their own research, creating their own personalized virtual interactive notebooks, knowing what to study on their own, and going to other students in the classroom for assistance instead of going to the teacher.

Forming their own questions and conducting their own research. Students in this study experienced independence as they were able to ask questions about the topics they were learning and then conduct research on their own to answer those questions as part of the inquiry process. Beth expressed her independence regarding questioning during the postinterview: “So when I had a question from writing the summary or learning about the topic in class, I could take that question and find an answer to it.” She felt free to question and then find answers to those questions on her own. Lily explained this feeling of independence as well. She said, “I had choice in the questions I had and the research I did. It was a big open world that I could do stuff in.” Questioning and researching was liberating for Lily and this made her feel like an independent learner. John experienced independence as he was able to decide how much research he conducted on a topic. Regarding the Republicans and Federalists slides, John shared, “I researched a lot more than usual because it was a really important topic.” Being able to

question and research as a part of the inquiry process allowed students in this study to be independent learners.

Creating their own personalized virtual interactive notebooks. Students in this study experienced independence as they created their virtual interactive notebooks. After finding information and forming an understanding on their own through questioning and researching, they then put that understanding into words and represented it with pictures. Lily shared during the postinterview how she was the one doing the work: "The slides required me to be the one to type everything and I was the one to put information in. I was the one doing the work, so I had to think deeper." Doing the work on her own instead of being provided the information made her feel independent.

Writing their understanding in their notebooks in their own words and not my words made the students to feel independence in their learning process. Lily shared that doing the work on her own was challenging: "Writing my own definition and putting the research in my own words was a challenge." John said, "The summary is basically just looking up research and putting it in your own words but the inquiry is a new level. It goes beyond the basics and gets more complicated." This sense of being challenged added to their feeling of independence as they found answers to their own questions and then formulated how to convey their understanding to others on their notebook page.

Formatting each slide allowed students to experience independence in their learning process. Aaron discussed how he experienced independence in the formatting of the slides. He said: "I had the same format in my head for each slide, but Alexander Hamilton did not fit that pattern because he was not a president. So I had to push myself and think about how I was going to format him differently." Having the ability to choose

how to format each slide and how best to show their understanding of the topic allowed students to be independent learners.

The students also experienced independence due to the fact that no two notebooks were the same. When explaining the notebook, Beth said, “It was more personal. We all have the same topics, but no one’s notebook will be the same because it is in our own words.” The creation of the virtual interactive notebook allowed each student to feel independent as they personalized their notebooks and shared their own understanding of each topic.

Knowing what to study without being told. Students in this study felt much more confident about the content for tests and quizzes because they were the ones forming an understanding of the content. Lily shared during the postinterview how she felt independent as she studied for social studies tests and quizzes. She felt more confident in her studying as she was the one who wrote each page. She said, “It’s easier to study now, but it helps me a lot to study it when I was the one who wrote it. I was the one who put it in my own words.” When asked about how the virtual interactive notebook helped each student as a learner, Lily replied, “It helps me because I can go back and look at each slide. And I don’t have to go to you.” These excerpts show the students were aware of their independence in their learning process and that they were the ones doing the work, not the teacher. This feeling of being an independent learner was not something they cited experiencing when creating their physical interactive notebook because they were not the ones doing the work. The teacher was supplying the students with the content.

Going to other students in the classroom for assistance instead of going to the teacher. As our unit using the virtual interactive notebook progressed, students began to

go to each other for assistance instead of coming to me for help. I was no longer the holder of information. Students saw each other as historians and independent sharers of information. Student perceptions of themselves and others as learners evolved as they felt more independent in their learning process.

Desires. Participants were able to express their desires as learners as they went through the process of creating their own virtual interactive notebook. When creating their physical interactive notebook, student wants were not considered. Students in this study shared during the pre- and postinterview their wants as learners to be challenged, to have choice, and for learning to be an enjoyable process.

Challenged. Students in this study expressed a desire to be challenged. When gifted learners are appropriately challenged, they show an increase in engagement and motivation for learning (Eysink et al., 2015; Phillips & Lindsay, 2006). Aaron cited this desire as a learner during the preinterview. He was not satisfied with what was expected of him in the social studies content area so he pushed himself to do more than was expected. He said, “You gave us a vague and easy assignment to write a summary, but I wrote a sentence that was above and beyond what you asked us to do.” When asked about how the physical interactive notebook challenged him as a learner, Aaron said, “I can’t really think of a way it challenged me, so I challenged myself.”

Students cited feeling challenged during the postinterview when discussing their virtual interactive notebook. One way the students described the challenge of creating the virtual interactive notebook was the word “pushed”. When talking about creating the virtual interactive notebook pages, Lily said, “Some were harder and pushed me to research new things and think deeper.” Beth enjoyed being challenged when creating her

virtual interactive notebook. She said, “I liked having my own questions and doing my own research because usually we would have just learned what you told us we had to learn. But when we learned it on our own, it became more challenging.” The students felt a sense of pride for their efforts in meeting the challenge. Lily described this when she said, “But I was so proud when I finished the slides because I had pushed myself on all of them.” The gifted learners in this study desired to be challenged and felt a sense of pride and enjoyment in meeting the challenge.

Choice. Students in this study expressed a desire to have choice in their learning process. During the preinterview, all four students shared their desire to have choice:

John: I would be more interested if I had some choice.

Beth: I wish I had more choice, but I still enjoy learning.

Lily: When the teacher tells me to do it, I start to think to myself that I really don’t want to do this. When the teacher gives me choice, it makes learning more fun. I don’t like being told I have to do an exact topic or an exact question.

Aaron: I would be a little more interested if I had choice.

The students associated choice with learning being interesting, motivating, and an enjoyable process.

After the preinterview, students were given choice in their learning as they created their virtual interactive notebooks while utilizing the inquiry process. Their personal responses to having their desire to have choice during their learning process fulfilled resulted in responses that were value coded as *freedom*. Lily described the freedom that choice gave when she said, “It was a big open world that I could do stuff

in." Aaron explained the correlation between choice and freedom when he said, "Now I have more freedom and can expand my knowledge and stuff of that nature."

During the postinterview, students in this study shared a correlation between having choice and experiencing an increase in motivation. Lily expressed this when she said, "The more I researched, the more interesting things that I found, it made me want to read more and find more facts." Aaron also experienced motivation from choice. Regarding choice, Aaron said, "It motivates me to learn by giving some kind of guidance to go off of but I am allowed to learn about what I am interested in too."

Learning to be an enjoyable process. Students in this study expressed a desire for learning to be an enjoyable process. During the preinterview, Beth shared, "I wish I had more choice, but I still enjoy learning." Gifted learners enjoy learning and finding out new information (Eysink et al., 2015; Perleth & Wilde, 2009). In the postinterview, students cited a correlation between being given choice and learning being an enjoyable process. When asked about being given choice in her learning process, Lucy said, "When the teacher gives me choice, it makes learning more fun". Lucy also shared during her postinterview that, "These are the most fun slides I have ever done." When speaking about creating his virtual interactive notebook, John said, "The inquiry section piques my interest and is fun because I can find facts that I didn't know and that is fun." Beth shared that creating her own virtual interactive notebook "was more exciting. It was more personal." She said, "I liked having my own questions and doing my own research because usually we would have just learned what you told us we had to learn." Creating her own questions and doing her own research made learning an enjoyable process for Beth.

Allowing students to have choice in their learning process, to be challenged, and for learning to be an enjoyable process were desires the students articulated during their interviews. Student perceptions of themselves as learners shifted as students were able to experience the fulfillment of their desires through the creation of their virtual interactive notebooks.

Students Experienced a Shift in Power from Teacher to Student

During this study, students experienced social studies instruction in a constructivist environment and through student-led inquiry. In a constructivist and student-centered approach to teaching social studies, the teacher's role is to create a learning environment where students can construct their own understanding of the content area through choice, independence, dialogue, interests, and engaging in self-reflection (Porath, 2016). Student participants who were interviewed cited a shift in power from teacher to student as they created their virtual interactive notebook. This became evident as they were the ones finding the information on topics, not the teacher, and when they had choice and control over their virtual notebook and were allowed to engage in the inquiry process. This theme emerged from two categories: (a) teacher is provider of information vs. student is provider of information and (b) physical notebook perceptions vs virtual notebook perceptions.

Teacher is provider vs. student is provider of information. Participants expressed a difference in their learning process based on who was the provider of the information. This difference equates to the students having power over their learning process while creating their virtual interactive notebook.

Teacher is provider of information. While using the physical interactive notebook, students were aware that I was the provider of the information. This is evident when Beth was asked about choice and control in her learning while creating her physical interactive notebook. Beth said, "You tell us what we are going to learn." When I was the one providing the students with the information, students cited the use of lower-order thinking skills. Students would take the teacher provided information and memorize it or read over it. Aaron said when speaking about the physical interactive notebook, "It shows me everything I need to know for the tests you give us." Beth said when speaking about the physical interactive notebook, "It helped me because I can look back and see what we learned. It can help me so I can memorize it." This lower-order thinking does not meet the needs of gifted learners. The students were aware they could do well on a test just by memorizing the information, which is not challenging to gifted learners. They were aware they were not being challenged when the teacher was the provider of the information and shared their thoughts about the ease of the physical interactive notebook in their interviews:

John: It isn't difficult . . . In the physical notebook you just glued and read and anyone can do that.

Beth: In the regular notebook, all you did was just read off of the papers or studied it or answered questions.

Aaron: I can't really think of a way it challenges me, so I challenge myself.

When I was the provider of information, I had all of the power. I was the holder of knowledge.

Student is provider of information. The power shifted from teacher to student when the students created their virtual interactive notebook. Students cited a feeling of ownership and being challenged when they were the provider of information. An in vivo code that occurred in the following excerpts from Lily was "the one":

> Lily: The slides required me to be the one to type everything and I was the one to put information in . . . I was the one doing the work, so I had to think deeper. I had to do research.
>
> Lily: It is easier to study now, but it helps me a lot to study it when I was the one who wrote it. I was the one who put it in my own words.

Lily noticed a shift in power as she used the words "the one" to describe who was the provider of the information. Beth cited a shift in power as well in her postinterview. An in vivo code that noted this shift was the word "own":

> Beth: But when we learned it on our own, it became more challenging.
>
> Beth: I liked having my own questions and doing my own research because usually we would have just learned what you told us to learn.

Aaron and John used the words *I*, *me*, and *my* to describe the provider of information and owner of the notebook when speaking about their virtual interactive notebooks. During the postinterview, they acknowledged they were now the ones doing the work and holding the power. Aaron shared how made the decisions about his notebook as he used the words *I* and *my*:

Aaron: I had to summarize everything I had learned into one section. I had to go through my research and pick and choose what was the most important information to include on my slide.

Aaron: When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic.

John shared how he was the one doing the research as he created his virtual interactive notebook, which resulted in him learning more than he did with the physical interactive notebook. He used the words *me* and *I* as he explained this shift in power:

John: It pushed me to think outside of the box. It helped me to research harder and learn more about it, which made me feel good about it.

John: It impacted me more than the normal notebook. Even though it was more work, what I learned was way more than I would have with the normal notebook.

All four students interviewed felt empowered when I allowed them to be active participants in their learning process as they utilized inquiry-based learning (IBL) and technology to create their virtual interactive notebooks. IBL and technology integration assisted in meeting the needs of my gifted learners as these learning tools provided a way to challenge my students throughout their learning process by allowing the student to be focused on a challenging task while also having autonomy over their learning (Eysink et al., 2015).

Physical notebook perceptions vs. virtual notebook perceptions. Participants noticed differences in their learning process based on who was doing the work, the

teacher or the student. The gifted students in this study want to achieve and do their best at whatever task is set before them. They will cooperate and complete the task, even when it may not interest them or challenge them.

Physical notebook perceptions. During the preinterview, students shared their perceptions of the physical interactive notebook. None of the students had positive perceptions about the physical interactive notebook. Student perceptions included lack of being challenged, not being an enjoyable process, and the use of lower-order thinking skills.

Students associated the physical interactive notebook with not being challenged as learners. During the postinterview, John shared he didn't feel challenged as a learner when creating the physical interactive notebook when he said, "In the physical notebook you just glued and read and anyone can do that." Aaron also shared his thoughts about not being challenged when he said, "I can't really think of a way it challenges me." Beth noted that being given the information did not challenge her as a learner when she said, "The passages just tell me the information and that doesn't push me." These responses prove that the students did not feel challenged in their learning process when they made their physical interactive notebook.

When students reflected on the physical interactive notebook, they did not describe learning as being an enjoyable process. Lily shared, "When the teacher tells me to do it, I start to think to myself that I really don't want to do this." When students were copying my notebook pages into their notebook, I would often find myself having to encourage the students to finish the copying and gluing because I could tell that they were not enjoying their learning process.

Students associated the physical interactive notebook with the use of lower-order thinking. Beth's perceptions were about the lower-order thinking required to create the physical interactive notebook. She said, "In the regular notebook, all you did was just read off of the papers or studied it or answered questions." Beth reiterated the lack of thinking required of her as she created and used the physical interactive notebook when she said: "It requires me to read it first and then look back over it." John described the thinking required of him as a learner when he said, "In the physical notebook you just glued and read and anyone can do that." This type of lower-level thinking, the lack of being challenged, and learning not being an enjoyable process was not meeting the needs of my gifted learners.

***Virtual interactive notebook perceptions*.** During the postinterview, students shared their perceptions of the virtual interactive notebook. All of the students had positive perceptions about the virtual interactive notebook. Student perceptions included the use of higher-order thinking skills, being challenged as a learner, learning being an individualized process, and creating a personalized product.

Students associated the virtual interactive notebook with the use of higher-order thinking skills. Lily shared how she had to synthesize the information you researched and formulate the questions she pursued during her inquiry process when she said, "Putting it in my own words. I had choice in the questions I had and the research I did." John noted the use of higher-order thinking skills in his inquiry process as well. He said, "The summary is basically just looking up research and putting it in your own words but the inquiry is a new level. It goes beyond the basics and gets more complicated." Describing his process as complicated exemplifies the complexity of thinking required to create his

virtual interactive notebook. Aaron described how using higher-order thinking skills helped him to really learn and understand the content. He said, “When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic.” John also shared how using higher-order thinking skills assisted him in forming and understanding: “It helped me to research harder and learn more about it.” Aaron was challenged as he selected which information to use on each notebook page and then synthesized the information to show what he had learned and understood. He said, “I had to go through my research and pick and choose what was the most important information to include on my slide.” Beth explained how this process worked for her: “It allows me to think deeper as a learner because I am not just reading off of one thing. I get to go to tons of websites and use the new info along with my background knowledge to put it together and to think deeper.” Higher-order thinking allowed them to go deeper into the content and enhanced their learning process.

Students associated the virtual interactive notebook with being challenged as a learner. John and Lily used the word “pushed” to describe being challenged as they created their virtual interactive notebook. John said, “It pushed me to think outside of the box. It helped me to research harder and learn more about it.” Lily explained how being able to do the work on her own was a challenge. She said, “I was the one doing the work, so I had to think deeper. I had to do research. It pushed me.” The gifted students in this study enjoyed being challenged and rose to the challenges presented as they created their virtual interactive notebooks.

Students associated the virtual interactive notebook with learning being an individualized process, especially regarding the pace at which they worked. Beth said, “It

makes it better because we get to explore more stuff and we get to learn on our own pace." Being able to work at their own pace and being provided time and space to self-regulate allowed students to personalize their learning. Also, students being provided choice in their inquiry process individualized their learning experiences. Aaron expressed this feeling during the postinterview as he shared about his experience creating his virtual interactive notebook. He said, "It helped me learn more because I have a little bit more freedom to learn. If there is a question I am wondering about the topic, I can look it up and put it on the slide for that topic." Being able to work at their own pace and having choice through inquiry allowed students to experience and individualized learning process.

Students noted that creating their virtual interactive notebook resulted in a more personalized product. Beth said, "It was more personal. We all have the same topics, but no one's notebook will be the same because it is in our own words." Although students were given a template to use for their virtual interactive notebook, students were able to create their own notebook with information put in their own words and no two notebooks looked the same.

Student perceptions of the virtual interactive notebook included the use of higher-order thinking skills, being challenged as a learner, learning being an individualized process, and creating a personalized product. All of these were possible due to the shift in power from the teacher to the students. They became agents in their learning process as they engaged in the inquiry process.

Students Were Empowered and Motivated to Learn Through Student Choice

Student participants who were interviewed cited a difference in their learning experience when not given choice with a physical notebook versus when given choice with a virtual notebook. Choice in this study was incorporated through the inquiry process. Students involved in IBL utilize the inquiry cycle as they meet curricular goals and participate in classroom discussions to ask, investigate, create, discuss, and reflect throughout their learning (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014). A key component of IBL is student choice or student autonomy (Buchanan, 2018; Campbell & Cox, 2018; Casey & Bruce, 2011). Students in this study determined the topic, planned the research, synthesized multiple texts and perspectives, wrote, and then created and shared the new understanding they had formed. As students discussed choice in the preinterview and postinterview, five categories emerged that supported this theme: (a) challenge, (b) relevance, (c) control, (d) student motivation, and (e) autonomy.

Challenge. During the preinterview, participants cited a lack of feeling challenged when choice was not a part of creating their physical interactive notebooks. When explicitly asked how their physical interactive notebook challenged them as a learner, John said, “It doesn’t really challenge me.” Lily answered, “The passages just tell me the information and that doesn’t push.” The students were aware they were not being challenged as learners. Gifted learners need and want to be challenged (Rogers, 2007). Aaron shared several times during the preinterview how he challenged himself while creating his physical interactive notebook because it was not meeting his needs as a learner:

Aaron: I can't really think of a way it challenges me, so I challenge myself.

Aaron: I try to think above and beyond what the notebook wants me to do.

Aaron: You gave us a vague and easy assignment to write a summary, but I wrote a sentence that was above and beyond what you asked us to do.

The physical interactive notebook did not meet the needs of the students in this study as it did not challenge them in their learning process.

During the postinterview, participants expressed a feeling of being challenged in their learning process when allowed to have choice while creating their virtual notebook. As students created their virtual interactive notebooks, I noticed a substantial increase in motivation to learn when given choice, even though it was more challenging. Students noted several ways they felt challenged as they created their virtual interactive notebooks. Students felt that choice allowed them to feel challenged as they conducted their own research, as they were pushed in their thinking process, and as they put their new understanding into their own words.

Students experienced being challenged as they conducted their own research. Students in this study felt challenged as they were given choice in the research they conducted as they created their virtual interactive notebooks. John shared, "The inquiry questions gave me choice because the topics are broad, not specific. You can research and are able to write a summary, but the inquiry expands your knowledge by letting you research about little parts of it." He had choice in the topics he researched and felt challenged as he expanded his knowledge and understanding on his own.

Students experienced being challenged as they were pushed in their thinking process. Students in this study felt challenged as they were pushed in their thinking process. John said, "It pushed me to think outside of the box. It helped me to research harder and learn more about it, which made me feel good about it." Questioning was an aspect of student thinking that students found challenging in this study. Lily shared about having choice in her questioning and research. She said, "I had choice in the questions I had and the research I did." Having time and space to question and then find answers to their questions was challenging for students and met the needs of the gifted learners in this study.

Students experienced being challenged as they put their new understanding into their own words. Students were challenged as they took information from various sources and put it into their own to demonstrate an understanding of the content. They had choice in the words they used and how they portrayed their understanding of the content. Lily explained the process of creating a notebook page and the feeling of being challenged. She said, "Some slides were very challenging, except for the picture. Writing my own definition and putting the research in my own words was a challenge." Aaron shared how he felt challenged as he created each notebook page. He said, "I looked at more information and had to summarize a ton of stuff into just one little paragraph. That was challenging." Virtual interactive notebooks allowed students to be challenged as they had choice in the words they used and how they portrayed their understanding of the content.

Students in this study noted a correlation between being provided choice in their learning process and being challenged as a learner. Specifically, students felt choice

allowed them to feel challenged as they conducted their own research, as they were pushed in their thinking process, and as they put their new understanding into their own words.

Relevance. Having choice in their learning enabled students to research and learn about topics that were important to them as learners, making learning more relevant to their lives. Relevant content resulted in learning being more interesting and enjoyable.

Relevant content resulted in learning being interesting for students. Choice made learning more relevant for the students in this study, which made learning interesting for students. Beth shared during the postiverview how having choice in the topics she explored made learning more interesting for her. She said, "I've always been interested in social studies, but it made me a little more interested because instead of being told what to learn, I was able to explore what I was interested in." Students noted during the postinterview how when they were given choice in their learning and learning became relevant to them, they found themselves caught up in the learning process. Lucy said, "The more I researched, the more interesting things that I found, it made me want to read more and find more facts." Aaron said:

> I was already interested but it helped me get more interested as I learned more about each topic. And the more you know, the more interesting it is. And the more you can expand your knowledge and learn more. And the more you learn part is the interesting part of it.

Students having choice resulted in learning being relevant. Students found themselves more interested in learning when the content was relevant. They would caught up in their

learning as they utilized the inquiry process to research and answer questions about topics that were relevant to them as learners.

Relevant content resulted in learning being enjoyable for students. Choice made learning more relevant for the students in this study, which made learning enjoyable for students. Participants cited a correlation between being able to find information that was relevant to them and learning being an enjoyable process. John described how the learning process became interesting for him by using the words *piques my interest* and *fun*. He said, "It was more interesting because I got to learn more interesting facts. The inquiry section piques my interest and is fun because I can find facts that I didn't know and that is fun." Lily also used the word "fun" to describe how learning was a more enjoyable process when she was given choice and learning was relevant to her. She said, "When the teacher gives me choice, it makes learning more fun. I don't like being told I have to do an exact topic or an exact question. When I have choice, it is more fun." Students having choice resulted in learning being relevant. Students found themselves enjoying learning when the content was relevant.

Allowing students to have choice in this study made learning more relevant. Relevance in this study correlates with an increase in student interest in the topic and learning being an enjoyable process.

Control. One aspect of higher-order thinking is the learner's taking control and being responsibility for their own thinking and learning (Anderson & Mills, 2015; Miri et al., 2007). Participants in this study referenced a sense of control and ownership in their learning process when they could exercise choice. During the postinterview, students

noted experiencing control over the creation of each notebook page and the research they conducted.

Control over the creation of each notebook page. Students were provided a template for creating each page, but they had control over the content they put on each page and the images they used to convey their meaning. Aaron shared how he had control over the images when he said, "Finding a picture was fun, because there are so many good pictures on the topic and I got to decide which one I thought fit best." Having choice and control over the images allowed him to evaluate images and then choose an image he thought best represented the content he put on the notebook page.

Control over the research they conducted. Students were allowed to research what they felt was interesting or what they had questions about pertaining to a certain topic. Aaron described how he had control over his research during the postinterview. He said, "It motivates me to learn by giving some kind of guideline to go off of but I am allowed to learn about what I am interested in, too." Aaron also described the control he had over his research as "freedom" when he said, "It helped me learn more because I have a little more freedom to learn. If there is a question I am wondering about the topic, I am allowed to look it up and put it on the slide for that topic." Beth described this freedom as being *able to explore*. She said, "I've always been interested in social studies, but it made me a little more interested because instead of being told what to learn, I was able to explore what I was interested in." Beth also shared that she enjoyed being able to have control over her research. Beth said, "I liked having my own questions and doing my own research because usually we would have just learned what you told us we had to

learn." Having control over their learning was freeing and made learning a more enjoyable process.

Students noted a distinct difference in the control they had over their learning process in regards to research. Aaron described the difference in control when he said, "Sometimes with the other notebook we didn't get to cover what I think might be interesting but with this notebook I can research it as part of my inquiry on that topic." Beth shared the same feelings about having control over her research while creating her virtual interactive notebook. She said, "And we got to decide what questions we wanted to research." These responses demonstrate that when students were given choice, they were in control of the research they conducted. The students were the ones making the decisions and they had ownership in their learning process. Having control over the research they conducted and the design of each notebook page made learning a more interesting and enjoyable process.

Student motivation. Gifted students find learning to be motivating when they are provided choice in their learning as they engage in inquiry in authentic ways with content that pertains to complex topics and allows students to personally find connections among ideas and topics (Kanevsky, 2011). In this study, students found choice to be a motivating factor in their learning process when creating their virtual interactive notebooks. Beth described being motivated by using the words *exciting* and *personal*. She said, "It was more exciting. It was more personal."

John, Lily, and Aaron used the words *motivates*, *motivating*, and *motivated* when describing how choice was a motivating factor for them as learners:

John: It made me feel good. It motivates me to do more. I get my choice to learn and I don't usually get that so it motivated me to do it harder and to push myself to the limit, unlike the normal notebook where I am just reading. I like having choice.

Lily: It was easier to have choice but also made it harder. But I like it. These are the most fun slides I have done. I learned a lot of cool stuff that I did not know existed. These slides really motivated me to learn more.

Aaron: It motivates me to learn by giving some kind of guideline to go off of but I am allowed to learn about what I am interested in, too. Sometimes with the other notebook we didn't get to cover what I think might be interesting but with this notebook I can research it as part of my inquiry on that topic.

They also described choice as being *fun, cool,* and *interesting*. Choice was something they enjoyed as learners. All four students interviewed cited during their postinterview a correlation between being allowed to have choice in their learning process and an increase in their motivation to learn. Students found choice to be motivating and it pushed them and challenged them in their learning process.

Students Embraced, Spoke, and Lived the Inquiry Process

Student participants who were interviewed cited specific ways the inquiry process helped them as learners. Students involved in IBL utilize the inquiry cycle as they meet curricular goals and participate in classroom discussions to ask, investigate, create, discuss, and reflect throughout their learning (Campbell & Cox, 2018; Casey & Bruce,

2011; Mills et al., 2014). In this study, student responses indicate students embraced, spoke, and lived the inquiry process through the following categories: (a) aids in knowledge acquisition, (b) creativity, (c) individualized, and (d) depth.

Aids in knowledge acquisition. Participants in this study noted that the inquiry process helped them acquire knowledge. When creating their physical interactive notebook, students received the information rather than using the inquiry process to gain an understanding of the content. Students used reading, rereading, copying information, and memorizing as tools for knowledge acquisition. When creating their virtual interactive notebooks, students found the information using the inquiry process for their own knowledge acquisition. The participants interviewed cited knowledge acquisition aids such as questioning, finding multiple sources of information, and synthesizing information.

Questioning. Questioning aided students in knowledge acquisition as it was integrated in their inquiry process. This, coupled with choice, gave them agency in their knowledge acquisition. The students enjoyed questioning and felt challenged by finding answers to their questions. Beth shared how questioning aided her and made learning interesting and enjoyable:

Beth: I liked having my own questions and doing my own research because usually we would have just learned what you told us we had to learn.

Beth: I've always been interested in social studies, but it made me a little more interested because instead of being told what to learn, I was able to explore what I was interested in.

Students shared how having the ability to question was liberating for them as learners and allowed them to gain more knowledge than if the teacher was providing the information. Aaron said, “Now I have more freedom and can expand my knowledge and stuff to that nature. With the inquiry section, I looked up more and knew more. I definitely gained more knowledge than I would have using a regular notebook.” In this study, questioning was an aid for students in their knowledge acquisition as they were given time and space to wonder and find answers to their wonderings.

Multiple Sources of Information. Getting information from multiple sources aided students in their knowledge acquisition. As part of the inquiry process, students in this study found and studied multiple sources of information which assisted them in making meaning. Beth described this process by using the words *explore* and *explored* and explained how it aided her knowledge acquisition. She said, “I got to explore more about the topic so I feel like I know a lot about that topic. I didn’t just look at a certain thing. I explored a lot of things and knew a lot about the topic.” During the postinterview, Beth explained her process of taking what she read from multiple sources and combining it with her background knowledge to make meaning of the content and the topic for each notebook page. Beth said, “It allows me to think deeper as a learner because I am not just reading off of one thing. I get to go to tons of websites and use the new info along with my background knowledge to put it together and to think deeper.” Aaron shared his process of making and conveying meaning as taking information from multiple sources and then selecting which information he wanted to use on his slide. He said,” Yes because I looked at more information and had to summarize a ton of stuff into just one little paragraph.” He also explained how he selected information from the multiple

sources. As students read from multiple sources, they were creating a deeper understanding of the topics they were researching. Students were able to confirm and solidify their understanding as they saw similar information in multiple places and then merged it with their previous understanding.

Synthesizing. Students in this study cited synthesizing as an aid in knowledge acquisition. When synthesizing, students would take the information they had collected across multiple sources and write a summary of the topic in their own words in their virtual interactive notebook. During the postinterview, Beth and Aaron described their synthesizing process. Beth said, "The summary section of each page requires you to take what you know plus the information you found while you researched and then put it into your own words." Aaron described this process when he said, "I had to summarize everything I had learned into one section. I had to go through my research and pick and choose what was the most important information to include on my slide." This process of synthesizing aided students in their meaning making process and was appropriately challenging for the gifted learners in this study. Lily described having to "think deeper and consider details." Synthesizing was an aid in knowledge acquisition in this study because it required the use of higher-order thinking skills as students merged their background knowledge with their new understanding to write a summary of the topic.

Creativity. Students in this study cited the freedom to be creative as an aid in their knowledge acquisition. Students found themselves being creative in the questions they asked and the presentation of their understanding on their notebook pages. Students also found creativity motivating, which made knowledge acquisition enjoyable.

Students were able to be creative in the questions they asked during their inquiry. Aaron described how being able to generate his own questions was freeing and allowed him to be creative in his knowledge acquisition process. He said, “It helped me learn more because I have a little bit more freedom to learn. If there is a question I am wondering about the topic, I can look it up and put it on the slide for that topic.” The freedom to be creative in their inquiry assisted students in their knowledge acquisition as they had to reflect on what they already knew about the topic and then formulate questions to dig deeper into the topic and form a deeper understanding.

Students were able to be creative in the presentation of the understanding they gained through the inquiry process. This process was individualized and assisted students in their knowledge acquisition. Aaron shared how he was able to be creative as he formatted his slides. He said, “I had the same format in my head for each slide, but Alexander Hamilton did not fit that pattern because he was not a president. So I had to … think about how I was going to format him differently.” Beth noted how writing her understanding in her own words allowed students the creativity to share what they had learned individually about the topics. She said, “We all have the same topics, but no one’s notebook will be the same because it is in our own words.” Creativity in the construction of their virtual interactive notebooks assisted students in their knowledge acquisition process as they had to put thought and effort into how to showcase their understanding of each topic.

Students found being able to create their own notebook to be a motivating and enjoyable aspect of their knowledge acquisition process. During the postinterview, Aaron shared how creating his own virtual interactive notebook was motivating for him as a

learner. He said, “It motivated me to want to learn more, especially the summary and inquiry. Finding a picture was fun, because there are so many good pictures on the topic and I got to decide which one I thought fit best.” Lily described this process as being “fun” when she said, “It was easier to have choice but also made it harder. But I like it. These are the most fun slides I have done. I learned a lot of cool stuff that I did not know existed. These slides really motivated me to learn more.” Creating their own personalized virtual interactive notebook gave students a place to share information on a topic in a way that represented their understanding through their personal inquiry process. Students found learning to be a motivating and enjoyable process as they were able to be creative in their questioning and presentation of their new understanding.

Individualized. During the postinterview. participants cited a sense of individuality in their learning process through the use of virtual interactive notebooks and the inquiry process. Gifted learners need regular opportunities to be different and to work independently on topics they are passionate about and find interesting (Rogers, 2007). As they created their virtual interactive notebooks, the inquiry process met this need as it allowed students to have choice, work at their own pace, create a personalized product, and formulate their own understanding of a topic.

Choice. Allowing students to have choice in their learning resulted in students embracing, speaking, and living the inquiry process. On each page of their virtual interactive notebook, students had a section in which they shared their thoughts on a personal inquiry they chose to pursue that pertained to that particular topic. John described this process: “The inquiry questions gave me choice because the topics are broad, not specific. You can research and are able to write a summary, but the inquiry

expands your knowledge by letting you research about little parts of it." Specifically, students cited that choice was freeing to them in their learning process and made learning more enjoyable.

Students cited during the postinterview that having choice as a part of the inquiry process was liberating and resulted in a more individualized learning. Aaron described the freedom he felt:

> Aaron: I was open to wondering more things.
>
> Aaron: It helped me learn more because I have a little bit more freedom to learn. If there is a question I am wondering about the topic, I can look it up and put it on the slide for that topic.

Beth also shared during the postinterview that she found choice to be liberating when she said, "I liked having my own questions and doing my own research because usually we would have just learned what you told us we had to learn." Having choice as they researched and created their virtual interactive notebooks individualized their learning.

Having choice also made learning more interesting. Beth said, "I've always been interested in social studies, but it made me a little more interested because instead of being told what to learn, I was able to explore what I was interested in." Like most gifted students, Beth enjoys learning and is interested in social studies. However, when she was given choice, she found herself more interested in the topics. Aaron described this feeling as well when he said:

> I am allowed to learn about what I am interested in, too. Sometimes with the other notebook we didn't get to cover what I think might be interesting but with this notebook I can research it as part of my inquiry on that topic.

Integrating choice in their learning process allowed learning to be more interesting for the students as it was individualized based on their wonderings.

Pace. Students in this study were able to work at their own pace as we went through the unit. If students found themselves wondering more about a topic, they had the freedom to dig deeper into that topic. Finding answers and learning more were valued while creating their virtual interactive notebook and students felt being able to decide how they spent their time made learning a more individualized process. Beth shared, "It makes it better because we get to explore more stuff and we get to learn on our own pace." The students found that being able to self-pace made learning a more individualized process as it resulted in deeper and more meaningful personal inquiries.

Personalized Product. In this study, students created a personalized product as they were given choice and control over their learning through an individualized inquiry process. When asked about the creation of her virtual interactive notebook, Beth shared, "It was more personal. We all have the same topics, but no one's notebook will be the same because it is in our own words." It became more personal because the students were the ones making the choices, conducting the research, and creating their notebooks.

Students in this study were able to share what they had learned individually through the personalization of each slide. Lily described this process:

> The slides required me to be the one to type everything and I was the one to put information in. I was the one doing the work, so I had to think deeper. I had to do research. It pushed me.

Each page of the student's virtual interactive notebook has an inquiry section in which the student had choice in the topic they researched. They were the ones who came up

with their inquiry question. They were the ones who put their learning from their inquiry into their own words. Each student's personalized virtual interactive notebook is evidence that learning in this study was an individualized process.

Formulate Their own Understanding. Students found they truly understood the material when learning was individualized and they were able to formulate their own understanding. The students were the ones doing the research and learning through the inquiry process. Students formulated their own understanding as they created each notebook page; they took what they had learned through their personal inquiry and then conveyed their understanding of the topic by putting it in their own words. Aaron shared how he had to conduct his own research to create each notebook page. He said, "When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic." He learned more about each topic than he normally would have and then shared his understanding through writing and images on each notebook page. Lily shared how having to formulate her own understanding of each topic made studying an easier process for her. She said, "It's easier to study now, but it helps me a lot to study it when I was the one who wrote it. I was the one who put it in my own words." Having to synthesize her thinking and put it into her own words helped her understand the content on a deeper level. Studying became easier because she had formulated her own understanding of the topic to begin with and only had to review what she had truly already learned. Having the opportunity to formulate their own understanding as they lived the inquiry process differentiated and individualized the learning process. This resulted in students' feeling they truly understood the content.

Depth. Participants in this study found their learning process became deeper and more complex through inquiry. Specifically, students found themselves thinking deeper as learners as they formulated their research questions, conducted their own research, and synthesized the information.

Students in this study were able to think deeper as learners as they formulated their own research questions. When asked about what aspects of creating their virtual interactive notebook pushed them to think deeper as a learner, John answered, "The inquiry questions. The summary is basically just looking up research and putting it in your own words but the inquiry is a new level. It goes beyond the basics and gets more complicated." Formulating their own research questions required students to think deeper as they reflected on what they already knew about a particular topic and then allowed themselves to articulate personal wonderings about that topic.

Students in this study were able to think deeper as learners as they conducted their own research. Students found conducting their own research to be appropriately challenging, which required them to think deeper. Lily described the challenge of researching each topic and the level of thinking required of her as a learner to complete that task when she said, "Some were harder and pushed me to research new things and think deeper." John described how he experienced depth when he said, "In the virtual notebook it requires advanced thinking and for the student to do research, a lot more research." He had to get his thoughts in order so he would know what he wanted and needed to conduct research on. Beth shared how learning for her went deeper as she conducted personal research and visited multiple sites on a particular topic. She said, "I got to explore more about the topic so I feel like I know a lot about that topic. I didn't just

look at a certain thing. I explored a lot of things and knew a lot about the topic." Aaron also found visiting multiple sites helped him learn more about each topic. He said, "When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic." Being able to conduct research as a part of the inquiry process contributed to the students thinking deeper in the social studies content.

Students in this study were able to think deeper as learners as they synthesized the information they collected during their research and then articulated their understanding on each notebook page. Lily said, "The slides required me to be the one to type everything and I was the one to put information in. I was the one doing the work, so I had to think deeper. I had to do research. It pushed me." Lily also said, "With the synthesizing, I had some trouble summarizing and explaining because it made me think deeper and consider details." Synthesizing the information was appropriately challenging for Lily and required her to think deeper as a learner. Beth also described her process and how it required her to think deeper as a learner. She said,

> It allows me to think deeper as a learner because I am not just reading off of one thing. I get to go to tons of websites and use the new info along with my background knowledge to put it together and to think deeper. The summary section of each page requires you to take what you know plus the information you found while you researched and then put it into your own words.

Aaron described his process for synthesizing and how he had to think deeper as a learner. He said, "I had to summarize everything I had learned into one section. I had to go through my research and pick and choose what was the most important information to

include on my slide." Synthesizing the information they collected during their research required the students to think deeper as they put their new understanding into their own words on each notebook page.

Participants found their learning process became deeper and more complex as they embraced, spoke, and lived the inquiry process. Through inquiry, students were able to dig deeper as learners as they formulated their research questions, conducted their own research, and synthesized the information onto each notebook page.

Students Experienced a Shift in Their Knowledge Acquisition Process

Allowing students to engage in real-world inquires positions them to create new knowledge (Mills et al., 2014). Using technology as a tool during their personal inquiries and in the sharing of their understanding results in "knowledge acquisition, knowledge building, knowledge expression, and knowledge reflection" (Coiro et al., 2016, p. 8). Coiro et al. (2016) believe technology allows for deeper understanding and learning throughout the inquiry cycle. Students in this study utilized technology during their personal inquiries and in the sharing of their understanding. The students who were interviewed cited a transformation in their knowledge acquisition process as they created their virtual notebook. This shift was evident from the emergence of the following categories: (a) learning events and (b) higher-order thinking.

Learning Events. Participants noted a shift in the types of learning events they experienced while using a virtual interactive notebook. The learning events are categorized as actively learning, instead of the passive learning that occurred when students were creating their physical interactive notebooks. Examples of passive learning events that students participated in while creating their physical interactive notebook

include gluing, copying, and memorizing. Researching, analyzing and synthesizing are three examples of active learning inquiry events that students participated in as they created their virtual interactive notebook.

Researching. Students cited performing research as part of their personal inquiry as a learning event that impacted their knowledge acquisition. Specifically, students mentioned the amount of research they conducted, the ability to conduct their own research, and continuing to question and research

During the postinterview, students shared that the amount of research they personally conducted impacted their knowledge acquisition process. John discussed the amount of research required of him as a learner to create each page in his virtual interactive notebook. He said, "It requires advanced thinking and for the student to do research, a lot more research." Beth shared about the amount of research she conducted to form an understanding of each topic. She said, "I didn't just look at a certain thing. I explored a lot of things and knew a lot about the topic." Being able to conduct their own research and having the ability to decide how much research they needed to conduct to form a solid understanding of each topic positively impacted students' learning acquisition.

Students interviewed suggested the ability to conduct their own research to answer questions they had as learners expanded their knowledge. John shared, "You can research and are able to write a summary, but the inquiry expands your knowledge by letting you research about little parts of it." Through research, Beth gained more knowledge about each topic. She said, "I got to explore more about the topic so I feel like I know a lot about that topic. I didn't just look at a certain thing. I explored a lot of things

and knew a lot about the topic." Similarly, Aaron said, "When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic." John enjoyed having the opportunity to conduct his own research. He used this a way to challenge himself as a learner. John shared, "I really pushed myself with the inquiry questions and found more info." Having the opportunity to conduct their own research based on their own questions positively impacted students' learning acquisition.

As students researched, they found themselves continuing to question and conduct research as they became consumed in the inquiry cycle. Students gained more knowledge than they did with the physical interactive notebook as they were able to conduct research on their own. Lily shared how finding answers to questions through her personal research led her to research more. She said, "The more I researched, the more interesting things that I found, it made me want to read more and find more facts." Aaron also found himself getting caught up in conducting research. He said, "Now I have more freedom and can expand my knowledge and stuff to that nature. With the inquiry section, I looked up more and knew more. I definitely gained more knowledge than I would have using a regular notebook. The learning more part is the interesting part of it." Aaron described learning as being "interesting" as he experienced a shift in his learning acquisition process. Having the opportunity to continue to question and conduct their own personal research to find answers to their questions positively impacted students' learning acquisition.

Analyzing. Students cited analyzing various texts to find answers to their personal questions as another learning event that impacted their knowledge acquisition process. As

students were engaged in inquiry, they encountered various sites and analyzed the information provided as they tried to formulate answers to their questions. Students also had to evaluate the information they had analyzed and decide what they wanted to include in their virtual interactive notebook. Aaron described this process when he said, "I had to go through my research and pick and choose what was the most important information to include on my slide." Aaron also shared how he analyzed images as he decided which one best represented the content on each slide. He said, "Finding a picture was fun, because there are so many good pictures on the topic and I got to decide which one I thought fit best." Aaron found analyzing information appropriately challenging for him as a gifted learner. He said, "I looked at more information and had to summarize a ton of stuff into just one little paragraph. That was challenging." Having the opportunity to analyze information positively impacted students' learning acquisition.

Synthesizing. After researching and analyzing various sites, students synthesized the information they had gained with their background knowledge. The synthesis, or summary, was challenging because it required students to make connections across texts and think at a deeper level. Beth described her process for synthesizing when she said, "The summary section of each page requires you to take what you know plus the information you found while you researched and then put it into your own words." She added, "I get to go to tons of websites and use the new info along with my background knowledge to put it together and to think deeper." When speaking about synthesizing, Beth also said, "It allows me to think deeper as a learner because I am not just reading off of one thing." Synthesizing, which required deeper thinking from each student, positively impacted students' learning acquisition.

Higher-order thinking. Higher-order thinking is a complex mode of thinking that involves uncertainty, application, and self-regulation as the learner identifies a useful source of information, analyzes its credibility, reflects on the new information and aligns it with prior knowledge, forms new conclusions, and generates multiple solutions as the learner takes control and is responsible for their own thinking (Anderson & Mills, 2015; Miri et al., 2007). Participants in this study referenced the use of higher-order thinking as they constructed their virtual interactive notebook. This was a shift from the lower-order thinking skills they utilized while creating and using their physical interactive notebook.

While creating and using their physical interactive notebooks, students were copying information into graphic organizers and diagrams, memorizing information, and reading and rereading information I provided. Students experienced a shift in their knowledge acquisition process and, therefore, the level of thinking required as they created their virtual interactive notebooks. The students who were interviewed cited the use of higher-order thinking. Four higher-order thinking skills participants cited utilizing while creating their virtual interactive notebook included: questioning, formulating, modifying, and examining.

Questioning. Students in this study experienced a shift in their learning acquisition process as they questioned. Questioning is a higher-order thinking skill that requires students to reflect on what they already know about a topic and then question in order to enrich and increase their understanding. When creating their physical interactive notebook, students did not have time to find answers to questions they had based on what we were learning. While creating their virtual interactive notebook, students engaged in

questioning as a part of the inquiry process. Questioning allowed students the freedom to wonder and to be challenged.

In the postinterview, students shared how they were allowed to wonder through questioning as they created their virtual interactive notebook. Aaron described his freedom to question as "wondering." He said, "If there is a question I am wondering about the topic, I am allowed to look it up and put it on the slide for that topic." Beth described how she had the freedom to wonder when she said, "So when I had a question from writing the summary or learning about the topic in class, I could take that question and find an answer to it." Having the freedom to wonder through questioning resulted in higher-order thinking for students as they created their virtual interactive notebooks.

Students in this study found questioning to be challenging. During the postinterview, when asked about a time she had pushed herself as a learner, Beth said, "The part where you came up with your own questions in the inquiry part." When asked what aspects of the virtual interactive notebook pushed him as a learner, John responded, "The inquiry questions. The summary is basically just looking up research and putting it in your own words but the inquiry is a new level. It goes beyond the basics and gets more complicated." Questioning while creating their virtual interactive challenged the gifted students in this as they engaged in inquiry.

Formulating. Students in this study experienced a shift in their learning acquisition process as they formulated their understanding during their personal inquiry. Formulating is a higher-order thinking skill that results in a newer and deeper understanding as requires students merge their background knowledge with new information. It also includes the forming of their responses in order to share their

understanding of a topic. Students in this study formulated answers to their synthesis as they created each page of their virtual interactive notebook.

Students formulated a synthesis as they put into words their background knowledge and the new information they found in their personal research. During the postinterview, Beth, Aaron, and Lily described the process of formulating their thinking. Beth articulated her process for formulating the summary (synthesis) section for each page of her virtual interactive notebook. She said, "The summary section of each page requires you to take what you know plus the information you found while you researched and then put it into your own words." Aaron also articulated the use of formulating as he wrote his synthesis when he said, "I looked at more information and had to summarize a ton of stuff into just one little paragraph. That was challenging." He had to formulate how he was going to convey his understanding of the topic with limited space. Lily also cited the use of formulating when she said, "With the synthesizing, I had some trouble summarizing and explaining because it made me think deeper and consider details." To present their new understanding in a way that showed they comprehended the information, students formulated a response that merged their background knowledge and the new information they had discovered.

Modifying. Students in this study experienced a shift in their learning acquisition process as they made modifications throughout their personal inquiry. Modifying is a higher-order thinking skill that requires students to reflect on their learning process and adjust their approach to or understanding of a topic. Students in this study utilized modification when creating their virtual interactive notebook as they questioned, researched, and presented their information. Aaron shared his experience with having to

modify the way he presented information about Alexander Hamilton. Alexander Hamilton did not fit the format he had already createdfor people in this unit, all of whom had been presidents until he researched Hamilton. He had to modify his approach, thinking, research, and presentation of the content. Aaron was so proud of himself for making an adjustment. This type of higher-order thinking was possible because the students were the ones doing the work and creating their own personalized notebook.

Examining. Students in this study experienced a shift in their learning acquisition process as they examined multiple sources during their personal inquiries. Examining is a higher-order thinking skill that requires students to evaluate and make connections across various sources of information. Students in this study examined resources to gain an understanding of a topic and then write a synthesis. They also examined resources as they led a personal inquiry on each topic. Examining multiple sites resulted in students' thinking at a deeper level and feeling more confident in their understanding of the topic.

As student in this study examined multiple sources, they found themselves thinking deeper as a learner. Beth explained this process when she said:

> It allows me to think deeper as a learner because I am not just reading off of one thing. I get to go to tons of websites and use the new info along with my background knowledge to put it together and to think deeper.

Aaron explained the process he went through after he felt he had enough information to start formulating his responses. He shared how he examined his notes and understanding and would decide what he wanted to include on each slide. Lily also cited the use of higher-order thinking skills as she examined details across multiple sources: "With the synthesizing, I had some trouble summarizing and explaining because it made me think

deeper and consider details." This process was appropriately challenging for Lily and the other gifted learners in this study as it required them to use higher-order thinking skills.

As students in this study examined multiple sources, they found themselves feeling more confident in their understanding of the topic. Beth explained this feeling when she said, "I got to explore more about the topic so I feel like I know a lot about that topic. I didn't just look at a certain thing. I explored a lot of things and knew a lot about the topic." These responses illustrate that examining multiple sources required students to utilize higher-order thinking skills as they made connections and evaluated the information in order to form an understanding of each topic.

Chapter Summary

For this study, quantitative and qualitative data were collected. Quantitative data was collected through the use of two instruments. First, quantitative data was collected on student motivation through the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1993). Second, the level of higher-order thinking, or Depth of Knowledge (DOK) Level, students utilized in their virtual interactive notebook creation was measured using a rubric that was created for this study and was derived from Webb's Web Alignment Tool (Webb et al., 2006). Qualitative data was collected through coding and analyzing pre- and postinterviews. Five themes emerged from this data: (1) student perceptions of themselves as learners evolved, (2) students experienced a shift in power from teacher to student, (3) students were empowered and motivated to learn through student choice, (4) students embraced, spoke, and lived the inquiry process, and (5) students experienced a shift in their knowledge acquisition process.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

This chapter positions my findings with the literature on higher-order thinking and motivation through the use of technology with gifted learners. The purpose of this action research was to evaluate the implementation of virtual interactive notebooks in my fourth-grade gifted classroom as a way to promote higher-order thinking and motivation in gifted students. Both quantitative (Motivated Strategies for Learning Questionnaire and the Depth of Knowledge Rubric) and qualitative data (student interviews) were collected and then analyzed. The (a) discussion, (b) implications, and (c) limitations of this research are examined below.

Discussion

It is important to situate these results within the larger context of research for higher-order thinking and motivation through the use of technology with gifted students in an inquiry-based classroom. To answer each of the research questions, the data were combined and considered with respect to previous research. Exploring the impact creating virtual interactive notebooks had on fourth-grade gifted students was important to address the problem at the center of this action research study: physical interactive notebooks are not meeting the needs of gifted learners in 21st-century classrooms.

Research Question 1: How does the implementation of virtual interactive notebooks in an inquiry based, constructivist learning environment impact the use of higher order thinking skills (according to Webb's Depth of Knowledge) of gifted learners in a fourth-grade social studies classroom?

Higher-order thinking is a complex mode of thinking that involves uncertainty, application, and self-regulation as the learner identifies a useful source of information, analyzes its credibility, reflects on the new information and aligns it with prior knowledge, forms new conclusions, and generates multiple solutions as the learner takes control and is responsible for their own thinking (Anderson & Mills, 2015; Miri et al., 2007). Common Core State Standards (CCSS) in social studies require students to construct knowledge as they analyze, synthesize, and apply understanding to solve problems, collaborate with others, and communicate their thinking, all of which require higher-order thinking (Anderson & Mills, 2015). In this study, I promoted students' higher-order thinking skills through the implementation of virtual interactive notebooks in the social studies content area and were evaluated through the use of Webb's DOK (Webb, 1997, 2002). Webb's Depth of Knowledge (DOK) is a continuum of thinking complexity, ranging from fundamental and simple knowledge to cognitively complex thinking, with each level referring to the depth of content understanding and the complexity of the learning task (Anderson & Mills, 2015; Paige et al., 2013; Paige et al., 2015). In this study, average student DOK Levels were compared between the physical interactive notebook and virtual interactive notebook. While creating their physical interactive notebooks, students in this study used an average DOK Level of $M = 1.11$ ($SD = 0.03$, $SE = 0.01$). While creating their virtual interactive notebooks, students in this

study used an average DOK Level of $M = 3.27$ ($SD = 0.34$, $SE = 0.09$). The implementation of virtual interactive notebooks in this study increased student use of higher-order thinking skills (according to Webb's DOK) due to (a) the requirements of the notebook, (b) the learning events associated with creating the notebook, and (c) students having choice and control over their learning.

Requirements of the notebook. The creation of virtual interactive notebooks in this study required students to use higher DOK Levels than when creating a physical interactive notebook. Notebooking in this study aligned with Alschbacher and Alonzo's (2006) definition of notebooking in an inquiry-based classroom: students construct meaning on their own and then utilize a notebook to articulate their understanding and thinking into their own words. According to Waldman and Crippen (2009), notebooks require students to be actively engaged, self-reflective, able to express thoughts and personal values, organized, proud of their products, able to demonstrate understanding, and able to self-regulate. For students in this study, their notebook was a place for them to share information on a topic in a way that represented their personal inquiry process. The requirements of the notebook provided students with (a) a template to record their understanding, (b) an opportunity to utilize IBL, and (c) a way to share their understanding using technology.

Template to record their understanding. In this study, each page of the virtual interactive notebook had three sections: a synthesis of the various sources of information presented to the students and that they encountered during their personal research, information from their personal wonderings and inquiry process, and an image, video, or other type of media that correlated with and supported the information they provided on

the page. I provided students with a template to assist them in knowing what to include on each notebook page (see Figure 3.2). After a topic was presented and discussed with the entire class, students then conducted research and pursued an inquiry on their own. They then used the template to put their new understanding into words.

Opportunity to utilize inquiry-based learning. DOK Levels for students increased as they utilized inquiry skills while creating their virtual interactive notebooks. Students involved in inquiry-based learning (IBL) utilize the inquiry cycle as they meet curricular goals and participate in classroom discussions to ask, investigate, create, discuss, and reflect throughout their learning (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014). Students met these requirements as they conducted personal inquiries and formed an understanding of each topic in the unit.

Students in this study found certain components of IBL to push them as learners, which resulted in higher DOK Levels. Specifically, students found their learning process became deeper and more complex due to choice, creativity, and individualization. Students utilized choice as they questioned, planned their research, synthesized multiple texts and perspectives, and then created each notebook page to put their new understanding into words. Students were creative in their questioning, research, and presentation of their new understanding, all of which required higher-order thinking. Using an inquiry approach also made their experience more individualized. They were able to generate their own questions, conduct their own research, pursue their own interests, formulate their own understanding, and design their own notebook pages. These aspects of IBL impacted the students' DOK Levels.

A way to share their understanding using technology. DOK Levels for students increased as they used digital tools to create products to express their convergent and divergent knowledge (Coiro et al., 2016), whereas when creating a physical interactive notebook, all notebooks looked exactly the same (see Figure 5.1, 5.2, 5.3, and 5.4). Students, not the teacher, were now the creators of the information and every single notebook page looked different (see Figure 5.5, 5.6, 5.7, and 5.8). The same four students' physical and virtual interactive notebooks demonstrate the differences between the notebooks themselves and among the students.

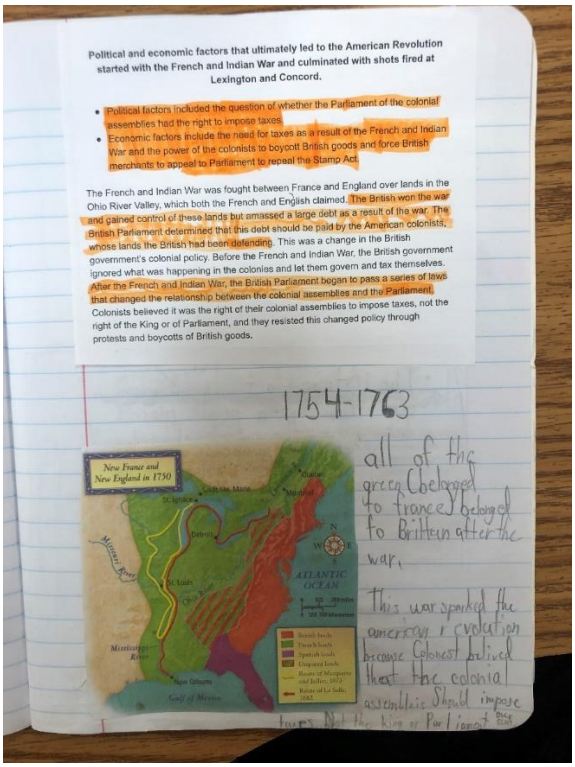

Figure 5.1. Page from Brent's physical interactive notebook.

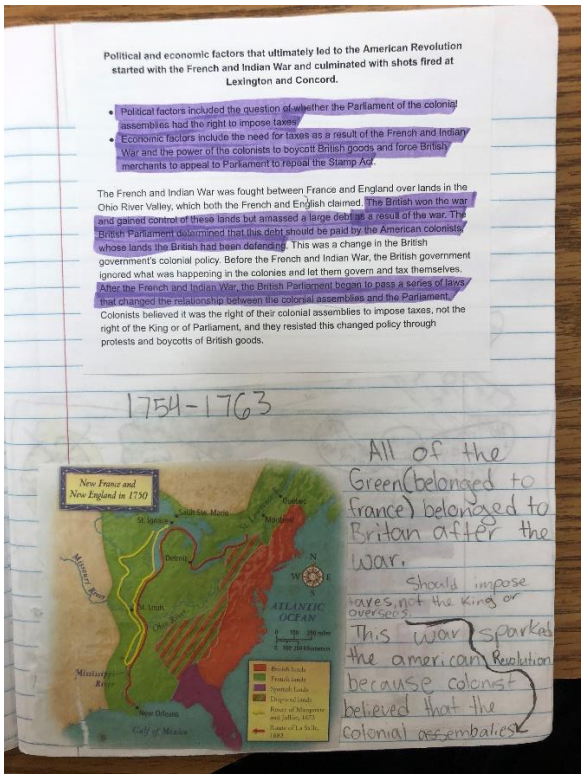

Figure 5.2. Page from Cindy's physical interactive notebook.

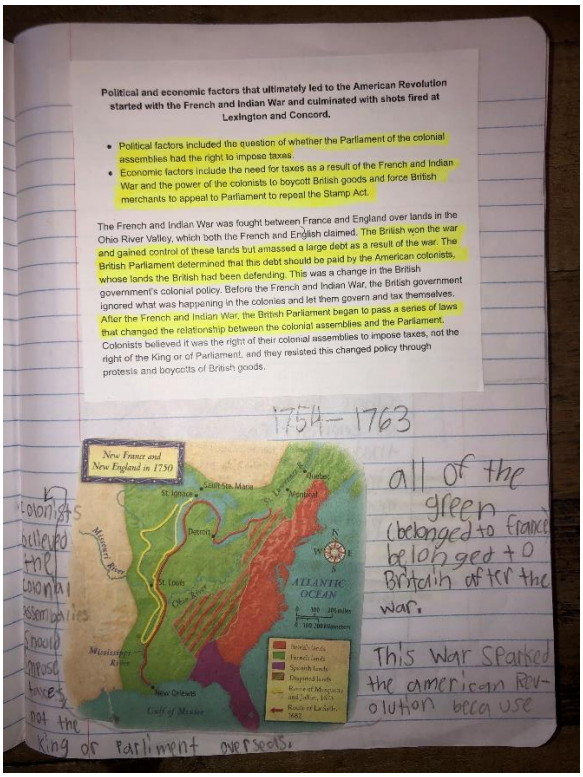

Figure 5.3. Page from Aaron's physical interactive notebook.

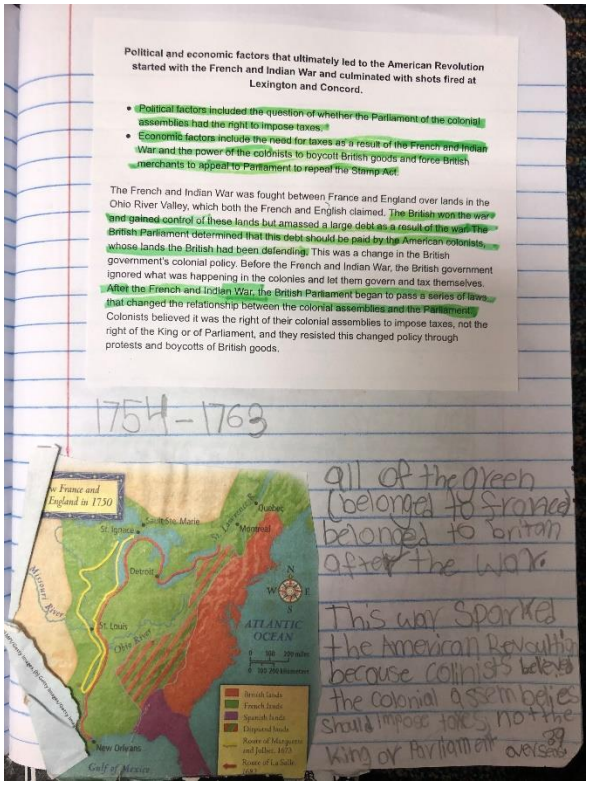

Figure 5.4. Page from Mel's physical interactive notebook.

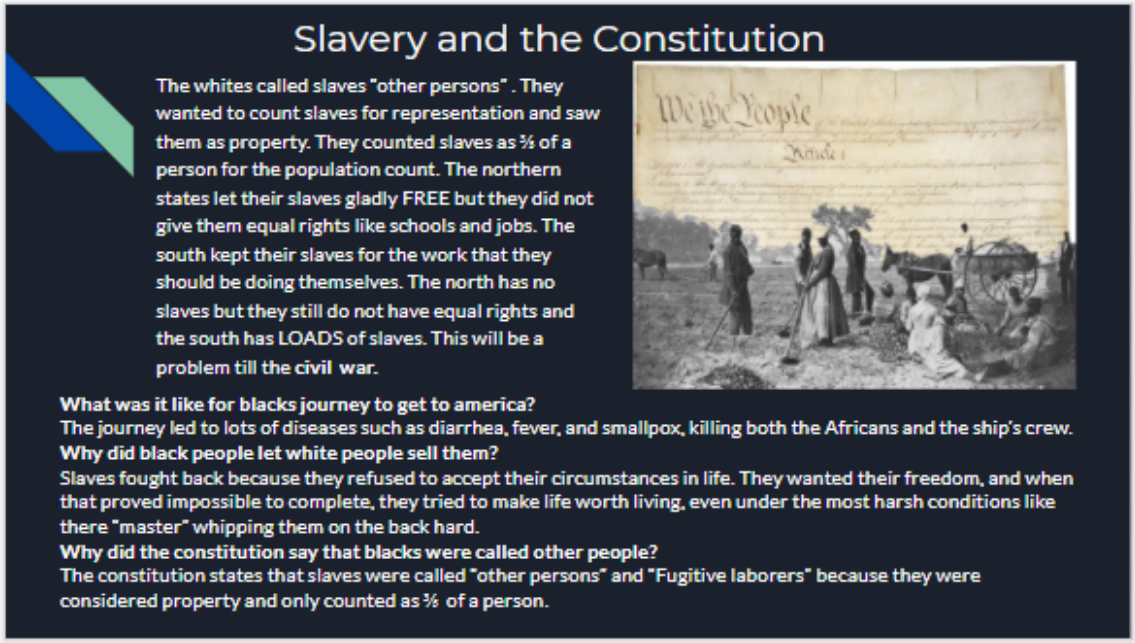

Figure 5.5. Page from Brent's virtual interactive notebook.

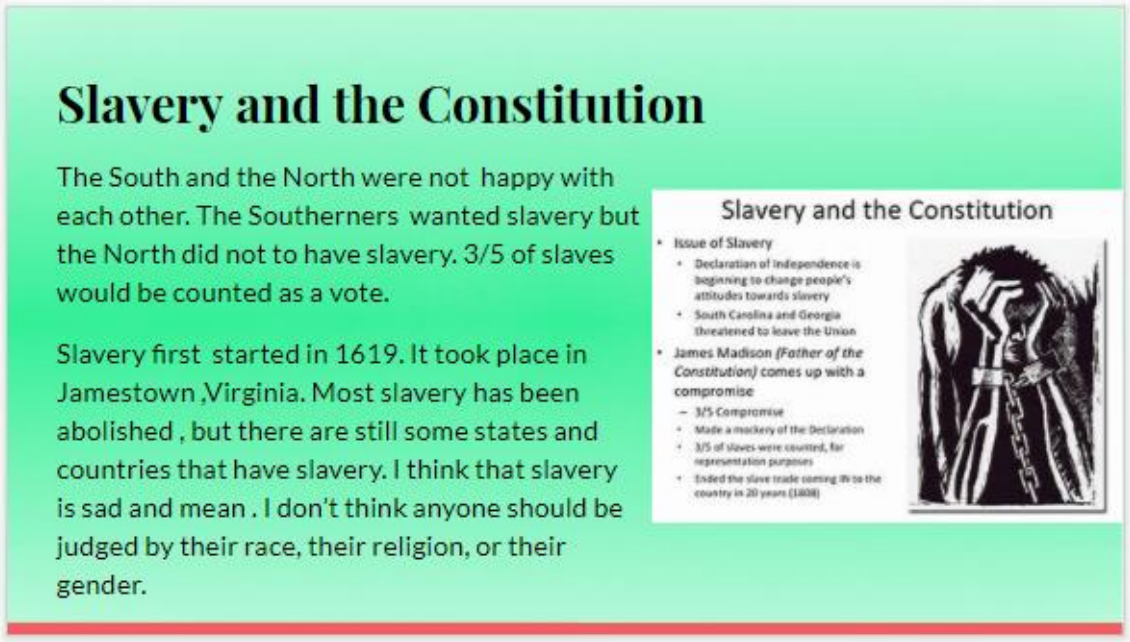

Figure 5.6. Page from Cindy's virtual interactive notebook.

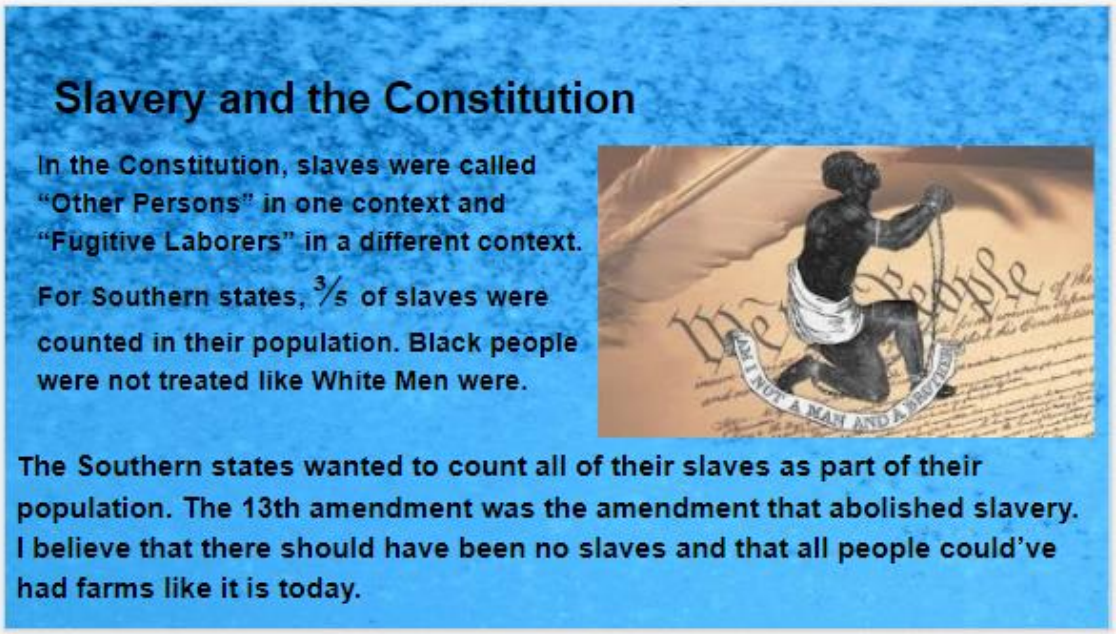

Figure 5.7. Page from Aaron's virtual interactive notebook.

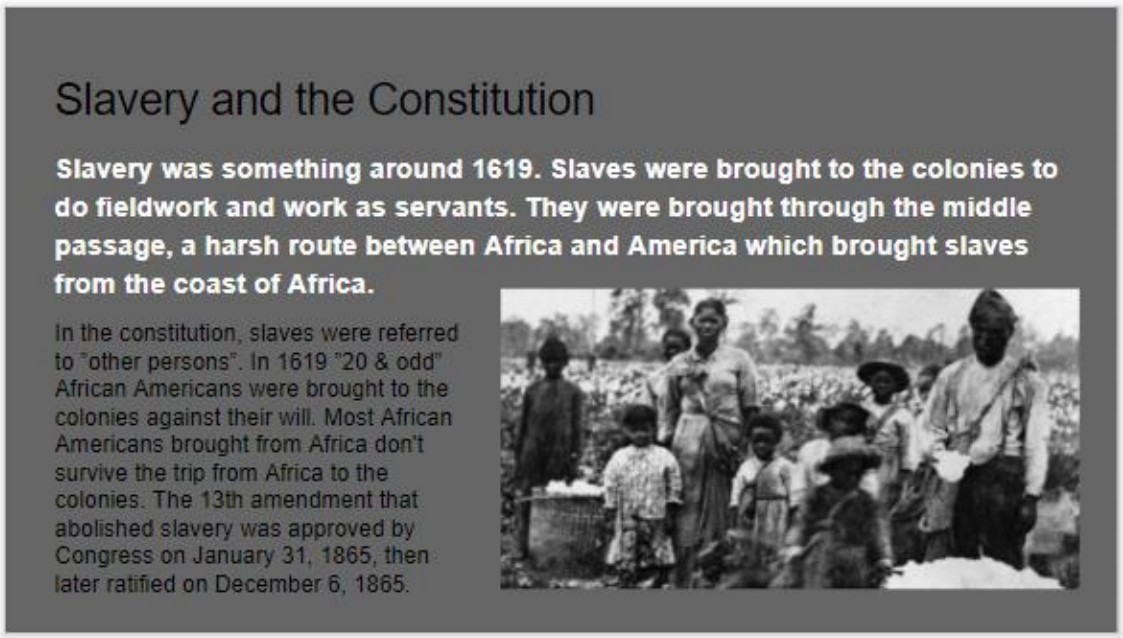

Figure 5.8. Page from Mel's virtual interactive notebook.

The students became aware of the difference in requirements of creating the notebooks and of themselves as learners when creating the virtual interactive notebook. Lily explained this difference during her postinterview: "The slides required me to be the one to type everything and I was the one to put information in. I was the one doing the work, so I had to think deeper. I had to do the research."

Learning events associated with creating the virtual interactive notebook. As the students in this study created their virtual interactive notebooks, they participated in various learning events that required higher DOK Levels than the learning events associated with creating the physical interactive notebook. Higher-order thinking is required when creating notebooks in an inquiry-based classroom as students are actively engaged in asking, investigating, creating, discussing, and reflecting throughout the notebooking process (Casey & Bruce, 2011; Campbell & Cox, 2018; Mills et al., 2014; Waldman & Crippen, 2009). The findings of this study correlate with the findings of

Laliberte et al. (2016), who found that when students have the opportunity to embark on student-led inquiries, they experience an increased level of Webb's DOK and are able to "extend their thinking beyond finite solutions to enter innovative mindsets" (p. 9). During the inquiry process, Webb's DOK Levels increase as students pose thoughtful questions, solve real-world issues, self-reflect, and utilize creativity routinely (Laliberte et al., 2016).

Students in this study cited the inquiry process as a learning event that changed their knowledge acquisition process. During the postinterview, John described what inquiry meant for him when he said, "The inquiry expands your knowledge by letting you research about little parts of it." John also said, "It requires advanced thinking and for the student to do research, a lot more research." Beth shared how inquiry impacted her understanding when she said, "I got to explore more about the topic so I feel like I know a lot about that topic. I didn't just look at a certain thing. I explored a lot of things and knew a lot about the topic." Aaron also shared how inquiry impacted his knowledge acquisition process, He said, "When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic." Being able to engage in a self-led inquiry changed the students' knowledge acquisition process as they were the ones conducting the research and forming an understanding of the topic independently.

In this study, the inquiry process assisted in the creation of the virtual interactive notebook, both of which required the use of higher-order thinking. Higher-order thinking in this study involved a variety of learning events including uncertainty, application, and self-regulation as the learners identified a useful source of information, analyzed its

credibility, reflected on the new information and aligned it with prior knowledge, and then formed new conclusions (Anderson & Mills, 2015; Miri et al., 2007). Students had to align new information with their background knowledge and to record their thoughts and reflections on their newly constructed knowledge (Doyle, 2017). Specifically, students in this study noted the use of higher-order thinking skills as they (a) questioned, (b) formulated, (c) modified, (d) examined, and (e) synthesized information.

Questioning. Questioning is a higher-order thinking skill that requires students to reflect on what they already know about a topic and then question in order to enrich and increase their understanding. On Webb's Web Alignment Tool (Appendix D), questioning is a DOK Level 3. Students in this study found questioning to be challenging. When asked to share a time she had pushed herself as a learner during the postinterview, Beth responded:

> The part where you came up with your own questions in the inquiry part. So when I had a question from writing the summary or learning about the topic in class, I could take that question and find an answer to it.

When asked what aspects of the virtual interactive notebook pushed him as a learner, John responded, "The inquiry questions… It goes beyond the basics and gets more complicated." As students researched, they found themselves consumed in the inquiry cycle, asking and researching more questions and gaining more knowledge than they did with the physical interactive notebook. Lily shared how she found herself being caught up in the inquiry, "The more I researched, the more interesting things that I found, it made me want to read more and find more facts." John shared how he questioning challenged him as a learner when he said, "I really pushed myself with the inquiry

questions and found more info than I should have." Lily and John found that the more they learned, the more questions they had. They allowed themselves as learners to wonder and then pushed themselves to find answers to their questions.

Formulating. Formulating is a higher-order thinking skill that requires students to merge their background knowledge with new information to form an understanding. It also includes the forming of their responses to share their understanding. Students in this study formulated answers to their personal inquiry question and their synthesis on each page of their virtual interactive notebook. On Webb's Web Alignment Tool (Appendix D), formulating is a DOK Level 4. To present their new understanding in a way that showed they comprehended the information, students formulated a response that merged their background knowledge and the new information they had discovered. Beth shared her process for formulating the synthesis section on each notebook page when she said, "It requires you to take what you know plus the information you found while you researched and then put it into your own words." Aaron described his process for formulating when he said, "I looked at more information and had to summarize a ton of stuff into just one little paragraph. That was challenging." The students in this study utilized higher-order thinking as they merged their background knowledge with the new information they encountered in their research and then formulated a response that represented their new understanding of the topic.

Modifying. Modifying is a higher-order thinking skill that requires students to reflect on their learning process and adjust their approach to or understanding of a topic. On Webb's Web Alignment Tool (Appendix D), modifying is a DOK Level 4. Students in this study utilized modification when creating their virtual interactive notebook as they

questioned, researched, and presented their information. Students modified their questions when they were unsuccessful in finding answers. They would reword their questions or ask them from a different angle and consider the possibilities of why they were having trouble finding answers. Students also modified their research. They reflected on the search terms they used and modified them to be more specific or more targeted towards the information they were seeking. They also modified their approach to research, sometimes finding it easier to go through school research resources and other times finding it easier to find information through a web search. Students also modified how they presented their information, such as when Aaron realized Alexander Hamilton did not fit his initial format. Students in this study modified their thinking and approach as they researched and pursued their personal inquiries.

Examining. Examining is a higher-order thinking skill that requires students to evaluate and make connections across various sources of information. Students in this study examined resources while researching to gain an understanding of a topic and write a synthesis. They also examined resources as they led a personal inquiry on each topic. Examining multiple sources encouraged students to think deeper. On Webb's Web Alignment Tool (Appendix D), examining (analyzing) is a DOK Level 4. Beth described examination as a part of her meaning making process: "It allows me to think deeper as a learner because I am not just reading off of one thing. I get to go to tons of websites and use the new info along with my background knowledge to put it together and to think deeper." Aaron explained his examining process after he felt he had enough information to start writing his synthesis: "I had to go through my research and pick and choose what

was the most important information to include on my slide." Students in this study examined and evaluated resources as they researched and pursued personal inquiries.

Synthesizing. Synthesizing is a higher-order thinking skill that requires students to merge their thinking across multiple texts with their background knowledge to form a new understanding and put it into words in the form of a summary. Students in this study examined multiple resources as they led a personal inquiry on each topic. Synthesizing multiple sources encouraged students to think deeper. According to Webb's Web Alignment Tool (Appendix D), synthesizing is a DOK Level 4. Lily cited the use of higher-order thinking skills as she examined details across multiple sources: "With the synthesizing, I had some trouble summarizing and explaining because it made me think deeper and consider details." Beth described the use of higher-order thinking while writing the synthesis when she said, "The summary section of each page requires you to take what you know plus the information you found while you researched and then put it into your own words." Aaron described his process for synthesizing when he shared, "The summary because I had to summarize everything I had learned into one section. I had to go through my research and pick and choose what was the most important information to include on my slide." These responses illustrate that synthesizing information from multiple sources required students to utilize higher-order thinking skills as they made connections and evaluated the information to create their virtual interactive notebook.

Students having choice and control over their learning. Students having choice and control in the creation of their virtual interactive notebook resulted in higher-order thinking in this study. Students in this study determined the topic, planned the research,

synthesized multiple texts and perspectives, wrote, and then created and shared the new understanding they had formed. Notebooking in an inquiry-based classroom is empowering to the learner and their learning process as students are given choice in the creating of their notebooks and students view their notebook as a record of their understanding (Walden & Crippen, 2009). As my students created their virtual interactive notebook, they viewed themselves as knowledge agents as they were given choice and control over their learning, which increased rigor (Longo, 2016; Pratt, 2019). Having choice and control over their thinking allowed students to (a) create a personalized product, (b) have personalized learning experience, and (c) personalize their use of technology.

Creating a personalized product. Students having choice and control over the creation of their virtual interactive notebooks resulted in their notebooks being personalized products. According to Webb's Web Alignment Tool (Appendix D), creating is a DOK Level 4. When asked about the creation of her virtual interactive notebook, Beth shared, "It was more personal. We all have the same topics, but no one's notebook will be the same because it is in our own words." Each page of the student's virtual interactive notebook provided ways for the students to have choice and control in their learning process. The inquiry provided students choice and control over the topic the student researched. They were the ones who came up with their inquiry question. They were the ones who put their learning from their inquiry into their own words. The image provided students choice in how they wanted to visually represent their understanding. The synthesis provided students choice and control over the research they conducted as they found multiple sources of information to use when formulating their understanding.

Each student's personalized virtual interactive notebook represents the higher-order thinking required of the student to create each page.

Personalized learning experience. Students having choice and control over their thinking allowed each student to have a personalized learning experience. Before students could create each notebook page, students had to conduct research and pursue personal inquiries. These activities allowed students to use DOK Level 3 to DOK Level 4 thinking, according to Webb's Web Alignment Tool (Appendix D). During the postinterview, students expressed how having choice and control contributed to the use of higher-order thinking as they conducted research and pursued personal inquiries. John said, "The inquiry questions gave me choice because the topics are broad, not specific. You can research and are able to write a summary, but the inquiry expands your knowledge by letting you research about little parts of it." Aaron shared how he utilized choice and control as he critiqued and analyzed images to include on each notebook page, which is DOK Level 4 thinking according to Webb's Web Alignment Tool (Appendix D). He said, "Finding a picture was fun, because there are so many good pictures on the topic and I got to decide which one I thought fit best." Aaron also shared how having choice and control was freeing to him as a learner when he said, "It helped me learn more because I have a little more freedom to learn. If there is a question I am wondering about the topic, I am allowed to look it up and put it on the slide for that topic." Aaron felt free to investigate, which is DOK Level 3 thinking according to Webb's Web Alignment Tool (Appendix D), because he was given choice and control over his thinking. Lily shared how having choice challenged her as a learner when she said, "It was easier to have

choice but also made it harder." These responses illustrate students' higher-order thinking when given choice and control over their learning process.

Personalized use of technology. Technology also promoted students' higher-order thinking as they had choice and control over their learning. Technology, the form of digital tools and online connectivity, allows students to employ various tools beyond the physical classroom as they make choices and decisions about their learning through the inquiry process (Thibaut et al., 2015). Specifically, students utilized technology in this study to: (a) conduct research and pursue personal inquiries and (b) create their virtual interactive notebooks.

Students conducted personal research on each topic to form a firm understanding of the content and then engaged in a personal inquiry to answer questions they had about the topic. Using technology to enable, sustain, and enrich the inquiry cycle results in students utilizing higher-order thinking (Casey & Bruce, 2011; Longo, 2016). Technology assists in student-driven inquiry where students determine the topic, plan the research, synthesize multiple texts, write, and then create and share new understanding (Buchanan 2018; Casey & Bruce, 2011). These activities correlate with DOK Level 3 and 4 thinking, according to Webb's Web Alignment Tool (Appendix D). Incorporating technology and inquiry as a part of this study resulted in student autonomy, deeper understanding, and individualization as students stretched themselves to discover new learning (Buchanan. 2018; Buchanan et al., 2016; McCormick, 2008).

Research Question 2: How does the implementation of virtual interactive notebooks in an inquiry-based, constructivist learning environment impact motivation of gifted learners in a fourth-grade social studies classroom?

When gifted learners are appropriately challenged, they show an increase in engagement and motivation for learning (Eysink et al., 2015; Phillips & Lindsay, 2006). Pintrich and Schunk (2002) define motivation as a process, not a product, that occurs when "goal-directed activity is instigated and sustained" and cannot be directly observed but is inferred from the student's actions and behaviors (p. 5). Self-regulated learning theory describes motivation and student learning as interdependent processes (Zimmerman, 1989). In this study, students in an inquiry-based gifted classroom created virtual interactive notebooks, which provided the opportunity to be self-regulated learners. I gave students time and space to instigate and sustain their own efforts in knowledge acquisition while creating their own personalized notebook pages. According to Zimmerman and Kitsantas (2005), self-regulated learners in an inquiry-based classroom are motivated to learn as they are able to set and reflect on learning goals, plan and carry out a course of action, select and utilize appropriate skills and strategies, self-monitor and self-evaluate throughout their learning process, are intrinsically motivated to learn, and report high self-efficacy for learning and performance. In this study, the motivation average for each subscale on the postsurvey (virtual interactive notebook) of the Motivated Strategies for Learning Questionnaire (MSLQ) increased based on the average for each subscale on the presurvey (physical interactive notebook) of the MSLQ. The implementation of virtual interactive notebooks in this study improved student motivation due to students (a) being provided choice and control over their learning, (b)

becoming independent learners, (c) finding learning to be interesting and enjoyable, (d) being challenged, and (e) experiencing a sense of accomplishment and understanding.

Students being provided choice and control over their learning. Students in this study experienced an increase in motivation due to being provided choice and control over their learning process. A key component of IBL is student choice and control (Buchanan, 2018; Campbell & Cox, 2018; Casey & Bruce, 2011). Gifted students find it motivating to learn through inquiry and choice about complex topics in authentic ways and appreciate being able to personally find connections among ideas and topics (Kanevsky, 2011). Students in this study utilized the inquiry process as they created their virtual interactive notebooks. Notebooking allows learners to experience freedom as they are provided choice. Students in this study found notebooking to be motivating to them as learners.

Student motivation in this study was measured through the MSLQ as a pre- and postsurvey. Students responded to statements using a Likert scale with a seven meaning that the statement is very true of the learner and a one meaning the statement is not at all true of the learner. Control of learning events is a subscale of the MSLQ. These questions addressed student choice, ownership, endeavor, and control. Students in this study reported a mean of 5.87 (0.94 *SD*, 0.20 *SE*) on the presurvey and a mean of 6.55 (0.56 *SD*, 0.15 *SE*) on the postsurvey (see Table 4.1). According to the student reported data from the pre-and postsurvey of the MSLQ (Appendix L), 82.6% of students reported an increase in intrinsic motivation during this study. Of the four students who did not experience an increase in intrinsic motivation, none of the students reported a decrease in intrinsic motivation. It is also important to note that one of the four students who did not

report an increase in intrinsic motivation reported a seven on both the pre- and the postsurvey, the highest number on the Likert scale for the MSLQ.

Being able to participate in activities that provided choice and control was not something students experienced during social studies prior to this study but it was something they desired. During the preinterview, students expressed their desire to have choice and control in their learning process. John said, “I would be more interested if I had some choice.” Lily shared, “When the teacher gives me choice, it makes learning more fun.” Using words like *more interested* and *more fun* demonstrates how the students would be more motivated as learners if they were given choice and control in their learning process. Students in this study found having choice and control over their learning while creating their virtual interactive notebook to be motivating to them as learners as they determined the topic, planned the research, synthesized multiple texts and perspectives, and then created and shared their new understanding they constructed (Buchanan, 2018; Casey & Bruce, 2011; Land et al., 2012). Students in this study were aware of: the impact choice and control had in their learning process, the impact choice and control had on their motivation to learn, and the role technology played in assisting them to have choice and control over their learning.

Student awareness of impact choice and control had on their learning process. During the postinterview, students expressed their awareness of being provided choice and control. Beth shared how she had choice and control over her learning as she generated her own questions and conducted research to find answers. She said, “So when I had a question from writing the summary or learning about the topic in class, I could take that question and find an answer to it.” Similarly, Lily shared, “I had choice in the

questions I had and the research I did. It was a big open world that I could do stuff in." She found that having choice and control was freeing to her as a learner. Aaron also described having choice and control as being freeing: "It helped me learn more because I have a little bit more freedom to learn. If there is a question I am wondering about the topic, I can look it up and put it on the slide for that topic." Aaron also said, "Now I have more freedom and can expand my knowledge and stuff of that nature." Beth also described a sense of freedom when she said, "I liked having my own questions and doing my own research because usually we would have just learned what you told us we had to learn." Students were aware of the impact choice and control had on their learning process and felt free to question and discover on their own.

Student awareness of impact choice and control had on their motivation to learn. Participants noted during the postinterview that having choice and control motivated them as learners, uisng words such as *exciting, cool, personal, fun, freedom,* and *interesting*. Beth said, "I've always been interested in social studies, but it made me a little more interested because instead of being told what to learn, I was able to explore what I was interested in." Lily used the words *interesting* and *more* to describe how having choice and control motivated her as a learner when she said, "The more I researched, the more interesting things that I found, it made me want to read more and find more facts." John and Aaron used the words *motivates* and *motivated.* John said:

> It made me feel good. It motivates me to do more. I get my choice to learn and I don't usually get that so it motivated me to do it harder and to push myself to the limit, unlike the normal notebook where I am just reading. I like having choice.

Aaron shared, “It motivates me to learn by giving some kind of guideline to go off of but I am allowed to learn about what I am interested in, too.” Aaron also said, “It motivated me to want to learn more, especially the summary and inquiry.” Students in this study were motivated in their learning process as they were able to have choice and control over their learning process.

Student awareness of impact technology had in providing choice and control.

Utilizing technology in their learning process motivated students as they had choice and control while creating their virtual interactive notebooks. Technology allowed students to employ various tools beyond the physical classroom as they made choices and decisions about their learning through the inquiry process (Thibaut et al., 2015). Students in this study cited how using technology as a tool in their inquiry process and in the creation of their virtual interactive notebooks increased their motivation to learn. Technology also promoted student motivation by getting students involved in their own learning process (Arguello, 2018). During the postinterview, Lily described how utilizing technology while being given choice and control over her learning impacted her motivation to learn. Lily said, “I had choice in the questions I had and the research I did. It was a big open world that I could do stuff in.” Lily also shared, “The more I researched, the more interesting things that I found, it made me want to read more and find more facts.” Technology made learning a freeing process for Lily as she used it to research answers to her questions. She found herself being so motivated to learn that she got caught up in conducting research and gaining more knowledge. John used the word *fun* to describe how he experienced motivation through utilizing technology to conduct research in his learning process. He said, “The inquiry section piques my interest and is fun because I

can find facts that I didn't know and that is fun." Technology provided students a way to conduct research and pursue personal inquiries. Technology also provided students a place to display their own personal understanding in the form of a virtual interactive notebook. Utilizing technology in these ways, accompanied with choice and control in their learning process, impacted student motivation in this study.

Students becoming confident independent learners. Students in this study experienced an increase in motivation due to becoming confident independent learners. Students were motivated to learn as they were given opportunities to focus on themselves as learners, to be different, and to work independently as they utilized the inquiry process to research topics they were passionate about at their own pace (Rogers, 2007). They became confident in their ability and had pride in their work and depth of understanding, which was motivating to them as learners.

Student motivation in this study was measured through the MSLQ using a Likert scale with a seven meaning that the statement is very true of the learner and a one meaning the statement is not at all true of the learner. Extrinsic motivation is a subscale of the MSLQ. These questions addressed student grades, belief in ability, pride, and fulfillment. Students in this study reported a mean of 6.01 (1.00 *SD*, 0.21 *SE*) on the presurvey and a mean of 6.59 (0.56 *SD*, 0.12 *SE*) on the postsurvey (see Table 4.1). According to the student reported data from the pre-and postsurvey of the MSLQ (Appendix M), 69.6% of students reported an increase in extrinsic motivation during this study. Of the seven students who did not experience an increase in extrinsic motivation, one of the students reported a decrease in intrinsic motivation. It is also important to note that four of the seven students who did not report experiencing an increase in extrinsic

motivation reported a seven on both the pre- and the postsurvey, the highest number on the Likert scale for the MSLQ.

Students in this study gained confidence and independence as they participated in personal inquiries and created their virtual interactive notebooks in a constructivist classroom setting. A constructivist learning environment requires students to utilize higher-order thinking and results in deeper understanding as teachers facilitate students' self-directed learning (Baer, 2016; Bolick et al., 2007; Land et al., 2012). Students in this study experienced an increase in motivation as they became confident independent learners through the implementation of the virtual interactive notebook, self-regulation, recording their understanding, and utilizing technology.

Implementation of the virtual interactive notebook. Students in this study experienced an increase in motivation during social studies through the implementation of the virtual interactive notebook. When students were first introduced to virtual interactive notebooking, they were unsure of themselves and needed a considerable amount of guidance on utilizing the inquiry process to create a virtual notebook. As our unit progressed, students began to go to each other for assistance instead of coming to me (the teacher) for help. I was no longer the holder of information. Students saw each other as historians and independent sharers of information. By the end of the unit, students became confident independent historians who had a variety of inquiry tools to help them learn and discover new information. Lily shared her awareness of her independence as a learner during the postinterview by using words like *I* and *the one*. When discussing how she became an independent learner through the creation of her virtual interactive notebook Lily said, "It helps me because I can go back and look at each slide. And I don't

have to go to you." Lily added, "The slides required me to be the one to type everything and I was the one to put information in. I was the one doing the work, so I had to think deeper. I had to do the research." Lily also said, "I was the one who wrote it. I was the one who put it in my own words." Lily experienced a belief in her own abilities and became independent in her process.

Student use of self-regulation. In this study, self-regulation had a positive impact on student motivation. Self-regulation was an aspect of metacognitive knowledge students utilized in the creation of their virtual interactive notebook. Students who are participating in self-regulated learning are able to originate, guide, and sustain their own efforts in knowledge acquisition instead of relying on teachers and other adults to guide instruction (Zimmerman, 1989). Zimmerman (1990) describes self-regulated learning strategies as "actions and processes directed at acquisition of information or skills that involve agency, purpose, and instrumentality perceptions by learners" (p. 5). Self-regulation was evident in this study as students independently made decisions throughout their learning process, planned a course of action, selected and utilized strategies, monitored their use of strategies and implementation of the plan, and abandoned or revised the use of strategies and the plan (Garafalo & Lester, 1985). Students shared their awareness of becoming independent learners and not needing to rely on the teacher for knowledge acquisition during the postinterview. Lily and Aaron used the word *I* to describe who was doing the work. Lily said, "I was the one doing the work, so I had to think deeper. I had to do research. It pushed me." Aaron said, "I had to summarize everything I had learned into one section. I had to go through my research and pick and choose what was the most important information to include on my slide."

Notebooks became a record of student understanding. Students creating their own record of their understanding was a motivating factor in this study. As independent learners, each created a notebook that became a "personal, organized, and documented record of their understanding" (Waldman & Crippen, 2009, p. 53). Students shared their confidence in their understanding during the postinterview. Students used words such as *more*, *impacted*, and *know* to describe how much knowledge they had gained. John and Aaron acknowledged the difference in their depth of understanding between the physical and virtual interactive notebooks. John said, "It impacted me more than the normal notebook. Even though it was more work, what I learned was way more than I would have with the normal notebook." Aaron said, "When I made my own notebook, it helped me learn it more than the regular notebook because I could research more and find more out about the topic." John and Aaron's responses demonstrate their awareness that the virtual interactive notebook required a deeper understanding of the content because they were the ones composing each page. The notebook was a record of their understanding and creating the notebook on their own allowed them to understand on a deeper level. Beth described the impact that creating her own record of her understanding had on her as a learner. She said, "And it really had a big impact on me and I know a lot more about the government now." When talking about recording her understanding in her virtual notebook, Beth said, "It was more personal. We all have the same topics, but no one's notebook will be the same because it is in our own words." This documented record of student understanding was personal and truly represented what they knew individually as learners.

Students utilizing technology. Student use of technology was a motivating factor in this study as it assisted in students becoming confident independent learners. This can be partially attributed to the fact that the students were the ones doing the work and using the technology, not the teacher (Zimlich, 2015). During the postinterview, students discussed how technology assisted them in their inquiry and knowledge acquisition process. Aaron shared how technology assisted in his learning process and impacted his understanding of a topic when he said, "It helped me learn more because I have a little bit more freedom to learn. If there is a question I am wondering about the topic, I can look it up and put it on the slide for that topic." If students found one topic to be more interesting and personal, they were able to take time to dig deeper into that topic. Technology also allowed students in this study to work at their own pace. Beth shared, "It makes it better because we get to explore more stuff and we get to learn on our own pace." Students enjoyed utilizing technology in their self-paced learning and found that it resulted in a deeper understanding and more meaningful personal inquiries.

Students found learning to be interesting and enjoyable. Students in this study experienced an increase in motivation because learning was interesting and enjoyable. The gifted students in this study enjoyed the level of challenge that the more advanced opportunities of the virtual interactive notebook presented and experienced motivation when they were allowed to participate in this type of learning (Foust et al., 2009). The students had positive attitudes about learning through self-directed inquires and enjoyed using critical thinking, problem solving skills, and having choice and control over their learning (Van Deur, 2011).

Student motivation in this study was measured through the MSLQ using a Likert scale with a seven meaning that the statement is very true of the learner and a one meaning the statement is not at all true of the learner. Task value is a subscale of the MSLQ. These questions addressed learning as transferable, important/useful, interesting, and enjoyable. Students in this study reported a mean motivation of 5.84 (0.98 *SD*, 0.20 *SE*) on the presurvey and a mean of 6.67 (0.37 *SD*, 0.08 *SE*) on the postsurvey (see Table 4.1). According to the student reported data from the pre-and postsurvey of the MSLQ (Appendix N), 82.6% of students reported an increase in task value motivation during this study. Of the four students who did not experience an increase in task value motivation, one of the students reported a decrease in task value motivation. It is also important to note that three of the four students who did not report experiencing an increase in task value motivation reported a seven on both the pre- and the postsurvey, the highest number on the Likert scale for the MSLQ.

The use of technology contributed to student enjoyment in their learning process. Students in this study used technology as a part of the inquiry cycle. They also used technology to create their virtual interactive notebooks. In a study by Heafner (2004), students reported a sense of motivation and enjoyment when they are able to use technology as a learning tool. Students in this study also correlated technology and learning as a motivating and enjoyable as they conducted their own research and pursued their own inquiries, created their own virtual interactive notebooks, were given choice, and experienced personalized learning.

Conducted their own research and pursued their own inquiries. Students in this study were motivated as learners as they utilized technology to conduct their own

research and pursued personal inquiries. Students used the words *interesting*, *more*, and *freedom* to describe how they found learning to be an interesting and enjoyable process as they utilized technology to conduct research and as a tool in their inquiry process. Lily shared her enthusiasm for researching when she said, "The more I researched, the more interesting things that I found, it made me want to read more and find more facts." Aaron shared how being able to conduct his own inquiry made learning interesting. He shared how he was felt free to learn and explore and that his interest in learning grew as a result of his new-found freedom. These gifted learners found knowledge acquisition to be an interesting and enjoyable process as they utilized technology as a learning tool.

Students created their own virtual interactive notebooks. Students in this study were motivated as learners as they utilized technology to create their virtual interactive notebooks. Students used the words *fun*, *cool*, and *motivated* to describe how they found learning to be an interesting and enjoyable process as they utilized technology to create their virtual interactive notebooks. During the postinterview, Lily shared how creating her notebook was motivating to her as a learner. She said, "These are the most fun slides I have done. I learned a lot of cool stuff that I did not know existed. These slides really motivated me to learn more." Aaron shared that the summary and inquiry section of each page motivated him to learn more. He knew he needed to be knowledgeable on each topic in order to create each page and he was motivated to meet that challenge. Both Lily and Aaron used the word *fun* to describe how they experienced motivation while creating their virtual interactive notebook. Technology truly was a motivating factor in their learning process.

Students were given choice in their learning process. Students in this study were motivated as learners as they were given choice in their learning process. Students used the words *fun*, *motivated,* and *peaks my interest* to describe how they found learning to be an interesting and enjoyable process as they were given choice in their learning process. During the postinterview, Lily shared how being able to have choice made learning a more enjoyable process. She said, "When the teacher gives me choice, it makes learning more fun. I don't like being told I have to do an exact topic or an exact question. When I have choice, it is more fun." John shared how practicing choice as a part of his inquiries made learning an interesting and enjoyable process. John said, "The inquiry section peaks my interest and is fun because I can find facts that I didn't know and that is fun." John also shared how having choice was motivating to him as a learner when he said, "I get my choice to learn and I don't usually get that so it motivated me to do it harder and to push myself to the limit, unlike the normal notebook where I am just reading." Students in this study found choice to be a motivating factor in their learning process.

Learning became personalized. Students in this study were motivated as learners as their learning became more personalized. Students used the words *exciting*, *personal*, and *own* to describe how they found learning to be an interesting and enjoyable process as learning became more personalized. Beth shared how she felt motivated when learning was more personalized when she said, "It was more exciting. It was more personal." Beth also said, "I liked having my own questions and doing my own research because usually we would have just learned what you told us to learn. Students in this study were aware they were able to personalize their learning experience and this motivated them as learners.

Students being challenged. Students in this study experienced an increase in motivation due to being challenged. When gifted learners are appropriately challenged, they show an increase in engagement and motivation for learning (Eysink et al., 2015; Phillips & Lindsay, 2006). The gifted students in this study had positive attitudes about being challenged in their learning through self-directed inquires and enjoyed using critical thinking, problem solving skills, and having choice and control over their learning as they created their virtual interactive notebooks (Van Deur, 2011).

Student motivation in this study was measured through the MSLQ using a Likert scale with a seven meaning that the statement is very true of the learner and a one meaning the statement is not at all true of the learner. Intrinsic motivation is a subscale of the MSLQ. These questions addressed learning being challenging, arousing curiosity, impacting student understanding, and impacting the student's desire to learn. Students in this study reported a mean intrinsic motivation of 5.71 (0.74 *SD*, 0.15 *SE*) on the presurvey and a mean of 6.50 (0.42 *SD*, 0.09 *SE*) on the postsurvey (see Table 4.1). According to the student reported data from the pre-and postsurvey of the MSLQ (Appendix O), 69.6% of students reported an increase in control during this study. Of the seven students who did not experience an increase in control, one of the students reported a decrease in control. It is also important to note that four of the seven students who did not report experiencing an increase in control reported a seven on both the pre- and the postsurvey, the highest number on the Likert scale for the MSLQ.

The physical interactive notebook did not meet the needs of the students in this study as it did not challenge them in their learning process. During the preinterview, participants cited a lack of feeling challenged as they created their physical interactive

notebooks. When explicitly asked how their physical interactive notebook challenged them as a learner, John said, “It doesn’t really challenge me.” Lily answered, “The passages just tell me the information and that doesn’t push.” The students were aware that they were not being challenged as learners. Gifted learners need and want to be challenged (Rogers, 2007). Creating their own virtual interactive notebooks challenged the gifted students in this study. Students felt challenged in their learning process as they were provided choice, completed tasks at a higher DOK Level, and put their new understanding into their own words.

Choice. Students in this study were motivated as learners as they were challenged through being provided choice. Students felt that choice allowed them to feel challenged as they conducted their own research, as they were pushed in their thinking process, and as they put their new understanding into their own words

During the postinterview, participants expressed a feeling of being challenged in their learning process when allowed to have choice while creating their virtual notebook. As students created their virtual interactive notebooks, I noticed a substantial increase in motivation to learn when given choice, even though it was more challenging. Students noted several ways that they felt challenged as they created their virtual interactive notebooks. Students felt that choice allowed them to feel challenged as they conducted their own research, as they were pushed in their thinking process, and as they put their new understanding into their own words.

Students in this study felt challenged as they were given choice in the research they conducted as they created their virtual interactive notebooks. John shared that he felt challenged as he conducted research. He said, “The inquiry questions gave me choice

because the topics are broad, not specific. You can research and are able to write a summary, but the inquiry expands your knowledge by letting you research about little parts of it." He had choice in the topics he researched and felt challenged as he expanded his knowledge and understanding on his own.

Completing tasks that required higher DOK Levels. Students in this study were motivated as learners as they were challenged by completing tasks that required higher DOK Levels. Buchanan (2018) found that students in an IBL environment experienced motivation and higher DOK Levels as they stretched themselves to discover and construct new knowledge through autonomy, curiosity, and individualization. In this study, students utilized an inquiry approach to learning along with technology integration to complete higher-order thinking tasks that challenged them as gifted learners (Eysink et al., 2015). Students in this study were motivated in their learning as they were pushed in their thinking process. John shared how he felt challenged in his thinking while creating his virtual interactive notebook. He said, "It pushed me to think outside of the box. It helped me to research harder and learn more about it, which made me feel good about it." Questioning was a higher-order thinking skill that students found challenging in this study. Having time and space to question and then find answers to their questions was challenging for students and met the needs of the gifted learners in this study. Conducting their own research and perusing their own inquiries required students to utilize higher DOK Levels. Beth described how being an independent learner was challenging to her as learner. She said, "But when we learned it on our own, it became more challenging." John shared how he learned more because he was challenged as a learner to work at a higher DOK Level. John described the higher DOK Level as *more work*. He said, "Even

though it was more work, what I learned was way more than I would have with the normal notebook." The students in this study found learning at a higher DOK Level to be motivating to them as learners as they were challenged in their learning process and gained more knowledge in the process.

Put their new understanding into their own words. Students in this study were motivated as learners as they were challenged to put their new understanding into their own words. Students were challenged as they took information from various sources and put it into their own words is order to demonstrate an understanding of the content. They had choice in the words that they used and how they portrayed their understanding of the content. Lily explained the process of creating a notebook page and the feeling of being challenged. She said, "Some slides were very challenging, except for the picture. Writing my own definition and putting the research in my own words was a challenge." Aaron shared how he felt challenged as he created each notebook page. He said, "I looked at more information and had to summarize a ton of stuff into just one little paragraph. That was challenging." Virtual interactive notebooks allowed students to be challenged as they had choice in the words they used and how they portrayed their understanding of the content.

Students experienced a sense of accomplishment and understanding. Students in this study experienced an increase in motivation due to feeling a sense of accomplishment and understanding. In this study, each student created their own virtual interactive notebook. Each student's notebook was an expression of their new-found knowledge, which was evident through the "personal, organized, and documented record of their understanding" (Waldman & Crippen, 2009, p. 53). The virtual interactive

notebook required the student to be the one finding the information, asking questions, and writing the information. Every notebook page looked different because it was created by the student. The students treasured their notebooks because they were individualized, contained their own thinking and reflection, and represented a personal accomplishment (Waldman &Crippen, 2009).

Student motivation in this study was measured through the MSLQ using a Likert scale with a seven meaning that the statement is very true of the learner and a one meaning the statement is not at all true of the learner. Self-efficacy is a subscale of the MSLQ. These questions addressed learning being complex and students experiencing a feeling of excellence, mastery, and confidence. Students in this study reported a mean motivation of 6.03 (0.86 *SD*, 0.18 *SE*) on the presurvey and a mean of 6.61 (0.32 *SD*, 0.07 *SE*) on the postsurvey (see Table 4.1). According to the student reported data from the pre-and postsurvey of the MSLQ (Appendix P), 78.3% of students reported an increase in self-efficacy during this study. Of the five students who did not experience an increase in self-efficacy, none of the students reported a decrease in this subscale. It is also important to note that one of the five students who did not report experiencing an increase in extrinsic motivation reported a seven on both the pre- and the postsurvey, the highest number on the Likert scale for the MSLQ.

Students in this study were engaged in inquiry to form an understanding of the topics presented in the unit. Students in an IBL environment experience motivation as they stretch themselves to discover and construct new knowledge through autonomy, curiosity, and individualization (Buchanan, 2018). As the students in this study originated, guided, and sustained their own efforts in knowledge acquisition, they

experienced motivation (Bandura, 1989). Student motivation was evident as they experienced a sense of accomplishment when creating their virtual interactive notebooks and as they gained a deeper understanding of the content.

Students experienced a sense of accomplishment. Students in this study were motivated as learners as they experienced a sense of accomplishment throughout their learning process. This sense of accomplishment was associated with all of the events and actions required to complete each notebook page such as: conducting research, synthesizing information from different resources, asking questions about the topic, finding answers to those questions, modifying their thinking and questions, and finding an image that represented their thinking and new understanding. Students were proud of themselves for the work and effort they put into creating each notebook page. They often came up to me to show me a virtual interactive notebook page they had created or to share an image they found that truly represented their thinking. They were excited to share their accomplishment with me and were proud of themselves for how they had pushed themselves as learners. The more they became comfortable with the inquiry process, the more they pushed themselves to learn and discover new information. They became aware of what they were capable of achieving as learners. Lily used the words *proud*, *hard*, and *pushed* to describe how she experienced feeling accomplished as she created her virtual interactive notebook. Lily said, "I was proud of myself for how much work I did and how hard I worked. The more I researched, the more interesting things that I found, it made me want to read more and find more facts." Lily found herself pushing herself as a learner in her inquiry process and felt a sense of accomplishment for how hard she worked on her inquiry. Lily also shared how she experienced a feeling of

accomplishment when she said, “But I was so proud when I finished the slides because I had pushed myself on all of them.” She had pushed herself as a learner and was proud of herself for her accomplishment of completing the notebook.

Students gained a deeper understanding of the content. Students in this study were motivated as learners as they gained a deeper understanding of the content. Students would often come to me during recess or other times not dedicated to social studies and share their learning. They would think about the content outside of our allotted social studies instruction time, allowing themselves to process and make connections. They were motivated to truly understand the content and found joy in mastering the content. During the postinterview, students cited experiencing a deeper understanding of the content as they created their virtual interactive notebook. Students used the words *more, gained, good,* and *a lot* to describe their sense of accomplishment and understanding of the content. Aaron shared how he had a deeper understanding of the content than he had previously when he said, “With the inquiry section, I looked up more and knew more. I definitely gained more knowledge than I would have using a regular notebook.” John shared how gaining a deeper understanding made him feel good about himself as a learner when he said, “It helped me to research harder and learn more about it, which made me feel good about it.” Beth also shared how she had a firm understanding of the content due to the amount of research she conducted when she said, “I didn’t just look at a certain thing. I explored a lot of things and knew a lot about the topic.” Students in this study were motivated as learners as they learned more and new information, resulting in a deeper understanding of the content.

Emergent Findings

One belief I gained during this study was that students can experience an increase in motivation while utilizing higher-order thinking skills. In this study, I utilized self-regulated learning as a theoretical lens to analyze motivation (Pintrich, 1999). There are three components of self-regulated learning: cognition, metacognition, and motivation. In order to quantitatively measure student motivation, I utilized the MSLQ as a pre- and postsurvey. Although I was able to quantitatively measure student motivation in isolation, I was not able to isolate student motivation qualitatively. Cognitive and metacognitive processes and skills cannot stand alone in self-regulated learning as motivation is infused throughout the process.

I previously believed learning that required higher-order thinking skills could make students uncomfortable or that the challenge could seem daunting and they would lose interest in the task. However, gifted students need to have learning experiences daily that challenge them as learners (Rogers, 2007). As students in this study had time and space to be historians, they experienced an increase in motivation as they utilized higher-order thinking skills (Paige et al., 2013). As the gifted students in this study were challenged to use higher DOK Levels of thinking through the inquiry progress, they showed an increase in motivation (Eysink et al., 2015; Phillips & Lindsay, 2006). Students in this study experienced an increase in student motivation and utilized higher DOK Levels as they stretched themselves to discover and construct new knowledge through autonomy, curiosity, and individualization in the inquiry process (Buchanan, 2018).

Implications

This research has implications for me, gifted classroom practitioners, and scholarly practioners and researchers. Three types of implications are considered: (a) personal implications, (b) implications for integrating virtual interactive notebooks in the gifted social studies content area, and (c) becoming a scholarly practitioner.

Personal Implications

As a result of this study, I have new beliefs about what matters in my classroom. These beliefs will help me as I plan instruction in my classroom and assist others in the future. These beliefs include: (a) students need time and space to be true historians, (b) students are able to independently construct meaning of the content, and (c) I must practice and share what I know is best for learners.

Students need time and space to be true historians. Constructivism refers to the construction of knowledge based on making meaning of new experiences through the use of prior knowledge (Baer, 2016; Isik, 2018; Miri et al., 2007; Porath, 2016). In constructivism, learning is often student-directed and authentic (Baer, 2016; Isik, 2018). Furthermore, the teacher has the role of a facilitator who scaffolds students as they make meaning (Baer, 2016; Isik, 2018). Therefore, learning that takes place in a constructivist environment is student-centered (Baer, 2016; Isik, 2018). However, teachers may struggle to find ways to make social studies student-centered in a fourth-grade classroom.

Before conducting this research, I was unsure of how to allow my students to be independent historians. I felt obligated to present the content to my students and to tell them everything they needed to know according to our state standards. I believed that if my students had the information recorded in their notebooks, then they would understand

and master it. Conducting this research changed my view of what it truly means to be a historian in a fourth-grade classroom. During this research, students had time and space to be historians. Coupling a constructivist approach to learning with technology integration benefited students in their meaning making process in my social studies classroom (Baser & Mutlu, 2011; Ertmer, 2005). Providing students an environment in which they were able to be historians allowed: (a) students to have meaningful experiences by approaching learning through an inquiry stance, (b) me to embody the role of a facilitator while the students were historians, and (c) students to utilize higher-order thinking skills and experience an increase in motivation at the same time.

Meaningful experiences by approaching learning through an inquiry stance. Before conducting this study, I was unsure of how to integrate IBL in the social studies content area. I often let students read primary source documents and analyze pictures, but I was the one choosing the primary sources and the pictures. The students had no say in what artifacts we would use each day to learn about the content. We would then record the same findings in our physical interactive notebooks. When the students would come to me with questions about the content, if I did not know the answer I would tell them to look it up at home. I began to realize I was squashing their creativity and excitement about social studies and our physical interactive notebooks were limiting student thinking. This study illuminated how traditional physical notebooks do not promote higher-order thinking skills and do not allow students to be true historians because they are limiting in nature. However, IBL allowed for meaningful learning experiences that were individualized and personal to each student. Inquiry promoted student learning through asking, creating, discussing, and reflecting throughout the learning process in

authentic, intentional, and systematic ways that began with the learner and were based on what the student already knew and what they want to know (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014**).** Providing students time and space to learn through an inquiry approach allowed my students to take on the identity of a historian. After we had a joint experience around the topic for that day, students engaged in the inquiry process. They were able to conduct research on their own to form an understanding of the topic while also finding answers to the personal questions they had throughout their process. Incorporating inquiry into the social studies content area made learning a more meaningful experience for students. From this experience my beliefs about what matters for social studies instruction were forever changed.

Teacher as facilitator. Giving the students power over their learning in this study allowed me to take on the role of facilitator in the social studies content area. Even though I had a constructivist approach to teaching in my classroom, I struggled with how to incorporate student-led inquiry when teaching social studies. My understanding before this study was that I had to be the deliverer of information when teaching social studies. Even though I was able to take on the role of a facilitator in other content areas, I was unsure of what this would look like in the social studies content area. I was aware that I was lacking in this area. I was also aware that IBL impacts knowledge acquisition of gifted learners, who benefit academically from being allowed to conduct an inquiry on their own with their teacher acting as a facilitator (Eysink et al., 2015).

Students participating in student-led inquires in the social studies content area allowed them to be the deliverers (McCormick, 2008). During this study, my role became that of a facilitator who modeled how historians perform inquiries in the real world. I also

aided them in finding information and questioning their thinking, assisted them in clarifying their understanding, and facilitated whole-group conversations where students shared their new understanding (Walden & Crippen, 2009). I also became a learner alongside my students and joined them in the inquiry process. Students recorded their new understanding in their own words, not my words, in their virtual interactive notebook. Allowing students time and space to be active learners and historians was liberating and enjoyable to me as an educator because I was able to witness the excitement my students experienced throughout their meaning making process.

Students are able to independently construct meaning of the content. During this research, students were able to construct meaning on their own as they created their virtual interactive notebooks. An inquiry approach to learning in a constructivist environment enabled students to be able to construct meaning on their own. In a constructivist environment, learners construct knowledge as they make meaning of new experiences through the use of prior knowledge (Baer, 2016; Isik, 2018; Miri et al., 2007; Porath, 2016). IBL promotes asking, creating, discussing, and reflecting throughout the learning process in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and what they want to know (Campbell & Cox, 2018; Casey & Bruce, 2011; Mills et al., 2014**).** Students in my classroom had previous experience with IBL in other content areas, but I personally had struggled as an educator to find ways to bring an inquiry-based approach into the social studies content area. At the outset of this experience, students needed guidance in how to push themselves as learners as they created each notebook page. By the end of the study, students became independent learners who were able to construct meaning on their own.

Three facets of IBL in this study that assisted students in constructing meaning independently include: (a) student choice, (b) utilizing technology, and (c) creating a personalized artifact.

Student choice. A key component of IBL is student choice (Buchanan, 2018; Campbell & Cox, 2018; Casey & Bruce, 2011). I have always valued student choice, but finding ways for students to have choice daily in social studies was a struggle. During this study, students led their own learning as they determined the inquiry topics, planned the research, and synthesized multiple texts and perspectives (Buchanan, 2018; Casey & Bruce, 2011; Land et al., 2012). The students also had choice as they created their virtual interactive notebooks and made a record of their new understanding. When choice became a key component in social studies, students were able to independently construct meaning. Their identity as learners changed as they posed personal questions, utilized critical thinking skills, and became problem solvers (Longo, 2016; Pratt, 2019). They became the holders of information. Allowing time for students to have choice and providing them with an inquiry-based, self-directed learning opportunity assisted the students in constructing knowledge independently and is something I will continue to implement during social studies instruction.

Technology. Utilizing technology through the constructivist approach promotes critical thinking skills (Baer, 2016; Miri et al., 2007). In this study, technology integration as a part of IBL assisted in meeting the needs of my gifted learners as it provided a way to challenge my students throughout the learning process. Technology integration allowed my students to focus on the challenging task of creating their virtual interactive notebook while also having autonomy over their learning (Eysink et al., 2015). Students used a

variety of skills while utilizing technology in their inquiry process, such as identifying reliable sources of information, reflecting on new information and aligning it with previous understanding, making multiple connectionsby activating prior knowledge, and drawing conclusions to make meaning and construct their own knowledge (Baer 2016; Miri et al., 2007). My students were able to create, explore, discover, and problem solve in innovative and individualized ways that provided for a more rigorous, open-ended, and student-centered approach to learning (Dunleavy et al., 2007; Ryan, 2017). These critical thinking skills and activities that were utilized through technology integration allowed students to construct meaning independently (Isik, 2018; Molebash, 2002). Including technology as a part of student-led inquiry in the social studies content area was extremely valuable as it impacted student learning and allowed students to be independent learners and constructers of knowledge.

Creating a personalized artifact. Creating their own personalized virtual interactive notebook allowed students to be independent learners and to construct meaning on their own. In the past, my students had a physical *interactive* notebook that was in no way interactive. I created each notebook page before I taught the lesson and the students would make a copy of the exact same page in their notebook as I projected it on the board. It required lower-order thinking and did not motivate students. I was not using notebooking to its fullest potential. Marcarelli (2010) defines interactive notebooks as a "tool students use to make connections prior to new learning, to revise their thinking, and to deepen their understandings of the world around them" (p. 2). Through this study, notebooking became an activity in which students constructed meaning on their own and then created their own notebook page to articulate their understanding and thinking into

their own words (Alschbacher & Alonzo, 2006). Notebooks became a safe place for my students to align new information with background knowledge and to record their thoughts and reflections on their newly constructed knowledge (Doyle, 2017). Through this constructivist approach to learning, my students became independent learners who were able to create meaning on their own and record their understanding in their personalized virtual interactive notebook.

I must practice and share with others what I know is best for learners. Conducting a review of literature related to inquiry, gifted-learners, motivation, higher-order thinking skills, and technology, coupled with having my own experience through conducting this study, assisted me in gaining a deeper understanding. I feel a personal obligation to practice what I know is best for learners and to share my understanding with my colleagues. Using the literature review and the experiences of others to guide the design of this study allowed me to build it upon frameworks and approaches that are considered sound research.

Allowing students time and space to create their own virtual interactive notebooks increased student use of higher-order thinking skills and increased student motivation to learn. Taking on the role of facilitator was liberating for my students. I was no longer the holder of all information. They became agents in their learning process and were able to make choices throughout their personal inquiries. They were able to create meaning on their own and enjoyed sharing their new understanding in creative ways.

Now that I have a deeper understanding of how to incorporate higher-order thinking in the social studies content area while also motivating gifted students, I must continue to implement virtual interactive notebooks in my classroom. I feel an obligation

to share my new understanding with others and to continue to look for ways to meet the needs of my gifted learners.

Implications for Teaching Gifted Learners

Meeting the needs of gifted learners can be challenging. In 2007, Rogers synthesized research on teaching gifted learners from a span of 150 years. Based on the research, five main themes emerged. Gifted learners need to: be challenged daily; have regular opportunities to be different and to work independently in areas that they are passionate about; be provided subject and grade-based acceleration; learn and socialize with other gifted and talented students; and have differentiated instruction in terms of pace, amount and type of assignments, and delivery of content (Rogers, 2007).

Allowing gifted students in this study to lead their own personal inquiries as they created their social studies virtual interactive notebooks met the needs of the gifted students in this study and provided me with new understanding about what matters when teaching gifted students. This resulted in every student's virtual notebook being individualized. Based on the implementation of virtual interactive notebooks in a fourth-grade gifted classroom, teachers need to give gifted students time and space to: (a) engage in inquiry, (b) utilize technology as a tool in their inquiry process, and (c) be challenged as they construct meaning.

Gifted students need time and space to engage in inquiry. Gifted students need to be provided the opportunity to engage in self-directed IBL that encourages the use of higher-order thinking skills (Eysink et al., 2015). Gifted learners benefit academically from being allowed to conduct an inquiry on their own with their teacher acting as a facilitator (Eysink et al., 2015). In this study, the IBL environment allowed students to

push themselves beyond their comfort zone and to remain engaged in the learning process as they utilized their gifted cognitive abilities (Eysink et al., 2015). Specifically, students led their own inquiries as they created a personalized virtual interactive notebook. Students utilized higher-order thinking skills throughout the process as they questioned, searched multiple resources, synthesized information, and recorded their new understanding in their notebooks. Student motivation in this study increased because the students were active learners. No longer was I the holder of all information, presenting students with what they needed to know on each topic. It can be hard for teachers to give up power, but empowering gifted students to be the lead in their learning process results in the students understanding the content on a deeper level. As my students engaged in the inquiry process in this study, they took on the identity of a historian as they constructed meaning and found answers to their wonderings. The students experienced an increase in motivation and the use of higher-order thinking skills. Allowing students time and space to engage in inquiry met their needs as gifted learners.

Gifted students need time and space to utilize technology as a tool in their inquiry process. Technology as a tool in an IBL environment assists teachers of gifted students in finding ways to deliver content with complexity and depth in an intriguing way that will meet the learners' needs (Eysink et al., 2015). In this study, IBL and technology integration provided a way for me to challenge my gifted students throughout their learning process by allowing students to focus on a challenging task while also having autonomy over their learning (Eysink et al., 2015). Technology provided the gifted learners opportunities to foster their curiosity and find answers to their personal wonderings as they explored at deeper levels (Housand & Housand, 2012; Siegle, 2004).

Throughout the implementation of the virtual interactive notebooks, students used technology as active learners who were able to conduct research, create presentations on their learning, publish their learning using Web 2.0 tools, problem solve, develop technology-based literacy skills, develop career and life skills, and utilize their creativity in productive ways. The active learning a product of the gifted students being the ones actively using the technology, not the teacher (Zimlich, 2015). Teachers of gifted students need to allow time and space for their students to use technology as a tool in the inquiry process to meet their needs as learners.

Gifted students need time and space to be challenged as they construct meaning. Gifted learners are students who are able to achieve at high levels and grow at an accelerated pace (Housand & Housand, 2012). These students have higher metacognitive skills and are able to self-monitor during their learning process (Barfurth et al., 2009; Eysink et al., 2015). Gifted learners prefer to work on meaningful and complex tasks (Eysink et al., 2015; Kanevsky, 2011; Scager et al., 2013). Virtual interactive notebooks met these needs of my gifted learners.

All students in this study reported being challenged as learners. Students responded to this challenge in different ways. I found that gifted students who scored higher on state testing and qualifying gifted tests would often write too much on their notebook pages as they tried to thoroughly convey their understanding of the topic. I would facilitate students in trimming the content they put on each page, focusing on what really mattered. This was challenging for these students as they wanted to make sure they thoroughly conveyed their understanding to meet the expectations of the notebook. Having students evaluate the information they had written and then edit it to focus on

what truly conveyed their understanding of the topic required higher-order thinking and challenged them as learners. I also found that gifted students who scored lower on state testing and qualifying gifted tests sometimes struggled with putting enough information on the slide to represent their understanding of the content. They needed me to facilitate them in their inquiry process and in the construction of their notebook page, as they found this to be challenging to them as a learner. As we went through the notebook, students became more independent in the notebooking process as they grew in understanding of what they needed to do as learners to construct each notebook page. As students felt challenged, they were motivated as learners (Eysink et al., 2015; Phillips & Lindsay, 2006).

Implications for Integrating Virtual Interactive Notebooks in the Gifted Social Studies Classrooms

Virtual interactive notebooks should be integrated into gifted fourth-grade social studies classrooms that practice an inquiry approach to learning. IBL and technology integration allows students to be independent learners and to construct meaning on their own as the teacher acts as a facilitator. Patterson (2016) argues for the importance of IBL in the social studies content area because it allows for critical and higher-order thinking. Patterson believes teaching social studies through an inquiry approach, when supported by a technological and a sociocultural approach, fosters student-centered instruction. Student-centered, personalized instruction leads to a greater depth of understanding through the use of higher-order thinking skills, enhancement of student personal competencies, and mastery of social studies content (Patterson, 2016). Allowing students

to create their own personalized virtual interactive notebooks increased student use of higher-order thinking skills while also increasing student motivation.

Implications for Future Research

Conducting this action research study has impacted my understanding of the research process. I now understand more about research design, data collection, and analyzing results. The findings of this study provide implications for future research about the use of virtual interactive notebooks. This study was conducted with gifted learners in a social studies classroom. Teachers or administers who are looking to implement virtual interactive notebooks in their classroom may be interested in future research related to these topics.

If I were to replicate this study, I would make multiple changes and adjustments. I collected data in one classroom at one school. The results provide a narrow view of the implementation of virtual interactive notebooks. This study could be conducted in gifted classrooms across multiple schools. Increasing participants and locations would increase the validity and reliability of the results in the study. This would also allow for the generalization of the findings to a larger group to other school settings and contexts. Another adjustment to this study could be to use a true experimental design with a control group.

Future iterations of this study could include the implementation of virtual interactive notebooks in regular-ed social studies classrooms. Although this study was conducted with gifted learners, IBL, in any content area, promotes learning in authentic, intentional, and systematic ways that begin with the learner and are based on what the student already knows and what they want to know (Casey & Bruce, 2011; Mills et al.,

2014). Notebooking and higher-order thinking is also not limited to gifted learners. According to Walden and Crippen (2009), notebooking is empowering to all as students are given choice in the creating of their notebooks and students view their notebook as a record of their understanding. Higher-order thinking is required when creating notebooks in an inquiry-based classroom as students are actively engaged in asking, investigating, creating, discussing, and reflecting throughout the notebooking process (Casey & Bruce, 2011; Campbell & Cox, 2018; Mills et al., 2014; Waldman & Crippen, 2009). Further research is needed to measure the impact virtual interactive notebooks have on higher-order thinking skills and motivation for regular-ed elementary students.

Another iteration of this study could include the implementation of virtual interactive notebooks with gifted classrooms in math or ELA. During this study, several students asked me if we could do virtual interactive notebooks in math or ELA. They viewed their science notebook as being interactive because the notebook provided a place for students "to collect, organize, and display observations and data"; "to reflect and make sense of inquiry experiences"; as well as "multiple opportunities to demonstrate understanding and receive formative feedback" (Rappolt-Schlichtmann et al., p. 1211). IBL and technology integration met the needs and characteristics of the gifted learners in this study as it provided a way to challenge the students throughout the learning process by allowing them to be focused on a challenging task while also having autonomy over their learning (Eysink et al., 2015). The students in this study enjoyed the challenge and freedom they experienced as they created their social studies virtual interactive notebook and wanted to have the same experience in other content areas. Based on the impact virtual interactive notebooks had on higher-order thinking and student motivation in this

study, further research is needed to measure the impact virtual interactive notebooks can have in math and language arts in gifted elementary classrooms.

Future research could include an in-depth study on the interconnectedness of cognition, metacognition, and motivation in self-regulated learners through the implementation of a virtual interactive notebook. For this study, only questions that addressed student motivation and aligned with the purpose of this study were utilized to collect quantitative data. However, when students were interviewed, all three components of self-regulated learning where addressed by students. According to self-regulated learning theory, motivation and student learning are interdependent processes that cannot be analyzed fully in isolation (Zimmerman, 1989). Therefore, another iteration of this study could include the cognitive and metacognitive scales of the learning strategies section of the MSLQ.

Limitations

There are limitations associated with this study, as there are with any research study. Mertler (2017) and Johnson (2008) believe action research is a systematic inquiry into a teacher's own practice. During action research, teachers study their own classrooms "to better understand them and be able to improve their quality or effectiveness" (Mertler, 2017, p. 4). Through this study, I was able to implement and analyze the use of virtual interactive notebooks as a way to impact the use of higher-order thinking skills and motivation in gifted students during social studies. There were, however, issues that could be improved with future research.

A limitation of all action research is researcher bias. Specific to this study, one limitation is the use of subjectivity and potential bias as I, as the researcher, participated

in the study as the teacher. I also was the one who interviewed the students. Therefore, a limitation was that the interviewees may have had difficulty adjusting to their teacher interviewing them about a topic they knew I was researching. According to Creswell (2014), the presence of the researcher/teacher may influence or affect student responses.

Findings of this study are limited to the 23 students in my fourth-grade gifted class. The sample size is a limitation because it is small and it may not be representative of all fourth-grade gifted students in my district. Working with fourth-grade gifted students from across the district may have yielded different results. This study, while providing insight on higher-order thinking skills and student motivation through the creation of virtual interactive notebooks, cannot be generalized beyond this context. In action research, small, purposely selected sample sizes do not allow for the generalizability of the findings beyond the study itself (Creswell, 2014). Therefore, readers are encouraged to use discretion when making assumptions beyond the conditions of this study.

The small sample size in this study also impacted the Cronbach's alpha for each individual subscale of the MSLQ. Reliability tests for each subscale did not align with the internal consistency results provided by Pintrich and McKeachie (Pintrich et al., 1993). Having more students included in the study could have impacted the internal consistency for each subscale of the MSLQ.

Another limitation in this study was the interruption of instruction due to COVID-19. The study was designed to take place in the classroom but, due to COVID-19, schools were closed and students learned virtually. This interruption may have influenced the use

of higher-order thinking skills and student motivation as students were adjusting to a new learning environment in the middle of the study.

The creation of the virtual interactive notebook could also have been viewed as a novelty by the students. The newness of the technology-based way of notebooking could have influenced student motivation and impacted the results of this study.

Recognizing these limitations, I took the measures to add to the validity of the study. I met with students individually via Google Meet to discuss their virtual interactive notebooks and to assist them with their personal inquiries. When interviewing students, I created an environment that was conducive to having open dialogue. I encouraged students to be honest and to share their true feelings about the use of virtual interactive notebooks.

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APPENDIX A

STUDENT CHECKLIST FOR VIRTUAL INTERACTIVE NOTEBOOK

Topic/Title of Slide	I included a thoughtful and well formulated synthesis on the topic.	I included a thoughtful and well formulated inquiry section that includes my thoughts, questions, findings, wonderings, and/or further research wishes.	I included an image or other form of media that aligns with and supports my synthesis, inquiry, or both sections.

APPENDIX B

LESSON PLAN: USE AND PURPOSE OF VIRTUAL INTERACTIVE NOTEBOOKING

Objective: Students will understand the purpose of virtual interactive notebooking.

Materials: Physical interactive notebook and Chromebook

Day 1

1. The teacher will explain that during this unit students will notebook using Google Slides instead of their physical interactive notebook.
2. The teacher will ask students to compare the pages of their notebooks with the students at their table.
3. The students will be asked to share what they notice about the appearance and content of the pages. The teacher will guide the students into noticing that the content and the pages are identical.
4. The teacher will tell the students that during this unit, no one will have pages that look the same or content that is exactly the same because these pages are going to be created by the students and not by the teacher.
5. Students will log into Google Classroom and find a shared file of the template for creating a notebook page (Figure 3.2).
6. The teacher will then have the student create a notebook page on the Middle Passage, a topic from a previous unit. The teacher will explain that they are going

to do this together, step by step, so the students will be able to create their own pages in the future.

7. First, the teacher will have the students name the page “Middle Passage”. The teacher will model for the students on the smartboard how the title should look. Students will have choice in font, font size, and color, but will explain to the students that the title should be the largest font on the page so that the reader knows what the page is about. The teacher will allow two minutes for the students to investigate creating a title for a page.
8. Next, the teacher will have the students find an image for the page. The teacher will model for the students on the smartboard how to find and insert and applicable image into the template. The teacher will also model for the students how to size the image on the slide. The students will have choice regarding the image they choose. However, the teacher will have the students check with their neighbors to see if the image they chose would help the reader of the slide better understand the Middle Passage. The teacher will allow four minutes for students to find an applicable image and to check in with their neighbors. The teacher will walk around the room, checking in on the progress of the class and aiding where necessary.
9. Then, the teacher will ask the students to read over the page in their notebooks on the Middle Passage. The teacher will ask the students to write a summary in their own words about the Middle Passage. The teacher will stress the importance of using their own words and not that of information that was provided to them by their teacher because it will help the reader to know what the student really

understands about the topic. The teacher will explain that in the future, students will synthesize information they collect to write a summary of the topic for that particular notebook page. The teacher will give the students 10 minutes to write a summary on the Middle Passage. The particulars about how to synthesize information will have previously been taught in ELA. After the students write their summary, the teacher will ask students to share their summary of the Middle Passage. The teacher will ask the students what they notice about the summaries. The teacher will guide the students to notice that none of the summaries are exactly the same, even though they may have the overall same points.

10. The teacher will ask for feedback from the students on how they feel so far about using virtual interactive notebooks for the next unit in social studies. The teacher will make sure that students realize that the point of these notebooks is to make learning more individualized, interactive, and personal for each student. The teacher will ask the students to write one word to describe how they are feeling about using virtual interactive notebooks in the next unit and to post it on a chart paper on the wall.

Day 2

1. The teacher will begin by asking the students to recall what they started the day before in social studies. The teacher will revisit the feedback poster from the day before and will share with students the thinking of everyone about using virtual interactive notebooks in the upcoming unit in social studies.

2. The teacher will remind students that yesterday they started creating a notebook page on the Middle Passage. The teacher will share the original template (Figure

3.2) with the students and will review each part that they did the day before, including the title, picture, and summary.

3. The teacher will then explain that today they are going to work on the last part of the template. The teacher will explain that this section allows each student to reflect on what they have discovered about the topic for that page and to journal questions, inquiries, findings, wonderings, and further research wishes that they personally have on that topic. The teacher will model this for the students by saying, "One thing I am personally interested in researching about the Middle Passage is the length of time that the voyage took from Africa to North America. The teacher will then conduct an inquiry into the length of time it took a boat to travel across the ocean. After finding this information, the teacher will then right a reflection about the length of time that Africans were on the boat on the way to the New World and what that must have been like for them. The teacher will then model how to include further questions and wonderings into this reflection section.
4. The teacher will then allow the students to ask their own questions about the Middle Passage and to research answers to those questions. The teacher will give the students 15 minutes to formulate questions, research, and write reflections on the topic. The teacher will walk around the room, aiding students as needed.
5. The teacher will then ask students to share their reflections with the class. As students share their reflections, the teacher will ask the class if they have any further questions or thoughts that they now have after hearing another student's thinking.

6. The teacher will then ask the students to participate in a gallery walk of the virtual notebook pages that they created over the past two days. The teacher will ask the students to be prepared to share what they notice about the notebook pages now versus the notebook pages that were in their physical interactive notebooks. The teacher will guide the students into noticing that every virtual interactive notebook page is different and personalized to the learner.
7. The teacher will ask the students to share feedback about how this type of notebooking is going to help them as a historian and a learner.

APPENDIX C

PRE- AND POSTINTERVIEW QUESTIONS

Preinterview Questions

The purpose of this interview is to contribute to the data collection component of an action research project on the implementation and evaluation of the use of virtual interactive notebooks based on the 4th grade social studies state standards with academically gifted students. You have the right to not participate at any time before or during the interview.

Participation in this interview is completely voluntary. You are not required to answer any or all of the interview questions. The following interview questions ask about your personal use of a physical interactive notebook in this class. Remember as you answer the interview questions that there are no right or wrong answers, just answer as accurately as possible based on your personal experiences.

1. How has using a physical interactive notebook impacted you as a learner?
2. What aspects of using a physical interactive notebook allow you to think deeper as a learner?
3. Can you describe the types of thinking you do as a learner while using your physical interactive notebook?
4. Give an example of a time you pushed yourself in your thinking when creating your physical interactive notebook.

5. What aspects of using a physical interactive notebook motivate you as a learner?

6. How does using a physical interactive notebook challenge you as a learner?

7. Does the use of your physical interactive notebook impact your belief in your ability to do well in this class? Explain.

8. How does using a physical interactive notebook impact your interest in what we are learning?

9. What aspects of the physical interactive notebook allow you to have student choice and control in your learning? Does this impact your motivation to learn?

Postinterview Questions

The purpose of this interview is to contribute to the data collection component of an action research project on the implementation and evaluation of the use of virtual interactive notebooks based on the 4th grade social studies state standards with academically gifted students. You have the right to not participate at any time before or during the interview.

Participation in this interview is completely voluntary. You are not required to answer any or all of the interview questions. The following interview questions ask about your personal use of a virtual interactive notebook in this class. Remember as you answer the interview questions that there are no right or wrong answers, just answer as accurately as possible based on your personal experiences.

1. How has using a virtual interactive notebook impacted you as a learner?

2. What aspects of using a virtual interactive notebook allow you to think deeper as a learner?

3. Can you describe the difference in the thinking required of you as a student to create a virtual interactive notebook versus a physical notebook?

4. Give an example of a time you pushed yourself in your thinking when creating your virtual interactive notebook.

5. What aspects of using a virtual interactive notebook motivate you as a learner?

6. How did using a virtual interactive notebook challenge you as a learner?

7. Does the use of the virtual interactive notebook impact your belief in your ability to do well in this class? Explain.

8. How does using a virtual interactive notebook impact your interest in what we are learning?

9. How does the use of student choice and control when creating an interactive notebook impact your motivation to learn?

APPENDIX D

WEBB'S WEB ALIGNMENT TOOL

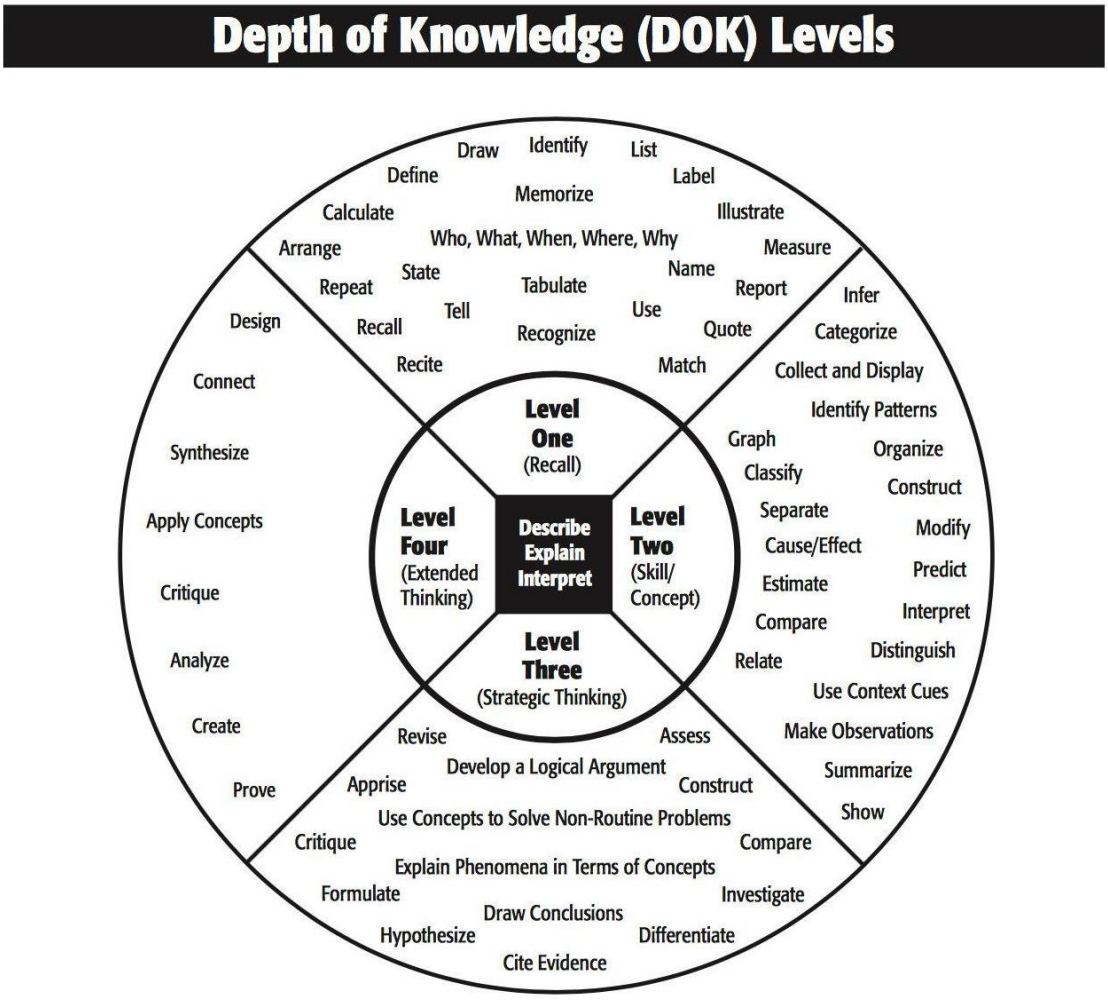

Figure D.1. Webb's Web Alignment Tool.

APPENDIX E

DEPTH OF KNOWLEDGE RUBRIC FOR NOTEBOOKS

Student Number _____

Level 1	**Level 2**	**Level 3**	**Level 4**
-Respond -Explain -Restate -Interpret -Recognize -Describe	-Solves problems -Calculates -Completes -Constructs -Compiles -Illustrates	-Debates -Examines -Justifies -Uncovers -Questions -Compares	-Designs -Takes risks -Proposes -Formulates -Modifies -Creates

Page Number	**Physical Interactive Notebook**	**Virtual Interactive Notebook**

APPENDIX F

MSLQ MOTIVATION SUBSCALES WITH COORDINATING QUESTION NUMBERS

Table F.1 *MSLQ Motivation Subscales with Coordinating Questions*

Subscale	Question Numbers
Intrinsic goal-orientation	1, 16, 22, 24
Extrinsic goal-orientation	7, 11, 13, 30
Task value	4, 10, 17, 23, 26, 27
Control of learning belief	2, 9, 18, 25
Self-efficacy for learning and performance	5, 6, 12, 15, 20, 21, 29, 31

APPENDIX G

MSLQ WITH QUESTIONS ALIGNED FOR THIS RESEARCH

The following is a list of items and questionnaire directions that are a part of the motivation section of the MSLQ with the selected subscales for this study (Pintrich et al., 1991).

The following questions ask about your motivation for and attitudes about this class. Remember there are no right or wrong answers, just answer as accurately as possible. Use the scale below to answer the questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

1 2 3 4 5 6 7 1. In a class like this, I prefer content that really challenges me so I can learn new things.

1 2 3 4 5 6 7 2. If I study in appropriate ways, then I will be able to learn the material in this course.

1 2 3 4 5 6 7 4. I think I will be able to use what I learn in this class in other classes.

1 2 3 4 5 6 7 5. I believe I will receive an excellent grade in this class.

1 2 3 4 5 6 7 6. I'm certain I can understand the most difficult material presented in this class.

1 2 3 4 5 6 7 7. Getting a good grade in this class is the most satisfying thing for me right now.

1 2 3 4 5 6 7 9. It is my own fault if I don't learn the content in this class.

1 2 3 4 5 6 7 10. It is important for me to learn the content in this class.

1 2 3 4 5 6 7 11. The most important thing for me right now is improving my grades for this school year, so my main concern in this class is getting a good grade.

1 2 3 4 5 6 7 12. I'm confident I can learn the basic concepts taught in this class.

1 2 3 4 5 6 7 13. If I can, I want to get better grades than most of the other students in this class.

1 2 3 4 5 6 7 15. I'm confident I can understand the most complex content presented by the teacher in this class.

1 2 3 4 5 6 7 16. In a class like this, I prefer content that peaks my curiosity, even if it is difficult to learn.

1 2 3 4 5 6 7 17. I am very interested in the content area of this class.

1 2 3 4 5 6 7 18. If I try hard enough, then I will understand the content in this class.

1 2 3 4 5 6 7 20. I'm confident I can do an excellent job on the assignments and tests in this class.

1 2 3 4 5 6 7 21. I expect to do well in this class.

1 2 3 4 5 6 7 22. The most satisfying thing for me in this class is trying to understand the content as thoroughly as possible.

1 2 3 4 5 6 7 23. I think the content in this class is useful for me to learn.

1 2 3 4 5 6 7 24. When I have the opportunity in this class, I choose assignments that help me to learn, even if they don't guarantee a good grade.

1 2 3 4 5 6 7 25. If I don't understand the content, it is because I didn't try hard enough.

1 2 3 4 5 6 7 26. I like the subject matter in this class.

1 2 3 4 5 6 7 27. Understanding the content in this class is very important to me.

1 2 3 4 5 6 7 29. I'm certain I can master the skills being taught in this class.

1 2 3 4 5 6 7 30. I want to do well in this class because it is important to show my ability to my family, friends, or others.

1 2 3 4 5 6 7 31. Considering the difficulty of the content, the teacher, and my skills, I think I will do well in this class.

APPENDIX H

MSLQ ORIGINAL QUESTIONS AND REWRITTEN QUESTIONS ALIGNED FOR THIS RESEARCH

Table H.2 *MSLQ Questions Rewritten for Alignment to Research*

Original Question	Aligned Question
1. In a class like this, I prefer course material that really challenges me so I can learn new things.	1. In a class like this, I prefer content that really challenges me so I can learn new things.
4. I think I will be able to use what I learn in this course in other courses.	4. I think I will be able to use what I learn in this class in other classes.
6. I'm certain I can understand the most difficult material presented in the readings for this course.	6. I'm certain I can understand the most difficult material presented in this class.
9. It is my own fault if I don't learn the material in this course.	9. It is my own fault if I don't learn the content in this class.
10. It is important for me to learn the course material in this class.	10. It is important for me to learn the content in this class.

Original Question	Aligned Question
11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.	11. The most important thing for me right now is improving my grades for this school year, so my main concern in this class is getting a good grade.
12. I'm confident I can learn the basic concepts taught in this course.	12. I'm confident I can learn the basic concepts taught in this class.
15. I'm confident I can understand the most complex material presented by the instructor in this course.	15. I'm confident I can understand the most complex content presented by the teacher in this class.
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.	16. In a class like this, I prefer content that arouses my curiosity, even if it is difficult to learn.
17. I am very interested in the content area of this course.	17. I am very interested in the content area of this class.
18. If I try hard enough, then I will understand the course material.	18. If I try hard enough, then I will understand the content in this class.
20. I'm confident I can do an excellent job on the assignments and tests in this course.	20. I'm confident I can do an excellent job on the assignments and tests in this class.
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	22. The most satisfying thing for me in this class is trying to understand the content as thoroughly as possible.

Original Question	Aligned Question
23. I think the course material in this class is useful for me to learn.	23. I think the content in this class is useful for me to learn.
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	24. When I have the opportunity in this class, I choose assignments that help me to learn, even if they don't guarantee a good grade.
25. If I don't understand the course material, it is because I didn't try hard enough.	25. If I don't understand the content, it is because I didn't try hard enough.
26. I like the subject matter of this course.	26. I like the subject matter in this class.
27. Understanding the subject matter of this course is very important to me.	27. Understanding the content in this class is very important to me.
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.	30. I want to do well in this class because it is important to show my ability to my family, friends, or others.
31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	31. Considering the difficulty of the content, the teacher, and my skills, I think I will do well in this class.

APPENDIX I

CHANGES MADE TO ALIGNED MSLQ QUESTIONS AFTER PILOT

Table I.3 *Aligned MSLQ Questions Changed due to Pilot*

Original Question	Reworded Question
13. If I can, I want to get better grades in this class than most of the other students.	13. If I can, I want to get better grades than most of the other students in this class.
16.In a class like this, I prefer content that arouses my curiosity, even if it is difficult to learn.	16. In a class like this, I prefer content that peaks my curiosity, even if it is difficult to learn.

APPENDIX J

CHANGES MADE TO ORIGINAL PRE-INTERVENTION INTERVIEW QUESTIONS AFTER PILOT

Table J.4 *Preintervention Interview Questions Changed due to Pilot*

Original Question	Reworded Question
2. What aspects of using a physical interactive notebook allow you to think deeper as a learner?	2. What parts of a physical interactive notebook allow you to think deeper as a learner?
5. What aspects of using a physical interactive notebook motivate you as a learner?	5. What parts of a physical interactive notebook motivate you as a learner?
8. How does using a physical interactive notebook impact your interest in what we are learning?	8. How does using a physical interactive notebook influence your interest in what we are learning?
9a. What aspects of the physical interactive notebook allow you to have student choice and control in your learning?	9a. What parts of the physical interactive notebook allow you to have student choice and control in your learning?
9b. Does this impact your motivation to learn?	9b. How does this influence your motivation to learn?

APPENDIX K

CHANGES MADE TO ORIGINAL POSTINTERVENTION INTERVIEW QUESTIONS AFTER PILOT

Table K.5 *Postintervention Interview Questions Changed due to Pilot*

Original Question	Reworded Question
2. What aspects of using a virtual interactive notebook allow you to think deeper as a learner?	2. What parts of a virtual interactive notebook allow you to think deeper as a learner?
5. What aspects of using a virtual interactive notebook motivate you as a learner?	5. What parts of a virtual interactive notebook motivate you as a learner?
8. How does using a virtual interactive notebook impact your interest in what we are learning?	8. How does using a virtual interactive notebook influence your interest in what we are learning?
9a. What aspects of the virtual interactive notebook allow you to have student choice and control in your learning?	9a. What parts of the virtual interactive notebook allow you to have student choice and control in your learning?
9b. How does the use of student choice and control when creating an interactive	9b. How does the use of student choice and control when creating an interactive notebook impact your motivation to learn?

Original Question	Reworded Question
notebook impact your motivation to learn?	

APPENDIX L

MSLQ INTRINSIC MOTIVATION SUBSCALE RESULTS FROM THE PRE- AND POSTSURVEY

Table L.6 *MSLQ Intrinsic Motivation Subscale Results*

Student	Presurvey	Postsurvey
Kim	5.50	6.25
Lily*	5.50	5.75
Izzy	5.75	7.00
Neil	6.50	6.50
Mel	6.00	6.75
Orion	7.00	7.00
Emma	5.25	5.75
Lindsay	6.25	6.75
Kate	6.00	6.25
John*	5.50	6.25
Luella	5.50	6.50
Evan	6.50	6.50
Cindy	5.25	7.00
Brad	6.25	7.00
Nolan	5.00	7.00
Paul	5.00	6.50
Aaron*	6.00	6.75
Gray	6.00	6.50
Mylie	6.00	6.00
Bryan	3.25	5.75
Beth*	6.00	7.00
Brent	6.00	6.25
Harris	5.25	6.50

Note. An asterisk next to the student numbers represents the student participated in the student interview

APPENDIX M

MSLQ EXTRINSIC MOTIVATION SUBSCALE RESULTS FROM THE PRE- AND POSTSURVEY

Table M.7 *MSLQ Extrinsic Motivation Subscale Results*

Student	Presurvey	Postsurvey
Kim	5.25	6.00
Lily*	6.50	6.50
Izzy	7.00	7.00
Neil	5.25	7.00
Mel	6.25	6.75
Orion	5.50	6.75
Emma	5.25	6.50
Lindsay	6.50	7.00
Kate	5.75	6.50
John*	4.50	6.75
Luella	6.50	7.00
Evan	6.25	6.50
Cindy	6.50	6.75
Brad	6.50	6.50
Nolan	7.00	6.25
Paul	7.00	7.00
Aaron*	7.00	7.00
Gray	3.75	4.50
Mylie	5.75	6.00
Bryan	3.75	6.25
Beth*	7.00	7.00
Brent	6.75	7.00
Harris	6.75	7.00

Note. An asterisk next to the student numbers represents the student participated in the student interview

APPENDIX N

MSLQ TASK VALUE SUBSCALE RESULTS FROM THE PRE- AND POSTSURVEY

Table N.8 *MSLQ Task Value Subscale Results*

Student	Presurvey	Postsurvey
Kim	6.33	7.00
Lily*	6.50	6.83
Izzy	5.33	6.67
Neil	5.50	6.67
Mel	7.00	7.00
Orion	7.00	7.00
Emma	5.17	6.50
Lindsay	7.00	7.00
Kate	6.50	6.33
John*	4.33	6.33
Luella	4.50	6.83
Evan	5.00	6.33
Cindy	5.00	6.67
Brad	6.83	7.00
Nolan	6.33	7.00
Paul	6.50	6.67
Aaron*	6.50	7.00
Gray	6.17	6.67
Mylie	5.67	6.50
Bryan	3.17	5.50
Beth*	6.33	7.00
Brent	6.00	6.83
Harris	5.67	6.17

Note. An asterisk next to the student numbers represents the student participated in the student interview

APPENDIX O

MSLQ CONTROL SUBSCALE RESULTS FROM THE PRE- AND POSTSURVEY

Table O.9 *MSLQ Control Subscale Results*

Student	Presurvey	Postsurvey
Kim	5.25	5.25
Lily*	6.25	7.00
Izzy	7.00	7.00
Neil	6.25	6.75
Mel	6.00	7.00
Orion	7.00	7.00
Emma	5.25	6.25
Lindsay	5.75	6.50
Kate	5.75	6.75
John*	3.50	6.50
Luella	5.25	6.50
Evan	5.75	6.00
Cindy	6.50	6.75
Brad	7.00	7.00
Nolan	5.00	6.75
Paul	5.75	6.25
Aaron*	6.75	7.00
Gray	6.75	6.75
Mylie	5.50	5.25
Bryan	4.00	7.00
Beth*	6.50	7.00
Brent	5.25	5.50
Harris	7.00	7.00

Note. An asterisk next to the student numbers represents the student participated in the student interview

APPENDIX P

MSLQ SELF-EFFICACY SUBSCALE RESULTS FROM THE PRE- AND POSTSURVEY

Table P.10 *MSLQ Self-Efficacy Subscale Results*

Student	Presurvey	Postsurvey
Kim	5.00	6.13
Lily*	5.25	5.75
Izzy	4.88	6.50
Neil	6.63	6.75
Mel	6.79	7.00
Orion	6.88	6.88
Emma	4.25	6.50
Lindsay	6.75	6.75
Kate	6.50	6.50
John*	6.63	6.88
Luella	5.63	6.63
Evan	5.88	6.38
Cindy	6.38	6.50
Brad	6.88	7.00
Nolan	5.88	6.38
Paul	5.63	6.25
Aaron*	7.00	7.00
Gray	6.75	7.00w
Mylie	5.75	6.25
Bryan	4.00	6.75
Beth*	6.75	6.75
Brent	6.25	6.75
Harris	6.38	6.75

Note. An asterisk next to the student numbers represents the student participated in the student interview

APPENDIX Q

IRB APPROVAL LETTER

OFFICE OF RESEARCH COMPLIANCE
INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
DECLARATION of NOT RESEARCH

Brandy Meyers
820 Main Street
Columbia, SC 29208 USA

Re: **Pro00094523**

Dear Mrs. Brandy Meyers:

This is to certify that research study entitled ***HOW DOES VIRTUAL INTERACTIVE NOTEBOOKING CHANGE LEARNING FOR GIFTED LEARNERS: A MIXED-METHODS ACTION RESEARCH STUDY ON HIGHER-ORDER THINKING AND STUDENT MOTIVATION*** was reviewed on **10/25/2015** by the Office of Research Compliance, which is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). The Office of Research Compliance, on behalf of the Institutional Review Board, has determined that the referenced research study is not subject to the Protection of Human Subject Regulations in accordance with the Code of Federal Regulations 45 CFR 46 et. seq.

No further oversight by the USC IRB is required. However, the investigator should inform the Office of Research Compliance prior to making any substantive changes in the research methods, as this may alter the status of the project and require another review.

If you have questions, contact Lisa M. Johnson at lisaj@mailbox.sc.edu or (803)

777-6670. Sincerely,

Lisa M. Johnson
ORC Assistant Director and IRB Manager

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