

A COLLECTIVE CASE STUDY OF MIDDLE SCHOOL TEACHERS' EXPERIENCES  
USING CHROMEBOOKS INSTEAD OF TEXTBOOKS IN THE CLASSROOM

by

Holly Diane Eimer

Liberty University

A Dissertation Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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## ABSTRACT

The purpose of this collective case study was to understand the classroom experiences using Chromebooks in place of textbooks among middle school teachers in the Central County School System (pseudonym). The central research question that guided the study asked, How do middle school teachers in Central County experience using Chromebooks instead of traditional textbooks for instructional purposes in the classroom? For this research, the use of Chromebooks was generally defined as reading for learning purposes. The theory that guided this study was the cognitive theory of multimedia learning. The participants were 15 sixth through eighth grade public-school core content teachers. Data collection included individual semi-structured interviews, focus group interviews, and participant journaling. A questionnaire was used to purposefully select participants. All interviews were recorded and transcribed by the researcher. The interviews and journal entries were analyzed through significant statements resulting in common themes that included the need for learner preference, differentiation, and balance, as well as the importance of quality applications, factors influencing learning, and observed benefits and concerns.

*Keywords:* Chromebooks, information processing, active learning, learning channels, pedagogical changes

### **Dedication**

I would like to first dedicate this dissertation to God and to His son, Jesus, for through Him all things are possible. I would also like to give thanks to my husband, Chris, and to my sons, Andrew and Adam, for being my cheerleaders and for the many hours sacrificed while I conducted research. Additionally, I would like to thank my parents, Elwood and Lynne Brown and Michael and Diane Swaney, for their unwavering support through the years. Also, to the best coworker and friend, Mitch Bailey, thank you for pushing me to pursue my doctoral degree, even though I resisted. Finally, thank you to Austin Richard Post for creating music that pushed me through when times were difficult.

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### **List of Abbreviations**

Cognitive Theory of Multimedia Learning (CTML)

Common Core State Standards (CCSS)

Google Apps for Education (GAFE)

Institutional Review Board (IRB)

U.S. Department of Education (USDOE)

## CHAPTER ONE: INTRODUCTION

### Overview

With recent adaptations of Common Core State Standards (CCSS) in multiple states, the implementation of technology is required in many classrooms (Common Core State Standards Initiative, 2019). The introduction of Chromebooks and digital textbooks has led to a dramatic shift in middle school classrooms in the United States (Stratton, Chitiyo, Mathende, & Davis, 2019). Oftentimes, Chromebooks are replacing traditional paper textbooks, and this transition has been supported by textbook companies as they offer expanding online versions or digital downloads of their traditional textbooks (Ullman, 2015). Schools throughout the United States are opting to purchase the online versions of textbooks in lieu of paper versions for a variety of reasons. Electronic textbooks usually cost less than their paper counterparts; however, many studies are contradictory in their findings with some studies showing benefits of Chromebook use and others showing no benefit or adverse effects in the classroom (Bentley, 2012; Giebelhausen, 2016). In addition, digital versions cannot be lost, damaged, or stolen, saving school systems valuable time and money (Ullman, 2015). While technology use in the classroom is certainly not a new idea, the replacement of traditional textbooks with Chromebooks is uncharted territory with unknown results (Blikstad-Balas & Davies, 2017). The experiences and subsequent effects on pedagogical practices are yet to be seen and require further study. This chapter includes a brief background on the use of Chromebooks and technology in the classroom and their impact on pedagogical practices, as well as my role within the study as the researcher experiencing the implementation of Chromebooks in the classroom. In addition, the problem and purpose of the research study are explained, the central research question and sub-questions that

guide the study are presented, and relevant definitions described. The chapter concludes with a brief summary.

### **Background**

The use of screen media for learning purposes has been a topic for study since 1987 (Cuban, 1987). In the three decades since the topic first gained the attention of researchers, technology, and the manner in which it is used, has drastically changed. For example, the first dedicated eBook reader was popularized in 2007 with Amazon's Kindle, and the first smartphone was popularized in the same year with the introduction of Apple's iPhone (Carnoy, 2009). Additionally, Google's popular Chromebook, a small laptop designed mainly to access the Internet, was launched in 2011 (Burns, 2011). Since these electronic devices are a relatively recent development, none were present during initial studies, yet their place in classrooms today is prevalent. Currently, computers are used in 97% of classrooms in the United States and 58% of schools employ portable electronic devices, such as Chromebooks (National Center for Education Statistics, 2018). I was unable to locate any case studies researching the experience of middle school teachers using Chromebooks in the classroom in place of traditional textbooks.

### **Historical Context**

In 1971, the Gutenberg Project was the first attempt to digitize electronic books, when founder Michael Hart began typing the Declaration of Independence (Brown, 2001). However, the use of technology and screen-reading for learning purposes has been a topic of study for over 30 years (Cuban, 1987). Researchers have studied the process of learning, placing emphasis on the learner's active cognitive processing and cognitive activity associated with meaningful instruction (Mayer, 2019). Recurring themes are that comprehension is caused by the method of instruction rather than the instructional media (Porion, Aparicio, Megalakaki, Robert, & Baccino,

2016). In earlier research investigating computers and reading, the focus was primarily on the efficacy and process of reading from computer screens rather than outcomes such as comprehension and learning (Margolin, Driscoll, Toland, & Kegler, 2013). Additionally, the goal or end result of purposeful reading influences the process of reading; whether one is reading for enjoyment or pleasure versus reading for learning and information (Brown, 2001).

The complete replacement of textbooks with Chromebooks in the classroom is a very recent development and is further promoted since the introduction of CCSS and its component of technology integration (Common Core State Standards Initiative, 2019). The introduction of Chromebooks for learning purposes is of particular interest to stakeholders due to the lack of empirical studies on the influence of their usage when replacing traditional textbooks. Additionally, the relatively recent development of the Chromebook contributes to the lack of empirical or historical literature on the implementation of Chromebook use in the middle school classroom and the experiences involved with usage.

To my knowledge, no research exists studying the experiences of middle school teachers using Chromebooks in place of traditional textbooks in the middle school classroom environment. The studies conducted thus far either analyze students' perception, focus on content-specific implementation, or study specific Google App usage (Davis & Neitzel, 2011; Giebelhausen, 2016). This collective case study adds to the existing scholarly literature by studying the experiences of teachers who have replaced textbooks with Chromebooks in their classrooms.

### **Social Context**

A study by Wilson (2017) discovered online textbooks were “creating an unintuitive, cumbersome process that teachers work around with more traditional methods” (p. 62). Sun,

Shieh, and Huang (2013) found there to be no difference in academic outcome once students familiarize themselves with the digital device. Additionally, Medcalfe (2013) determined there was no change in student performance when one section of a class could access online recordings of lectures. The inconsistent findings and multiple factors that influenced the results were further clarified in this collective case study and may contribute to the breadth of knowledge by adding to the empirical literature.

Since the topic first gained the attention of researchers in 1987, technology and the manner in which it is used has considerably changed. The use of technology for learning purposes affects the dynamic of the teacher and student relationship and may alter pedagogical practices (Kucirkova & Littleton, 2017). When utilizing Chromebooks to read online textbooks, teachers may find it difficult to gauge if students are correctly following along due to the lack of turning pages (Singer & Alexander, 2016). Additionally, when interacting with a Chromebook, students make less eye contact with the instructor (Richert, Robb, & Smith, 2011), a critical component of social constructivism where meaning is formed through interaction with others (Vygotsky, 1926).

There are many stakeholders impacted by the replacement of traditional textbooks with Chromebooks. School systems considering adoption of Chromebooks may benefit from this collective case study. Furthermore, institutions of higher learning, school staff and faculty members, administrators, teachers, local taxpayers, students, and parents may also benefit from the research.

### **Theoretical Context**

Chromebooks are replacing traditional paper textbooks in middle school classrooms, and this transition has been supported by textbook companies as they offer expanding online versions

or digital downloads of their traditional textbooks (Ullman, 2015). The ramifications of this replacement are unknown. The cognitive theory of multimedia learning (CTML) guided this study as it provided a framework for understanding teacher experiences when replacing textbooks with Chromebooks (Mayer & Moreno, 2003). Mayer and Moreno's (2003) CTML was viewed with a social constructivist paradigm under which the learner is an active participant in the learning process (Vygotsky, 1926). Clark and Mayer (2008) asserted the importance of considering cognitive consequences when adding extraneous pictures, words, or sounds to the learning environment. When adding computers into the learning environment, it is critical for educators to reflect whether the addition may disrupt, distract, or entice the learner's process of knowledge construction (Clark & Mayer, 2008).

Xu (2018) stated the constructivist learning environment should include four elements: situation, cooperation, conversation, and meaning construction. In the constructivist theory, understanding and knowledge are socially constructed, with student-centered learning, and teachers as facilitators of learning (Xu, 2018). To maximize learning potential, Mayer and Moreno (2003) emphasized the need to implement evidence-based principles when using computers in the learning environment. The effectiveness of computer-learning can be increased by aligning learning goals to games, including guidance and structure, and managing complexity (Mayer & Moreno, 2003). Van Eck (2007) stated, "We do not yet have the theoretical and research base we need to establish guidelines for practice, and, while we have everyone's attention now, we do not yet know what to say" (p. 31). The ever-changing nature of technology supports Van Eck's (2007) assertion that the struggle for understanding how learner's acquire knowledge when utilizing computers is ongoing (Clark & Mayer, 2008).



### **Situation to Self**

My motivation for conducting this case study was my personal experience and interest in technology for learning purposes. I am currently in my 14th year of teaching middle school students in a Title I setting, and during this time I have witnessed the removal of traditional paper textbooks from the curriculum of core content areas by the superintendent and their replacement with Chromebooks. A Title I school has a large concentration of low-income students and receives federal funding (U.S. Department of Education [USDOE], 2018). In the county where I teach, Chromebooks were purchased for every student in Grades 3–12 in 2016. As a former literature teacher and now social studies teacher, I have witnessed the effects of reading from paper and from screens and the different methods students employ when utilizing both methods. As a mother to two young sons, I also stay abreast of current research and recommendations regarding technology use and children, as well as the importance of reading. The convergence of the two topics of study especially interests me and affects my life on a daily basis.

My research addressed the following philosophical assumptions: ontological, epistemological, and axiological. Utilizing the ontological assumption that realities are constructed through the lived experiences of individuals, I described varying participant experiences as themes developed from the data without including my own bias or beliefs (Creswell, 2013). Using the epistemological assumption that all knowledge will be known through the subjective experiences of the participants, I remained within the context of the research, which allowed for deeper understanding of the issue being studied (Creswell, 2013). My research has an inherent axiological philosophical assumption due to the emphasis on the values, biases, and interpretations of the researcher. As the researcher, I acknowledged the bias I had towards paper-reading and acknowledged the importance of objectivity in reporting my

findings. In an effort to avoid bias in my personal interpretation, I did not include any participants located within my school of employment. I also attempted to bracket my personal values and experiences by journaling after interviewing participants and prior to data analysis. Additionally, a social constructivist paradigm guided my research as it lent itself to the researcher and participant engaging in conversation to construct meaning from the experiences of the participants.

### **Problem Statement**

Schools across the United States are opting to purchase online or digital versions of textbooks in lieu of paper versions for a variety of reasons (Varier et al., 2017). The problem is that while technology use in the middle school classroom is certainly not a new idea, the replacement of traditional textbooks with Chromebooks is a recent development with unknown ramifications for teachers and students alike (Blikstad-Balas & Davies, 2017). This dramatic shift in delivering information influences the learning process and affects instruction (Underwood, Underwood, & Farrington-Flint, 2015). There are conflicting research results regarding the medium's effect on student understanding and learning (Porat, Blau, & Barak, 2018). Due to the continual improvements in technology and the newness of Chromebooks replacing textbooks in classrooms, the gap in the empirical literature is significant (Singer & Alexander, 2016).

### **Purpose Statement**

The purpose of this collective case study was to understand the experiences of Central County (pseudonym) middle school teachers who use Chromebooks in place of traditional textbooks in the classroom for student learning. The use of Chromebooks was generally defined as reading for learning purposes (Mayer, 2019). The theory guiding this study was the cognitive

theory of multimedia learning as it provided a framework for understanding teacher experiences when replacing textbooks with Chromebooks (Mayer & Moreno, 2003).

### **Significance of the Study**

“A case study’s significance can be exemplary when the case involves a topic of public interest with underlying nationally important issues” (Yin, 2014, p. 201). This study was significant because it may contribute to the existing body of research on the replacement of textbooks with Chromebooks in the classroom environment. Additionally, this study reached beyond the current empirical knowledge on the implementation of Chromebooks, for it investigated the need for understanding teachers’ experiences when replacing traditional textbooks with online or digital versions of textbooks on Chromebooks (Singer & Alexander, 2016). These experiences included understanding common emerging themes of the teachers’ experiences using Chromebooks after having taught with traditional textbooks.

With many school systems electing to purchase Chromebooks instead of textbooks (Ullman, 2015), this study will allow school boards, administrators, teachers, local tax payers, educational software companies, parents, and students to be more informed. Through a comprehensive understanding of the collective case study in this research, all stakeholders will be more knowledgeable of the implications of replacing textbooks with Chromebooks. Furthermore, it is critical to understand emerging themes of teachers’ experiences in hopes of contributing to the exiting body of research on the replacement of textbooks as policymakers and other stakeholders make future decisions regarding the purchase of Chromebooks for student use.

The meaning constructed from the research may be useful as decisions regarding implementation or non-implementation of curriculum that utilizes Chromebooks and paper

textbooks are made. This study solidified Mayer's CTML by highlighting the manners in which students learn using Chromebooks by processing information through two channels with finite capacity and the active nature of the process (Mayer & Moreno, 2003). Finally, this study contributed to the existing literature by filling the gap regarding the research of middle grades teachers' experiences incorporating Chromebook use for student learning purposes in place of traditional textbooks.

### **Research Questions**

The following central research question guided this study:

**Central Question:** How do middle school teachers in Central County experience using Chromebooks instead of traditional textbooks for instructional purposes in the classroom?

This question sought to understand teachers' experiences of utilizing Chromebooks in place of textbooks in the middle school classroom setting. The central question was designed to increase understanding of common themes demonstrated in the experiences of teachers who have replaced textbooks with Chromebooks in their classrooms. Additionally, the goal of this question was to fill the gap in current research pertaining to teacher experiences with using Chromebooks in place of textbooks in the middle school classroom (Mayer, 2014).

The following sub questions were used to further guide the study:

**Sub-question 1:** How do teachers describe information processing changes when replacing traditional texts with Chromebooks?

This question built upon prior studies on reading for learning purposes on paper and screens (Singer & Alexander, 2016). The goal of this question was to understand and gain insight into how teachers described the changes in processing when replacing textbooks with

Chromebooks. Furthermore, the question addressed information processing as it pertained to Mayer's cognitive theory of multimedia learning (Mayer & Moreno, 2003).

**Sub-question 2:** How do teachers describe the process of active learning?

The goal of this question was to understand the process of active learning by having teachers describe in their own words the traits seen when observing students involved in the learning process. Emerging themes were identified to understand commonalities. Additionally, the question addressed active learning as it pertains to Mayer's CTML (Mayer & Moreno, 2003).

**Sub-question 3:** How do teachers describe differences in pedagogical practices in the classroom when utilizing Chromebooks rather than traditional textbooks?

With the implementation of Chromebooks in place of textbooks, it is beneficial for educators to share differences in pedagogical practices when transitioning from one medium to the other. The goal of this question was to understand how instructional changes occur in an effort to share useful techniques with other educators (Mayer & Moreno, 2003). Furthermore, the modifications made to the lesson planning process could provide for a deeper understanding of how the medium of delivery of information affected the participants.

### **Definitions**

1. *Active Learning* – Educational instruction involving students engaged in activities while actively thinking about what they are doing (Kolb, 2014).
2. *Cognitive Load* – Learners are able to process a finite amount of information through their visual and verbal channels (Mayer, 2019).
3. *Cognitive Theory of Multimedia Learning* – Theory established by Richard Mayer in 2003 to explain how individuals learn from words and pictures (Mayer, 2014).

4. *Common Core State Standards* – The CCSS include standards in mathematics and English language arts with goals that detail what students should know by completion of each grade level from K–12. Forty-one states, the District of Columbia, four territories, and the Department of Defense Education Activity (DoDEA, 2017) have adopted the standards. The CCSS promote college and career readiness (Common Core State Standards Initiative, 2019).
5. *Google Chromebooks* – A laptop style computer with a screen and keyboard that utilizes Google Chrome OS and is lightweight, runs cloud-based applications, and offers minimal storage, all while utilizing the Chrome Internet browser which runs seamlessly with the Google Drive (Miller, 2011).
6. *Information Processing* – Knowledge is personally constructed by the learner and made meaningful by connecting it to prior knowledge and mentally organizing knowledge into a coherent structure (Mayer, 2019).
7. *Learning Channels* – There are two learning channels to process information (dual channels), including visual and verbal to process material (Mayer, 2019).
8. *Pedagogical Changes* – The change, transformation, reform, or reconsideration of teaching or instructional practices (Brownell & Tanner, 2017).

### **Summary**

This collective case study sought to understand the experiences of Central County Middle School teachers who used Chromebooks in place of traditional textbooks in the classroom for student learning. Schools across the United States are opting to purchase online or digital versions of textbooks in lieu of paper versions for a variety of reasons (Varier et al., 2017). The problem is that while technology use in the classroom is certainly not a new idea, the

replacement of traditional textbooks with Chromebooks is a recent development with unknown ramifications (Blikstad-Balas & Davies, 2017). This dramatic shift in delivering information influences the learning process and affects instruction (Underwood et al., 2015). There are conflicting research results regarding the medium's effect on student understanding and learning (Porat et al., 2018). Due to the continual improvements in technology and the newness of Chromebooks replacing textbooks in classrooms, the gap in the empirical literature is significant (Singer & Alexander, 2016). The gap in the area of teacher perceptions on the influence of Chromebooks replacing paper textbooks in the classroom further added to the empirical research. This collective case study sought to fill this gap.

## **CHAPTER TWO: LITERATURE REVIEW**

### **Overview**

The review of the literature and the purpose of this chapter provide an overview of the theoretical framework guiding this collective case study, including Mayer's (2014) cognitive theory of multimedia learning (CTML) and the understanding of the experiences of middle school core content area teachers using traditional textbooks and Chromebooks in the classroom environment. Mayer's (2014) CTML addressed the way an individual processes pictures and words during the learning process. A review of the empirical literature relating to learning from textbooks and Chromebooks includes information processing changes, the process of active learning, and shifting pedagogical practices. Additionally, the review identifies the gaps in the literature in the body of research and emphasizes the significance of this collective case study, as the understanding on the topic is still developing.

### **Theoretical Framework**

Due to the increasing use of Chromebooks as an instructional aid in the classroom environment, the utilization of guiding constructs such as Mayer's CTML is being recognized now more than ever (Walsh, 2016). Mayer's (2014) CTML is founded on 12 principles:

1. Coherence Principle – individuals learn better when extraneous words, pictures, and sounds are excluded rather than included.
2. Signaling Principle – individuals learn better when cues that highlight the organization of the essential material are added.
3. Redundancy Principle – individuals learn better from graphics and narration than from graphics, narration, and on-screen text.



4. Spatial Contiguity Principle – individuals learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.
5. Temporal Contiguity Principle – individuals learn better when corresponding words and pictures are presented simultaneously rather than successively.
6. Segmenting Principle – individuals learn better from a multimedia lesson that is presented in user-paced segments rather than as a continuous unit.
7. Pre-training Principle – individuals learn better from a multimedia lesson when they know the names and characteristics of the main concepts.
8. Modality Principle – individuals learn better from graphics and narrations than from animation and on-screen text.
9. Multimedia Principle – individuals learn better from words and pictures than from words alone.
10. Personalization Principle – individuals learn better from multimedia lessons when words are in conversational style rather than formal style.
11. Voice Principle – individuals learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.
12. Image Principle – individuals do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

Of Mayer's (2014) 12 principles, six were spotlighted, as the others were beyond the scope of this study. The six principles included the coherence principle, redundancy principle, segmenting principle, modality principle, multimedia principle, and voice principle (Mayer, 2014).

According to Mayer's (2014) CTML, humans can only process a finite amount of information in just one channel at a time, and they make sense of incoming information by actively creating

mental representations. Mayer and Moreno (2003) also discussed the role of three memory stores: sensory (which receives stimuli and stores it for a very short time), working (where active processing of information to create mental constructs or schema occurs), and long-term (the repository of all things learned). Furthermore, Mayer and Moreno (2003) underscored the importance of learning, based upon the testing of content and demonstrating the successful transfer of knowledge, when new information is integrated with prior knowledge. Mayer and Moreno (2003) noted,

The case for multimedia is based on the idea that instructional messages should be designed in light of how the human mind works. Let's assume humans have two information-processing systems—one for verbal material and one for visual material. Let's also acknowledge that the major format for presenting instructional material is verbal. The rationale for multimedia presentations—that is, presenting material in words and pictures—is that it takes advantage of the full capacity of humans for processing information. (p. 4)

This theory proposes three main assumptions when it comes to learning with multimedia.

- There are two separate channels (auditory and visual) for processing information and is sometimes referred to as dual-coding theory.
- Each channel (auditory and visual) has a limited (finite) capacity.
- Learning is an active process of filtering, selecting, organizing, and integrating information based upon prior knowledge.

Mayer's (2014) CTML was viewed with a social constructivist paradigm and axiological philosophical assumption. Under the social constructivist paradigm, learners take an active role in their learning (Vygotsky, 1926). Harji and Vafaepour (2015) proclaimed student-centered

learning encouraged learners to understand the importance of initiating the learning process by shaping their own views from their experiences rather than waiting for the instructor to explain and present his or her view to them. Xu (2018) discussed the constructivist theory in detail and affirmed the main idea of constructivism when applied to learning is the environment and its learner-centric focus of knowledge acquisition. Through this theory, knowledge and understanding is socially constructed and promotes student-centered learning with teachers as guides and facilitators instead of the traditional teach or lecture style traditionally seen in the classroom. Xu (2018) stated the constructivist learning environment includes four elements: situation, cooperation, conversation, and meaning construction. An axiological philosophical assumption was selected due to the emphasis on values, intuition, and biases of the researcher when interpreting the data.

The CTML model (Mayer & Moreno, 2003) depicts the occurrence of dual-channel processing in the individuals' mind when utilizing multimedia, auditory and visual. Sensory representation occurs in the eyes and ears of the individual and shallow working representations include the sounds and images perceived by the learner while attending to instruction. In Mayer and Moreno's (2003) model, the deep working memory representations include the verbal and pictorial models uniquely constructed by the learner, and finally, long-term memory depictions are included in prior knowledge or what the learner already knows about the topic being taught. Cognitive processing through both channels is required in multimedia learning. Working memory must make depictions of images and sounds, while deep working memory creates pictorial and verbal models. Lastly, long-term memory is locating and retrieving pertinent prior knowledge in the CTML model (Mayer & Moreno, 2003).

## **Related Literature**

While technology use in the classroom is certainly not a new idea, the replacement of traditional textbooks with Chromebooks is uncharted territory with unknown results (Blikstad-Balas & Davies, 2017). The use of screen media for learning purposes has been a topic for study since 1987 (Cuban, 1987). Since these electronic devices are a relatively recent development, none were present during initial studies, yet their place in classrooms today is prevalent (National Center for Education Statistics, 2018). Upon examining related literature, common themes emerged. Some of these themes included information processing changes in the process of active learning, shifting pedagogical practices, preferred medium of the learner, and the differing needs of learners based on factors such as prior knowledge, familiarity with the device, and attention and focus issues (Alsaeed, 2017; Lauterman & Ackerman, 2014; Maslow, 1943; Mayer, 2019; Singer & Alexander, 2016; Smallhorn, 2017). A close examination of the empirical literature and common themes allowed for an in-depth understanding of Chromebooks for learning purposes.

### **Chromebooks for Learning Purposes**

Many districts in the United States have opted for purchasing online versions of texts or digital downloads of textbooks (Singer & Alexander, 2016). Many factors, including the ability to update information within the text when it becomes outdated, reusability, and cost are just some of the factors taken into consideration (Ahlfeld, 2017). Ji, Michaels, and Waterman (2014) found in meetings with textbook companies, cost effectiveness was a factor considered when adopting digital textbooks over traditional paper textbooks. Also, students cannot lose or destroy virtual textbooks (Ji et al., 2014). Chromebooks have a long battery life, quick start-up time, update automatically, and are simplistic and update automatically; therefore, they do not become

sluggish over time (“Scaling up to 1:1,” 2014). However, there is little evidence that has suggested classroom technology, including Chromebooks, improved educational outcomes (Waters, 2018). One challenge with using Chromebooks for learning purposes surrounds the struggle associated with students working at their own pace and the difficulty of collaboration since students are all at different places in the curriculum when utilizing online devices and programs. The flexibility and personalization of Chromebook implementation caused schools to sacrifice autonomy to technology (Waters, 2018). However, Quinn (2016) found Chromebooks to be effective in increasing technology efficiency and declared learning was enhanced with the reduction of “tedious technical issues that plague traditional operating systems such as updates, re-imaging and data transfer” (p. 91). Additionally, Chromebook implementation can simplify organization, allowing more focus on learning and enabling hands-on projects with deeper skill development and personalized engagement leading to overall improved performance (“Chromebook: Designed for Learning,” 2018).

Parkay, Anctil, and Hass (2014) asserted that the inevitable progression of technology and its integration into the classroom environment mean that curriculum must be developed with this in mind, not only curriculum affecting public school students, but also curriculum developed to instruct novice educators entering the educational field, as well as veteran educators currently in the classroom. Seward and Nguyen (2019) advocated that proficiency with computers in the classroom can support students’ critical problem-solving skills, reading and writing abilities, and creativity across subject areas. The U.S. Department of Education (USDOE, 2016) developed a policy brief to identify key challenges and solutions to the effective integration of technology in teacher preparation. The policy offered guiding principles on how educators can effectively integrate technology into the classroom. In addition, the policy also offered curriculum

developments for teacher preparation programs o identify opportunities for collaboration within the educational field (USDOE, 2016). In the meantime, students have complained that using Chromebooks for learning purposes can be “boring and annoying to just sit there and stare at a screen all day long . . . you have to teach yourself” (Malkin, 2019, para. 10) with students spending as much as five hours per day on a Chromebook. The screen-time usage can be inescapable, with new school buses equipped with wireless Internet so students can access the Internet and complete assignments while en route to school and home (Mestel, 2018).

Simply incorporating technology for technology’s sake is not sufficient; rather, the USDOE (2016) stressed the need for curriculum leaders and faculty to collaborate in sharing innovative tools and strategies in the field to ensure their technology use is contributing to learning and achievement. These changes in technology have influenced the roles of teachers and students. The need for educators to guide students in their journey to become critical thinkers, capable of deciphering useful information in a vast ocean of available resources, is crucial (Parkay et al., 2014). Students now have access to and regularly use smartphones, laptops, and social media; therefore, educators must be able to create a learning experience where technology is a part of a seamless real-world experience (USDOE, 2016). In doing so, curriculum enables students to develop healthy habits regarding technology integration and its role in everyday life.

In prior studies, processes like reading speed and ability were studied, with paper presentation generally outperforming computerized texts (Singer & Alexander, 2016). Initially, researchers attributed these differences to factors like backlighting and flickering of electronic texts, spacing across media due to difficulty gauging length of textual passage when in digital form, scrolling versus page-turning, and involvement of the five senses, such as the feel, smell, and weight of the paper (Hou, Rashid, & Lee, 2017). However, with advances in technology, the

gap is closing in discrepancies between screen-reading and paper texts (Porion et al., 2016).

Hermena, Sheen, Al Jassmi, and Al Falasi (2017) suggested that advances such as digital ink and the ability to turn pages on e-readers mimic paper text reading. The majority of students at the middle grades level are digital natives, having never known a time without computers, e-readers, or smart phones (Lauterman & Ackerman, 2014). A closer examination of learning utilizing Chromebooks in the classroom through the lens of Mayer's CTML (2014) was warranted as it related to the learning process and presented the idea that the brain does not interpret a "multimedia presentation of words, pictures, and auditory information in a mutually exclusive fashion; rather, these elements are selected and organized dynamically to produce logical mental constructs" (p. 47).

### **Information Processing Changes**

Lauterman and Ackerman (2014) voiced concern over students' use of technology and the implementation of curriculum centered around technology as the sole instrument for learning, as it lends itself to more shallow learning. Additionally, the absence of deep-thinking when utilizing computers for learning was noted (Delgado, Salmeron, Varas, & Ackerman, 2018). The amount of time students spend behind a screen is steadily increasing and the implications have been noticed by researchers. Schools began adapting to the technology curve by allocating funds for devices and computer software programs for curriculum instruction purposes (Ahlfeld, 2017). This change increased the amount of screen time young people are exposed to exponentially. A recent study involving more than 11,000 American children revealed more than two hours per day of screen time could do major damage (Naftulin, 2018). In Naftulin's (2018) study brain scans revealed premature and severe thinning of the brain's cortex when seven hours or more per day was spent interacting with screens.

Hou et al. (2017) suggested different reading media have dissimilar material characteristics that afford contrasting sensorimotor experiences, influencing cognitive processing of the text. Worrell, Duffy, Brady, Dukes, and Gonzalez-DeHass (2016) shared that “variations in screen size, font size, screen resolution, operating systems, and browser settings can affect readability from computer screens, and student performance during computer-based assessments” (p. 267). “Texts are difficult to read online in part because they are not designed for that medium. Online texts are digital versions of printed texts designed for a page not a screen” (Robertson, 2006, p. 442). Knowledge creation is a process through which in its “conversion into knowledge, requires certain cognitive, critical, and theoretical skills that enable us to orient ourselves in thought” (Mehmood, Rehman, & Rizvi, 2014). Delgado et al. (2018) concluded the paper-based reading advantage was consistent across studies using informational texts, or a mix of informational and narrative texts, yet their studies using only narrative texts showed no effect of media on comprehension. Lui (2015) speculated that “when humans experience the world, they conceptualize experiences into concepts and relations through the brain and store them in their memory” (p. 432). Porion et al. (2016) concluded that “students read more slowly from the computer, but recall more information” (p. 570). In their study assessing recall, Johnson and Nádas (2009) showed that participants had poorer recall on screen, with more difficulty remembering the location of details in texts. Walsh (2016) speculated that “to remember something, the brain recollects information in relation to its context, and oftentimes one can remember something specifically by its location within a document. Thus, remembering can develop into knowledge” (p. 162). However, a recent study from the Gallant Lab at UC Berkeley showed no difference in the cognitive and emotional areas of the brain’s cortex stimulated when listening to an audiobook versus reading the printed version (Walter, 2018). This information



could be useful to teachers using Chromebooks in the classroom to have students listen to audio recordings of novels.

Carr (2013) identified the language and visual ability areas of the brain that were stimulated when reading print. In addition to these, the decision-making and pattern analysis areas of the brain were also stimulated when reading online. Walsh (2016) emphasized this overstimulation may “negatively affect readers’ ability to reflect, absorb and recall information as effectively as information in the paper form” (p. 162). Dillon (1992) suggested that the concept of a schema for electronic documents lacks the history of print, and to date, schematic structures for information on paper have little or no electronic equivalents. Young (2014) affirmed Dillon’s suggestion, claiming the “study’s findings and focus-group interviews suggest that schemata structures or processing information would now appear to be used extensively when a reader engages with an electronic text” (p. 390). Lui (2015) concluded, “Far from being linear as the arrangement of words in the print is, what these words evoke in readers’ mind is a highly complex and hierarchical structure of certain situations” (p. 437).

### **Process of Active Learning**

Active learning was defined as instructional activities involving students in activities while thinking about what they are doing (Kolb, 2014). In Kolb’s (2014) study, the interactive process occurred when students were engaged in their own learning and were able to articulate and reflect on their learning by talking, listening, writing, reading, and reflecting. Pearson, Buchanan, and Thimbleby (2013) stated reading is rarely passive since it is accompanied by thinking and learning. Adler and Van (1972) defined active reading as a tiered approach in evaluating a book’s purpose, structure, claims, and implications. The recent technology integrated into Chromebooks allows students to engage with the device as though they were

using a tablet by folding the Chromebook in half and scrolling using their fingers on the tablets' new touchscreen innovation. Thompson (2015) identified characteristics found to inhibit active learning and usage on touchscreen devices citing apps with “unclear or unresponsive user interface, game play that lacks reward or feedback, obscure game objectives, too many distractions, and apps that lack palm rest where buttons trigger themselves if touched within the play area” (p. 21).

Lau et al. (2017) affirmed that the “learning process must consist of a combination of discursive, adaptive, interactive, and reflective activities to engage students in deep meaningful learning” (p. 14). In other words, “a feedback mechanism—a commonplace in face-to-face traditional classroom-based learning but a shortfall in most distance education and online study—needs to be set in place, perhaps embedded in the e-learning resources, to enable higher-order learning” (Lau et al., 2017, p. 21). Fortunati and Vincent (2014) postulated there was a certain actively unique, creative, and personal freedom that aligned with writing that could not be replicated through typing. Additionally, the same study found students learned better when reading lengthier texts from paper as opposed to a screen (Fortunati & Vincent, 2014).

Ross, Pechenkina, Aeschliman, and Chase (2017) speculated that students may have responded to different learning strategies that do not account for reading comprehension when interacting with digital devices compared to print; however, the manner in which learners perceive their understanding, the device, and the platform is critical to their willingness and engagement in the active learning process. Smallhorn (2017) claimed the manner, device, and platform suggested that students attending classes incorporating computers was strongly linked to learning outcomes and poorly engaged learners were more likely to fail. Additionally, Smallhorn (2017) proclaimed the “cultural shift towards a more engaged learner was a key

attribute which had the potential to increase student retention at both topic and course level” (p. 51). Weng, Otanga, Weng, and Cox (2018) hypothesized curriculum needs to be developed in a new manner in which interactivity takes place between the learner and the computer to engage and motivate students in the process of learning.

Kim, Kim, Khera, and Getman (2014) studied expanded roles, responsibilities, and challenges associated with student-centered learning by analyzing the active learning process students encounter in flipped classrooms. In flipped classrooms, in-class instruction is often replaced with videos and using class time to complete homework. Kim et al. (2014) found no evidence that the flipped classroom model using computer screens as instruction contributed to increased student grades. Additionally, no observable increase was found in students’ academic achievement when using the flipped classroom model; instead, students lacked face-to-face engagement with teachers, a critical component of active learning and learning satisfaction (Cabi, 2018; Sun & Wu, 2016). Quinn (2016) found Chromebook usage in flipped classrooms to be a successful teaching method since they use streamlined technology and delivered a standardized and focused learning tool where learning was enhanced. Even very young students at the prekindergarten levels showed less active engagement when reading electronic print versus print books (Munzer, Miller, Weeks, Kaciroti, & Radesky, 2019). Pearson et al. (2013) attributed this disengagement to the affordance offered by physical documents, including subconscious interactions that “divert very little cognitive attention from the primary active reading task” (p. 44).

### **Shifting Pedagogical Practices and Roles**

Smallhorn (2017) suggested that to improve student engagement with educational material, instructors needed to deliver curricula which fostered relationships and promoted active

learning. When teaching with Chromebooks, each child works on something different, thus taking away the most “human component in the learning process, which is social interaction-learning from one another and collaborating to solve problems, instead developing a relationship with their tablet but not with each other” (Waters, 2018, para. 12). Alsaeed (2017) reaffirmed Smallhorn’s (2017) suggestion to foster relationships and included the need for teachers and educators to be aware of the student-centered approach to learning, in which the students and their intellect and uniqueness are the center of instruction. Lau et al. (2017) stated that conversations among students and educators, which are commonplace in an instructor-led classroom but scarce in a classroom utilizing computers for instruction, are vital as a source of learning. Consequently, Alsaeed (2017) recommended students use the Internet learning resources with the guidance of instructors as a key part of instruction. Salmeron, Gil, and Braten (2018) found that teachers may initiate students’ understanding of a document’s content by presenting learners with real instead of print-out versions of documents. In this way, “our findings seem to support the use of ‘old-fashioned’ text-based documents in instructional contexts because such documents can enhance document boundaries and help readers create document level representations from the reading materials” (Salmeron et al., 2018, p. 34). Sahin, Top, and Delen (2017) found teachers’ familiarity with technology has a direct impact on changing instruction in the classroom setting, and professional development regarding Chromebooks was imperative to proficient implementation in the classroom.

Wilson (2017) relayed that “although an increasing amount of business, social interaction, and more take place online, many classrooms continue to rely on pen and paper” (p. 62). Wilson (2017) stated that the “limitations of many learning programs and computers contribute to this by creating an unintuitive, cumbersome process that teachers must work around

with more traditional methods” (p. 11). Hahnel, Goldhammer, Naumann, and Krohne (2015) determined comprehension could be improved if learners were provided guidance on following particular hyperlinks. Additionally, Vygotsky (1978) implied instruction and learning to be most advantageous when learners engaged in “activities within a supportive learning environment and when they receive appropriate guidance that is mediated by tools” (p. 231). Sun and Wu (2016) found no difference in student and teacher interaction between a traditional teacher-led classroom and a flipped classroom led by technology with the teacher present. Both classroom models provided for positive effects on student learning achievement and opportunities for collaboration, guidance, and assistance to students. Kimmons, Darragh, Haruch, and Clark (2017) found Chromebooks to be beneficial for eighth grade students in essay writing, suggesting greater complexity in vocabulary and sentence composition when compared to handwritten essays, suggesting the “medium itself may have an effect upon the complexity of student writing” (p. 13).

The practice of linking online resources to textbook content proved to be challenging yet beneficial for collaborative purposes (Mason & Kimmons, 2018). When teachers worked together to co-design online resources to be used in the classroom, teachers were enabled to share knowledge and experience to personalize the curriculum from their experiences, aligned to specific goals of students (Khlaif, Gok, & Kouraichi, 2019). Oftentimes, the implementation of online curricula requires a fundamental change in the method teachers traditionally taught and force teachers to transform resources into instructional experiences for students (Nie et al., 2013). Nie et al. (2013) also found student learning to be directly related to the instructional tasks selected and assigned by teachers from their provided materials. Arnold (2013) found textbooks served as a valuable springboard for teacher training when learning to teach using computers as

the medium in the classroom. Teachers and students alike learned best with a combination of technology and paper and the two seemed to complement one another (Arnold, 2013).

The rise of what is referred to as the Net generation by Macpherson (2018) will need to be “educated in a knowledge economy” (p. 303). Unfortunately, the current method of learning, which Macpherson (2018) termed the “broadcast learning” (p. 303) method of delivering instruction through lecturing, can no longer be supported due to financial restraints. Macpherson stated that the Net generation will learn through a more media savvy method in which the educational potential of the Internet is implemented. Macpherson shared that, in the pedagogical delivery method of Internet technology, the instruction will transition from:

- Linear to hypermedia writing;
- instruction to construction and discovery;
- teacher-centered to learner-centered,
- absorbing material to learning how to navigate and learn;
- school learning to lifelong learning;
- standardized to customized learning;
- learning as torture to learning as fun; and
- teacher as transmitter to teacher as facilitator (p. 303).

Technology and Chromebook usage in the classroom, while ubiquitous, must bring about transformative pedagogical practices. Teachers must become educated to the usage of Chromebooks with a focus on innovative pedagogies rather than the Chromebooks themselves (Cramp & Lamond, 2016). Meaningful engagement and delivery through the use of Chromebooks for learning purposes is essential to student learning. The importance of relational connectiveness between teacher and student, along with a nurturing environment is imperative

for learner confidence and growth when using Chromebooks for learning (Ng'ambi & Bozalek, 2013).

### **Other Factors to Consider**

The decision to forgo traditional textbooks does not come without its own set of drawbacks. In order to allow students accessibility to virtual or online textbooks, schools must be equipped with electronic mediums with which students may access the texts. Many schools have implemented the use of existing desktop computers in computer labs or media centers within the school, while others have chosen to purchase iPads, tablets, or relatively inexpensive laptop computer devices such as Chromebooks (Ahlfeld, 2017). Yet there are still other factors to be considered.

Due to the dynamics and manner of screen reading, aspects such as scrolling through text on a screen, the positioning of the reader in relation to the screen, and the reader's familiarity with the device being used, many readers may find comprehension difficult due to factors outside of cognition (Sun et al., 2013). "From the viewpoints of psychology, physiology and ergonomics, there are many factors influencing people's reading comprehension performance" (Sun et al., 2013, p. 91), including linguistic surface structure, semantic cognition, and individual disparities in prior knowledge and retention ability (Margolin et al., 2013; Pearson et al., 2013). Many commonalities exist between print reading and digital reading in cognitive operations such as sentence integration, decoding, and interpreting linguistic nuances. Similar skills the reader must possess include the ability to identify important questions, locate, evaluate, synthesize, and communicate information (Lim & Jung, 2019).

McGlynn and Kelly (2018) attested to the benefits of traditional textbooks and how to effectively use them by modeling strategies good readers use. Through utilization of interactive

activities using the textbook, such as guided notes, think-alouds, graphic organizers, carousel activities, and text data sets, students were encouraged and showed growth. As an ever increasing number of school districts

follow the momentum for using digital textbooks and developing digital curricula aligned to standards, training of teachers to develop and adapt digital curricula, optimizing technology, and improving teachers' capacity to meaningfully implement a digital curriculum and associated technologies becomes a challenge. (Leary et al., 2016, p. 69)

Another factor to be considered when implementing Chromebooks for learning purposes within the classroom is the human factor and the challenge the delivery presents regarding the development of a meaningful human approach to online learning (Cramp & Lamond, 2016). Engagement opportunities exist yet require a collaborative process with concerted efforts given to ensure a warm and inviting learning environment that fosters learning. Vygotsky (1978) believed "instruction is most efficient when students engage in activities within a supportive learning environment and when they receive appropriate guidance that is mediated by tools" (p. 231). Possible associations between digital media and mental health including low self-esteem and psychological well-being were found with moderate and heavy digital media usage (Hari, 2018; Housman, 2014; Lobel, Engels, Stone, Burk, & Granic, 2017; Maras et al., 2015; Page, Cooper, Griew, & Jago, 2010; Romer, Bagdasarov, & More, 2013; Rosen et al., 2014). Special concern was shown regarding adolescents, a subgroup prone to vulnerability of psychological well-being that has come of age with smartphones and other technology, allowing for constant access to the Internet (Twenge & Campbell, 2019). However, Barryman, Ferguson, and Negy (2017) found that there is no link between digital media usage and mental health. Twenge and Campbell (2019) concluded the need for further research into factors such as developmental



needs, socioeconomic status, academic performance, delinquent behavior, and predisposition to addictive behavior or depression.

Additionally, there was an associated connection between handwriting and learning to read (Horowitz, 2018), and increased technology usage in the classroom was found to have an impact on language and literacy. In a study conducted by Wolf (2018), the cognitive connection between the multisensory activity of handwriting enabled the learner's hands and eyes to engage and transmit information to the brain, which was found to activate reading circuits in the brain and promoted literacy. In contrast, typing words onto a keyboard was not found to improve reading skills, encouraging skim reading rather than reading carefully and slowly (Wolf, 2018).

### **Attention and Focus**

Gurian and Stevens (2006) suggested that students will hyper-focus when engaged with an online educational game and thus may completely miss directions to close their Chromebooks. Many of the online learning games students are instructed to use employ the usage of practicing the same material or pattern repetition which Wang, Dapretto, Hariri, Sigman, and Bookheimer (2004) found to disengage the brain's thinking. It is essential that school systems purchase programs utilizing higher order thinking skills or critical thinking skills, not simply patterns or rote memorization techniques. Singer and Alexander (2016) found learners performed worse on digital, single-spaced text when attention was medium or poor. Waters (2018) noted that

students as young as Kindergarten used Chromebooks for up to 90 minutes, uninterrupted, in a large room where kids spend time sitting at long tables, wearing headphones and working on laptops, supervised by classroom aides. Students scarcely talked and when they did, or their attention drifted too far, they were admonished. The

kids looked zoned out, with blank expressions on their faces and were often told by a supervisor to “focus” and “sit up.” Some children even complained of becoming dizzy or having fuzzy vision. (p. 14)

Due to the complexity of the reading process, attention played a significant role when measured by eye movement in a lab setting (Stern & Shalev, 2013). The attention level of the reader was found to affect the interaction with the medium, and students who possessed higher attention levels performed best on digital devices, while students who possessed lower attention levels performed worse on digital screens. All learners benefitted when text was presented on screen and students with diagnosed attention issues became less frustrated with lengthy texts since they were unable to gauge the length of a text presented on a screen (Stern & Shalev, 2013). However, schools in Sydney, Australia, removed usage of iPads from classrooms (Baker (2019) after 11 years of traditional textbook replacement due to the distractions and lack of contribution to technology skills gained. Merga (2014) stated an “analysis of all the research into differences in book formats has found that understanding improves when information is read in a paper rather than a digital format” (p. 34) due to perceived comfort, retention, and comprehension of what had been read when paper was used. Additionally, Alexander and Trakhman (2017) found there to be little difference when students were asked about general themes of the text, yet the printed text made students better able to answer specific questions and increased engagement and deeper comprehension when required to read lengthier texts of more than 500 words.

Gose (2017) noted teachers who favor banning Chromebooks must be mindful in preparing instruction for students with disabilities, especially students with attention deficit hyperactivity disorder who might receive accommodations such as voice-recognition software to

record a lecture. Additionally, May and Elder (2018) related students' tendency towards media multitasking, switching and dividing attention, as inherent mental habits when utilizing devices for learning and the importance of instructors to understand the effects on attention and working memory of the learner. One technique employed in an attempt to regain focus when reading from paper texts was finger-tracing of words as they were read; however, this can be difficult to accomplish when screen-reading (Kilickaya, 2016). Additionally, readers with self-described attention issues admitted to skipping around when reading a passage on a screen device since they were unable to gauge the length or how far along they had read in the passage (Al-Samarraie, Sarsam, & Umar, 2017). Hahnel et al. (2015) asserted learners' decisions on whether to delve further into a particular reading by clicking embedded hyperlinks proved to be a distractor.

### **Preferred Medium of the Learner**

Ackerman and Lauterman (2012) declared the greatest knowledge acquisition was achieved in both paper and screen media when learners studied on their preferred medium. Thus, the preferred medium of the learner was deemed a critical factor in the "accuracy of knowledge monitoring and in the effectiveness of learning regulation according to task demands even for learning from continuous texts" (Ackerman & Lauterman, 2012, p. 456). Additionally, personal study preferences were found to be of great importance in dealing with effects of the medium on learners' knowledge acquisition (Merga & Roni, 2017; Ross et al., 2017). Myrberg and Wiberg (2015) shared the problem with screen reading to be more psychological than technical and argued the importance of utilizing the preferred medium of the learner to achieve confidence and better test scores.

Köpper, Mayr, and Buchner (2016) found that neither learners' increased computer experience nor advancements in screen technology eliminated the inclination of participants' preference for paper texts, and when allowed to read from their preferred medium, participants experienced greater comfort, with less eye strain and neck pain. Merga (2014) found that students did not necessarily prefer reading from screens and that reading paper books was often more appealing. Young adults are no more likely than older learners to be digital only book readers (Perrin, 2016). Students who prefer e-textbooks for their learning purposes had "significantly higher perceived affective learning and psychomotor learning than students who chose to use traditional print textbooks" (Rockinson-Szapkiw, Courduff, Carter, & Bennett, 2013, p. 259), and there was no difference discovered in cognitive learning or grades between the two preferred mediums. However, Kurata, Ishita, Miyata, and Minami (2016) found a mismatch between reading behavior and stated preference for print and digital media.

### **Reading Level/Skills**

Sun et al. (2013) discovered that once participants had acquired a certain degree of technical skill, there was little difference in comprehension outcomes between learners reading on screen or paper. This same study suggested the age of the reader, not the medium, affected the ability for cognitive processing and memory (Sun et al., 2013). Walsh (2016) stated that the process of "reading deeply is integral to furthering comprehension, deductive reasoning, critical thought, and insight" and those who have advanced reading skills are able to "contextualize and infer deeper meaning from text" (p. 165). These deep-reading skills are abilities that may take years to develop (Walsh, 2016).

In identifying the areas of the brain activated by deep-reading, Hou et al. (2017) observed that over-stimulation may occur and have a negative impact on the reader using screen media.

Hou et al. (2017) discovered that

according to the cognitive map mechanism, human brains read by constructing a mental map of the text based on the spatial placement of the textual information on a page. The extent to which a text presentation facilitates or impedes the formation of a cognitive map of the text structure would influence text processing. We observed that reading with disrupted view (from a screen and not from paper), a specific design that hindered mental map construction, appeared to be a compromised reading experience in terms of comprehension, feelings of fatigue, and psychological immersion. (p. 92)

Deep-reading skills are necessary to assist in cognitive analysis of reading material (Mayer, 2014). Singer and Alexander (2016) noted that older readers whose reading skills and reading level were advanced, were found to read more quickly in print than digitally, which was found to be an “anomaly with regard to the relation between speed and medium within the same study” (p. 171). Emergent readers performed better on all indicators (words, phrase, and story structure) under the print versus electronic condition (Singer & Alexander, 2016). Advantages were found in reading on paper for information and were attributed to learners’ use of strategies for reading on paper (Kong, Seo, & Zhai, 2017). Additionally, the increased demand on learners’ cognitive load when reading on screens was found to impede comprehension (Kong et al., 2017).

### **Prior Knowledge**

Learners construct understanding based on prior knowledge and the convergence is made meaningful by the organization of the newfound knowledge into a coherent structure (Mayer, 2019). Additionally, learners’ familiarity and prior knowledge regarding digital device usage

assisted in learners' comprehension (Hermena et al., 2017). Hahnel et al. (2015) advocated the underlying skill of evaluating the usefulness of online information and basic computer skills were critical components contributing to learners' comprehension of digitally distributed material. Coiro (2011) discovered the following:

There was an interaction between prior knowledge and online reading comprehension, such that higher levels of online reading comprehension skills may help compensate for lower levels of topic-specific prior knowledge when adolescents are asked to locate, critically evaluate, synthesize, and communicate information using the Internet. (p. 352)

Leu et al. (2015) noticed a distinct gap for online research and comprehension for learners who had little to no prior knowledge using online resources. Additionally, an integral component of learning acquisition is the ability to integrate or synthesize from multiple sources, infusing prior knowledge and applying it when applicable (Kiili & Leu, 2019). Kiili and Leu (2019) discovered that the integration from multiple online texts was difficult for adolescent students. Seward and Nguyen (2019) asserted educators must be mindful of the full range of abilities students possess and reconceptualize the teacher-student dynamic by delving into their students' existing repertoires in technology and harness the inherent participatory culture of technology in the classroom.

### **Impact of the Screen**

Hermena et al. (2017) discovered hypertext structure and the linguistic structure's effect on comprehension and retention appeared evident and the addition of enabled links on a screen encouraged readers to exit one reading document and explore another range of alternatives. This provided for a less fluid, linear experience for the cognitive and linguistic skills for the reader to be able to understand both the literal and inferential meanings of text. Google Chromebooks and

Google Apps are specifically designed to compete for kids' attention, and developmentally, a "war is being waged for attention and it is affecting our children . . . it should be a tool that you use, not a tool that uses you" former Google manager Tristan Harris postulated (Cooper, 2018, para. 11). Hutton, Dudley, Horowitz-Kraus, DeWitt, and Holland (2019) found associations between increased screen media usage and lower microstructural brain white matter integrity contributed to language and emergent literacy skills in preschool-age students and suggested further studies in the early stages of brain development.

The spatial layout of text can also directly affect memory and recall. Hermena et al. (2017) found that students tend to bounce around textbooks during the research process, just as they did when employing electronic print for information. The researchers discovered that graduate students and those in higher levels of learning preferred to print out electronic texts, citing the inability to gauge the length of an article from an electronic source as one of the deciding factors to read from paper. In addition, Singer and Alexander (2016) indicated older adults may be lacking in linguistic and cognitive abilities when compared with younger counterparts, so it is crucial when assigning reading comprehension assessments that factors such as age and computer literacy be taken into account. Additionally, Sun et al. (2013) considered hypertext to be an advantageous medium for readers to improve their inferential text comprehension, and appropriate employment of hypertext documents can provide reading performance that is quite comparable to traditional hard copy material.

The effectiveness of annotating electronic material versus highlighting paper texts is one area of interest and concern among researchers. Reading for information involves high levels of concentration and a certain amount of intimacy with the document being studied (Singer & Alexander, 2016). Methods students employ include bookmarking, annotating, and highlighting

within the document (Sun et al., 2013). Many students convey an inclination for using print texts for lengthy readings. While research shows an improvement in the ability of e-texts in regard to annotating, which is an integral component of academic reading, they simply do not yet equate to the functionality of their print counterparts (Walsh, 2016).

Porion et al. (2016) indicated students tended to dip into online learning for particular information as opposed to reading the document in its paper form. When doing this, useful information may be missed or skipped over entirely. Some students said they preferred the printed version of texts due to the strain placed on their eyes when reading from a screen (Walsh, 2016). Instead, many students printed out electronic documents to read, finding it less difficult to navigate and easier to browse due to the nature of scrolling and turning pages on a screen (Ross et al., 2017). Also, Porion et al. (2016) reported many students responded that due to the vast amount of capabilities of computers, they were prone to distraction when using them, in turn affecting retention and comprehension of information. On the other hand, Weng et al. (2018) found when the information being presented is designed for the medium, computers have the ability and potential to engage students. Lauterman and Ackerman (2014) indicated that the nature of online documents can encourage skim reading, and many research participants viewed printed material as being more authoritative and less distracting. Additionally, Hahnel et al. (2015) discovered learners tended to skim and scan pages of electronic text in search of relevant information.

Margolin et al. (2013) examined the effects of technology on reading comprehension and noticed an increase in reading speed when employing paper; however, the researchers attributed the result to factors like backlighting and flickering of electronic texts, spacing across media, and scrolling as opposed to page-turning. However, Kimmons et al. (2017) found Chromebook



essays exhibited a “significantly higher grade-level of writing and greater reading difficulty” (p. 15) over their handwritten counterparts. The discrepancy gap between screen-reading and paper texts is closing with advances in technology (Weng et al., 2018).

### **Learning Styles and Differing Needs**

Maslow’s (1943) hierarchy of needs demonstrates the psychological importance of the need for individuals to feel safe, loved, and respected. The nature of employing screen media in the classroom creates a lack of face-to-face interaction. Reich, Subrahmanyam, and Espinoza (2012) suggested that young people’s online and offline worlds are psychologically connected. Therefore, if a student engages with others in an online environment that makes them feel unsafe, unloved, or disrespected, those feelings will carry over into their offline world. This factor creates a void some researchers have asserted can hinder the development of close connections. Lau et al. (2017) discovered the majority of textbooks’ learning resources are appropriate for low to mid-order learning acquisition according to the current revised Bloom’s taxonomy.

Leer and Ivanov (2013) affirmed a customized education should be created when implementing technology in the classroom, matched with the way each child learns best, enabling intrinsic motivation to occur. The specificity of current technological approaches countered the standardized methods of traditional textbook learning which does not always serve every child best (Doyle, 2008). Younger students have been found to be much more touch oriented and the use of a tablet was discovered to be beneficial; new Chromebook models have the ability to fold in half and are touch enabled to mimic a tablet (“Scaling up to 1:1,” 2014). The key to differentiated learning is multiple intelligences which can be difficult when teaching on Chromebooks; however, through creative planning, teachers can still reach students who have

strengths such as social and emotional intelligence, as well as creative abilities (Christensen, Johnson, & Horn, 2010).

### **Strategies for Learning with Chromebooks**

While research shows an improvement in the ability of e-texts in annotating, which is an integral component of academic reading, they simply do not yet equate to the functionality of their print counterparts (Walsh, 2016). Methods students employed when reading from traditional paper texts for learning purposes included bookmarking, annotating, and highlighting within the document, and Walsh (2016) stated many students conveyed an inclination for using print texts for lengthy readings. Additional techniques readers utilized were reading, re-reading, taking notes, saying words silently, saying words aloud, and moving lips while reading (Margolin et al., 2013).

Weng et al. (2018) found a higher perceived degree of learning and a higher preference for e-textbooks than paper texts; however, no difference was found in resulting test scores. The researchers surmised that learners utilized skimming and selective attentiveness when reading from the e-textbook, a helpful strategy when learning from an electronic device such as a Chromebook (Weng et al., 2018). Ji et al. (2014) affirmed these findings by asserting learners skimmed electronic texts; however, their findings noted learners obtained deeper engagement and knowledge when utilizing paper texts. In utilizing Chromebooks for learning purposes, interventions should be made to aid learners to productively manage their confusion to assist in correcting misconceptions and to strengthen conceptual networks (Lehman, D'Mello, & Graesser, 2012). In this manner, teachers can be more sensitive to learners' individual differences.

The platform Chromebooks employ, Google Apps for Education (GAFE), is simplistic for students to access and use whether using the school network or a personal device from home. Despite the advantages of their simplicity, GAFE and Chromebooks do not meet all needs, and they have “struggled to make their case outside the student deployment” (Gruman, 2017, p. 3). GAFE enables teachers to assign activities, homework, and links, to set specific due dates, and receive homework from students. This eases the teacher’s amount of work and imposes accountability for students and allows for communication between teachers and students through email and Google Classroom, a component of GAFE that allows for a paperless classroom (Gruman, 2017; Reaves, 2017). Students are able to receive direct feedback from the teacher, and teachers are able to receive and grade electronic papers as they are submitted in real time, speeding up the instruction process and allowing time for more content delivery (Spence, 2018). Ahlfeld (2017) suggested educators and librarians share their search strategies using Chromebooks as early as possible to enable students to become thinkers, researchers, and creative thinkers in control of a wonderful tool, rather than students controlled by a wonderful tool. By training students in search strategies in the early grades, they will be less likely to succumb to the wasted time resulting from a downward spiral of unrelated information through wasted clicking on images and videos (Ahlfeld, 2017).

### **Summary**

The introduction of Chromebooks and digital textbooks has led to a dramatic shift in middle school classrooms in the United States (Ahlfeld, 2017). Oftentimes, Chromebooks are replacing traditional paper textbooks, and this transition has been supported by textbook companies as they offer expanding online versions or digital downloads of their traditional textbooks (Ullman, 2015). Schools throughout the United States are opting to purchase the

online versions of textbooks in lieu of paper versions for a variety of reasons. Electronic textbooks usually cost less than their paper counterparts; however, many of these studies are contradictory in their findings (Bentley, 2012; Giebelhausen, 2016). In addition, digital versions cannot be lost, damaged, or stolen, saving school systems valuable time and money (Ullman, 2015). While technology use in the classroom is certainly not a new idea, the replacement of traditional textbooks with Chromebooks is uncharted territory with unknown results (Blikstad-Balas & Davies, 2017). The experiences and subsequent effects on pedagogical practices are yet to be seen and require further study.

While some studies indicated that learning is more difficult when utilizing a computer screen as opposed to paper (Mangen, Walgermo, & Brønneick, 2013), others implied that there is no difference between the two (Krug, 2006; Noyes & Garland, 2008; Schneiderman & Plaisant, 2009). Noyes and Garland (2008) suggested that the results depended on the assessment criteria and that some tasks were more appropriate than others for a given medium. I have been unable to locate any case studies researching middle school teachers' perspectives using Chromebooks for instructional purposes after having previously taught with traditional textbooks.

The purpose of this chapter and literature review provided an overview of the theoretical framework guiding this collective case study, including Mayer's (2014) CTML and the understanding of the experiences of middle school core content area teachers using traditional textbooks and Chromebooks in the classroom environment. Mayer's (2014) CTML addressed the way an individual processes pictures and words during the learning process. A review of the empirical literature relating to learning from textbooks and Chromebooks included information processing changes, the process of active learning, and shifting pedagogical practices. Additionally, the review identified the gaps in the literature in the body of research and

emphasized the significance of this collective case study, as the understanding on the topic is still developing.

Upon examining related literature, common themes emerged. Some of these themes included information processing changes in the process of active learning, shifting pedagogical practices, preferred medium of the learner, and the differing needs of learners based on factors such as prior knowledge, familiarity with the device, and attention and focus issues (Alsaeed, 2017; Lauterman & Ackerman, 2014; Maslow, 1943; Mayer, 2019; Singer & Alexander, 2016; Smallhorn, 2017). A close examination of the empirical literature and common themes allowed for an in-depth understanding of Chromebooks for learning purposes.

Many districts in the United States have chosen to purchase online versions of textbooks or digital downloads (Singer & Alexander, 2016). One struggle with Chromebook implementation is the sacrifice of schools' autonomy to allow for personalization of the curriculum (Waters, 2018). The process of active learning occurs when learners are engaged in their own learning and are able to articulate and reflect on their learning (Kolb, 2014). Recent technological advances in Chromebooks allow students to engage with the device in a more pronounced manner. Smallhorn (2017) suggested that to improve student engagement with educational material, teachers needed to deliver curricula which foster relationships and promote active learning. Professional development is vital to the success of Chromebook implementation ("Scaling up to 1:1," 2014).

Additionally, Vygotsky (1978) implied instruction and learning to be most advantageous when learners engage in "activities within a supportive environment and when they receive appropriate guidance that is mediated by tools" (p. 231). Other factors to be considered when replacing textbooks with Chromebooks are the readers' familiarity with the device and the

guidance on how to implement and utilize interactive strategies while reading, such as guided notes, think-alouds, graphic organizers, and carousel activities (McGlynn & Kelly, 2018).

Students who lack the ability to focus or who have been diagnosed with attention disorders such as attention deficit hyperactivity disorder may hyper-focus when engaged with an online educational game, thus missing directions or instruction regarding the curricula (Gurian & Stevens, 2006).

It is imperative for school systems to purchase programs utilizing higher order thinking skills or critical thinking skills, not simply patterns or rote memorization techniques (Wang et al., 2004). Ackerman and Lauterman (2012) asserted the greatest knowledge acquisition was achieved in both paper and screen media when learners studied on their preferred medium. Sun et al. (2013) discovered that once students had acquired a certain degree of technical skill, there was little difference in comprehension outcomes between learners reading on screen or paper. Learners constructed understanding based on prior knowledge and the convergence was made meaningful by the organization of the newfound knowledge into a coherent structure (Mayer, 2019). Hermena et al. (2017) found hypertext structure and the linguistic structure's effect on comprehension and retention appeared evident, additionally the addition of enabled links on a screen encouraged readers to exit one reading document and explore another range of alternatives. The short-term effects of Chromebook implementation on students and staff seem to have a positive impact on engagement ("Scaling up to 1:1," 2014). Reaves (2017) found Chromebooks to be a practical alternative to the traditional computer lab, allowing more teachers to engage students in the classroom.

Maslow's (1943) hierarchy of needs demonstrates the psychological importance of the need for individuals to feel safe, loved, and respected. The nature of employing screen media in

the classroom creates a lack of face-to-face interaction, prompting a need for a more customized educational experience to ensure students engage with others (Leer & Ivanov, 2013). Weng et al. (2018) found a higher perceived degree of learning and a higher preference for e-textbooks than paper texts; however, no difference was found in resulting test scores. Walsh (2016) showed an improvement in the ability of e-texts in annotating, which is an integral component of academic reading, yet e-texts did not yet equate to the functionality of their paper counterparts. Arnold (2013) declared the computer as an instructional tool to be neither “inherently good or bad, appropriate or inappropriate, effective or ineffective” (p. 235); rather, those judgments and outcomes depended on when, how, and why the computer was used in the classroom.

## **CHAPTER THREE: METHODS**

### **Overview**

The purpose of this collective case study was to understand the experiences of Central County Middle School teachers who used Chromebooks in place of traditional textbooks in the classroom for student learning. The theoretical framework that guided this study was grounded in Mayer's (2014) cognitive theory of multimedia learning (CTML). The data were collected from 15 teachers in the sixth through eighth grade core content areas from multiple middle schools within Central County (pseudonym), Georgia, through one-on-one interviews, participant journaling, and focus groups. Data were analyzed to examine common themes. This chapter begins with an in-depth overview of the selected design. Following this section, the research questions, site, participants, and procedures are described. Next, the researcher's role, data collection procedures, and data analysis are discussed. Finally, the trustworthiness and ethical considerations are described and the chapter summarized.

### **Design**

A qualitative approach was used to describe with rich, thick details the experiences of middle school teachers using Chromebooks instead of textbooks in the classroom. Yin (2014) stated, "Qualitative research most of all involves studying the meaning of people's lives, as experienced under real-world conditions" (p. 9). During this qualitative study, a collective case study research design was utilized. Characteristics of an exemplary case study, according to Yin (2014), include that the case study is significant, complete, considers alternative perspectives, contains sufficient evidence, and is engaging in composition. By utilizing a case study design, participants were purposefully selected and were able to provide essential information or understanding about the case, perhaps offering additional sources of evidence for the researcher



to consider (Yin, 2014). In order to gather and describe participant experiences in the most thorough, comprehensive, and in-depth manner, a collective case study, encompassing multiple sites, was selected as the most appropriate method of design. Case studies that incorporate multiple sources are highly regarded (Yin, 2014). As the human instrument, I gathered, analyzed, and interpreted the data to better understand the experiences of the participants in the study. Stake (1995) asserted the role of the researcher to be that of teacher, advocate, evaluator, biographer, and interpreter. Yazan (2015) shared:

From a Yinian perspective, case study research design is comprised of five components: a study's questions; its propositions, if any; its unit(s) of analysis; the logic linking the data to the propositions; and the criteria for interpreting the findings. While designing the inquiry, the researcher is supposed to make sure that these components are cohesive to and consistent among each other. (p. 140)

According to Yin (2014), potential case study audiences included academic colleagues, policy makers, and community leaders. The findings of this study may allow all stakeholders, including schools and teachers, to make informed decisions on the use of textbooks and Chromebooks when implemented into the curriculum and classroom. In this manner, findings were strengthened when compared with single-case studies.

Yin's (2014) approach defined case study research as an "empirical inquiry investigating a contemporary phenomenon in depth and within its real-life context, especially when boundaries between phenomenon and context are not clearly evident" (p. 18). My collective case study consisted of 15 teachers of sixth through eighth grade core content area with boundaries defined as Central County. Classrooms from five middle schools within Central County, a pseudonym, were the setting. My school of employment was not included in the study to

minimize bias (Yin, 1981). Stake (1995) proclaimed, “Balance and variety are important; opportunity to learn is of primary importance” (p. 6). An in-depth picture of the collective case study is provided utilizing multiple information-gathering methods.

### **Research Questions**

**Central Question:** How do middle school teachers in Central County experience using Chromebooks instead of traditional textbooks for instructional purposes in the classroom?

**Sub-question 1:** How do teachers describe information processing changes when replacing traditional texts with Chromebooks?

**Sub-question 2:** How do teachers describe the process of active learning?

**Sub-question 3:** How do teachers describe differences in pedagogical practices in the classroom when utilizing Chromebooks rather than traditional textbooks?

### **Site**

The location for this collective case study included five middle schools in Central County and their perspective core content area middle school classrooms. Central County is in a suburban city in the southern United States. The population of Central County exceeds 145,000 residents (U.S. Census Bureau, 2018). The Central County School System serves over 22,000 students in 19 elementary schools, six middle schools, three high schools, two alternative schools, and one vocational school for Grades 8–12. Additionally, the Central County School System employs over 3,000 employees. The graduation rate for the Central County School System was 84.6%, three percentage points higher than the state average of 81.6% (Governor’s Office of Student Achievement, 2018). The setting for interviews was the participants’ choice and agreed upon location. The comfort and confidentiality of the participant was of utmost

importance, and the interview site was chosen by the participant upon agreeing to participate in the research study (Yin, 2014).

### **Participants**

A purposeful sampling of 15 teachers of sixth through eighth grade middle school content area was chosen out of a pool of approximately 600 teachers. All participants were certified Georgia educators in Central County, a pseudonym used for confidentiality, a suburban district in the southern United States. All participants were pooled from among five middle schools in Central County. To minimize bias, I did not conduct this qualitative research with the teachers in my own school (Yin, 1981). Both regular education and special education curriculum content teachers were given the opportunity to participate. Information regarding gender, race, and subject taught was collected but had no bearing on participant selection. Of the 15 participants in the study, 13 were female and two were male. Additionally, 12 were Caucasian, two were African American, and one participant was Latino. Participants must have had a minimum of three years of experience teaching solely with textbooks and a minimum of two years exclusively teaching with Chromebooks. According to Yin (2014), participants should be purposefully selected and able to provide essential information or understanding about the case, perhaps offering additional sources of evidence for the researcher to consider. Table 1 presents teacher participants' number of years taught, content area of instruction, highest degree earned, and grade level currently taught.

Table 1

*Teacher Participants*

Teacher Participant	Years Taught	Highest Degree Earned	Content Area	Grade Level
Alana	23	Education Specialist	English Language Arts	6th–8th
Amy	10	Masters	Social Studies	8th
Brandon	7	Education Specialist	English Language Arts	8th
Charlotte	14	Education Specialist	Special Education - All Content Areas	6th–8th
Cynthia	25	Masters	English Language Arts	8th
Diane	8	Education Specialist	Science	6th–7th
Heather	19	Masters	Science	6th–8th
Jamie	18	Masters	Science	8th
Julie	18	Education Specialist	Social Studies	6th
Karen	12	Masters	English Language Arts	8th
Lynn	14	Masters	Special Education - English Language Arts & Science	6th–8th
Matt	10	Education Specialist	Social Studies	8th
Monica	28	Education Specialist	Math & Science	8th
Patsy	16	Education Specialist	Special Education - All Content Areas	6th–8th
Susan	17	Education Specialist	Gifted - English Language Arts	7th

**Procedures**

The first step for this collective case study was to receive permission from the Central County School system to conduct research in their middle school sites. I filled out the Central

County School System's Research Application which explained the research I planned on conducting in the county. After I received permission from the Central County School System, I applied to the Liberty University Institutional Review Board (IRB) for approval to conduct this research (see Appendix A). Upon receiving IRB approval from Liberty University, I started contacting possible research participants. The Central County School district's superintendent's office did not provide me with a list of teachers and I had to begin with an email campaign. I obtained teachers' names and email addresses from the individual school websites. I emailed all sixth through eighth grade prospective participants a recruitment letter (see Appendix C) that allowed the use of audio recording for interviews. As my research was conducted during the worldwide COVID-19 pandemic, I utilized Google Meet to conduct one-on-one and focus group interviews with my participants. I created pseudonyms for all participants and confidentiality was ensured to protect participants (Yin, 2014).

According to Creswell (2013), researchers should utilize case study "to examine a case, bounded in time or place, and look for contextual material about the setting of the case . . . gather(ing) extensive material from multiple sources of information to provide an in-depth picture of the case" (p. 125). After conducting one-on-one, in-depth interviews with participants, 10 journal entries were collected over a time period of two weeks from each participant through guided self-reflection prompts. Participants were emailed the journal prompts (see Appendix G) in the form of a Google Document. The third method of data collection was in the form of two focus groups. Participants were invited to attend a small focus group consisting of no more than six teachers to discuss questions (see Appendix F) with the researcher and reaffirm findings from journal entries. For both the interviews and the focus groups, I recorded them using the record feature on Google Meet using my laptop and an audio recorder. The data collected from the

interviews and focus groups were transcribed by the researcher. Common themes from all three sources of data collection were analyzed to assist in understanding the experiences of the participants.

### **The Researcher's Role**

I gathered and analyzed the data in this collective case study, as I was the human instrument. I have taught the core content areas of sixth through ninth grade literature, social studies, and civics in the Central County School System for 14 years. For this collective case study, to minimize bias, I did not collect or analyze any data from my school of employment; instead, I only examined the experiences of participants from the other five middle schools in Central County (Yin, 2014). I did not have any authority over the teacher participants. Topics that were discussed regarding textbook and Chromebook usage included the benefits, barriers, struggles, and likes/dislikes of each. In addition, all interviews were transcribed and preserved digitally and in hard copy formats. As Yin (2014) recommended, I attempted to avoid any possible bias by purposeful reflection through journaling after every interview and remained open to “contrary evidence, neither plagiarizing nor falsifying information, as well as being honest, avoiding deception, and accepting responsibility for (my) own work” (pp. 76–77). I was open to the value of technology and the benefits it provided, such as student engagement and cost savings. The presentation of data is such that the reader will be able to use their personal judgment and interpretation of the data to arrive at an independent conclusion (Yin, 2014).

### **Data Collection**

Data were collected through one-on-one interviews, participant-journaling, and focus groups. Regarding the interview process, Yin (2014) emphasized the role of interviews in the

case study data collection process, especially the need for “in depth and up close” (p. 192) case coverage. The role as researcher is detailed in case studies to allow for identification and understanding of the researcher’s personal relation to the topic of study. After conducting in-person interviews with participants, 10 journal entries were collected from participants through guided self-reflection prompts for a duration of 10 school days or a two-week time period, which is the typical length for a unit or topic to be taught. The third method of data collection was in the form of two focus group sessions. Participants were invited to attend a focus group consisting of a maximum of six teachers to discuss questions with the researcher and reaffirm findings from journal entries.

### **Interviews**

Stake (1995) declared, “The interview is the main road to multiple realities” (p. 64). Additionally, Yin (2014) affirmed the importance of the interview as being the most useful of tools in the data gathering process. Advanced planning of the interview process promoted a rich explanation of posed questions unique to individual participants. Individual one-on-one interviews were conducted using semi-structured open-ended questions. Participants were asked to share their experiences using textbooks and Chromebooks in the middle school classroom. Questions were structured in a manner that strove to put the interviewee at ease and allow for conversational-style guided interviews (Yin, 2014). All interview data were transcribed by the researcher. Interview questions (see Appendix E) for this collective case study are listed below:

Standardized Open-Ended Interview Questions:

#### *Information Processing Changes*

1. Describe the process of Chromebook implementation in your classroom.

2. What are some differences you have observed when students learn from Chromebooks rather than textbooks?
3. What are some changes in the amount of time spent with reading text from a screen as opposed to reading from paper?

#### *Active Learning Process*

4. How do you observe if learning is taking place in your classroom while using Chromebooks?
5. What strategies do students employ when engaging with Chromebooks for learning purposes?
6. How do students with learning differences respond to learning with Chromebooks?
7. What are some of the differences in homework completion you have noticed when students are instructed to utilize Chromebooks?

#### *Pedagogical Practices*

8. How has the replacement of textbooks with Chromebooks altered your teaching practices or teaching methods?
9. How have students responded to the implementation of Chromebooks?
10. Describe the preferred medium of learning for students.
11. What programs have you implemented using Chromebooks and why did you select these programs?
12. Describe how students read text using Chromebooks for learning.

Questions 1 through 3 pertained to processing changes. Hou et al. (2017) suggested different reading media have dissimilar material characteristics that afford contrasting sensorimotor experiences, influencing cognitive processing of the text. Questions 4 through 7



addressed the active process of learning. Ross et al. (2017) speculated that students may have responded to different learning strategies that do not account for reading comprehension when interacting with digital devices compared to print; however, the manner in which learners perceive their understanding, the device, and the platform is critical to their willingness and engagement in the active learning process. Questions 8 through 12 related to pedagogical practices. Alsaeed (2017) recommended students use Internet learning resources with the guidance of instructors as a key part of instruction. Hahnel et al. (2015) determined comprehension could be improved if learners were provided guidance on following hyperlinks.

### **Participant Journals**

Stake (1995) recommended the use of data-gathering by the participant at times when the researcher may be unable to observe. In case studies, oftentimes, the “recorder is a more expert observer than the researcher” (p. 68). Using guided prompts, participants were asked to complete a journal entry for 10 days over a maximum time period of 14 days or two school weeks. Participants were asked to include additional information regarding perceptions or observations pertaining to the in-person interviews or focus group sessions. Additionally, participants were provided with a copy of the questions from the interviews or focus group sessions prior to journaling. Commonalities and emerging themes were identified and analyzed. The exact script of the prompt that participants were given was provided to the IRB and further established trustworthiness. Participant journal prompts (see Appendix G) for this collective case study are listed below:

#### **Open-Ended Guided Prompts:**

1. What did you observe today regarding student Chromebook usage?
2. What did you find successful or unsuccessful in implementing Chromebook usage?

3. What programs did you utilize on the Chromebook today?
4. Approximately how much instructional and learning time was spent using Chromebooks today?
5. Approximately how much instructional and learning time was spent using resources other than the Chromebook today?

The first open-ended guided prompt attempted to gain a better understanding of the participants' experiences regarding Chromebook usage in the classroom. By asking for observations regarding Chromebook usage, the researcher hoped for rich, detailed descriptions from participant observation descriptions. The second prompt addressed successful and unsuccessful implementation regarding Chromebook usage to allow for a better understanding of participant experiences, both positive and negative. The third prompt asked participants to share the specific programs used in the classroom in an effort to ascertain commonalities and differences among programs and applications utilized by the participants. Prompts 4 and 5 addressed the amount of instructional time spent using Chromebooks and textbooks in an effort to better understand the participants' experiences regarding the use of technology and other resources in the classroom environment.

### **Focus Groups**

Focus groups provide an opportunity for the researcher to interact with multiple participants at the same time (Creswell, 2013). Focus groups are especially useful for exploring complex, multi-layered concepts from the perspectives of the participants. Focus group questions must be developed and reported using the same format as interview questions. Participants were invited to attend one of two different focus group sessions with a maximum of six teachers to discuss questions with the researcher and reaffirm findings from journal entries. Four

participants responded and two individual group sessions consisting of two participants and the researcher were conducted using semi-structured open-ended questions. Participants were asked to share their experiences using textbooks and Chromebooks in the middle school classroom.

Focus group questions (see Appendix F) for this collective case study are listed below:

Standardized Open-Ended Focus Group Questions:

*Information Processing Changes*

1. Describe the process of Chromebook implementation in your classroom.
2. What are some differences you have observed when students learn from Chromebooks rather than textbooks?
3. What are some changes in the amount of time spent with reading text from a screen as opposed to reading from paper?

*Active Learning Process*

4. How do you observe if learning is taking place in your classroom while using Chromebooks?
5. What strategies do students employ when engaging with Chromebooks for learning purposes?
6. How do students with learning differences respond to learning with Chromebooks?
7. What are some of the differences in homework completion you have noticed when students are instructed to utilize Chromebooks?

*Pedagogical Practices*

8. How has the replacement of textbooks with Chromebooks altered your teaching practices or teaching methods?
9. How have students responded to the implementation of Chromebooks?

10. Describe the preferred medium of learning for students.
11. What programs have you implemented using Chromebooks and why did you select these programs?
12. Describe how students read text using Chromebooks for learning.

Questions 1 through 3 pertained to processing changes. Hou et al. (2017) suggested different reading media have dissimilar material characteristics that afford contrasting sensorimotor experiences, influencing cognitive processing of the text. Questions 4 through 7 addressed the active process of learning. Ross et al. (2017) speculated that students may have responded to different learning strategies that do not account for reading comprehension when interacting with digital devices compared to print; however, the manner in which learners perceive their understanding, the device, and the platform is critical to their willingness and engagement in the active learning process. Questions 8 through 12 related to pedagogical practices. Alsaeed (2017) recommended students use Internet learning resources with the guidance of instructors as a key part of instruction. Hahnel et al. (2015) determined comprehension could be improved if learners were provided guidance on following particular hyperlinks.

### **Data Analysis**

To ensure trustworthiness, triangulation, member checking, bracketing, and rich descriptions were integrated into the study. Triangulation was conducted through the collection of data through semi-structured open-ended interviews, participant journaling, and focus group interviews (Yin, 2014). Yin (2014) explained, “Triangulation is the convergence of data collected from different sources, to determine the consistency of a finding” (p. 241). The purpose was to corroborate findings from multiple sources to strengthen the validity. Bracketing of the

researcher's personal experiences, judgments, and presumptions was conducted to minimize biases. Data were collected, analyzed, and coded to identify significant statements, subthemes, and emerging themes. As the findings from all these sources pointed to a common phenomenon, confidence in my case study may be increased.

Data analysis included member checks in which the participants reviewed their own transcripts. Additionally, I followed the thematic analysis method to familiarize myself with the data (Thomas & Harden, 2008). Enumeration was utilized to assess how many respondents mentioned important categories. My analysis included journal entries which were analyzed through the thematic analysis method which included line by line coding of the significant statements. Next, interviews were conducted one-on-one and were transcribed with key themes, reoccurring words/phrases, and significant statements coded, analyzed, and charted. As the human instrument, I determined if a reappearing theme, phrase, or word was significant or insignificant and shared all findings by thoroughly describing and detailing the data (see Appendix H).

Yin (2014) asserted that the analysis of data depends on the researcher's own style and ability to think empirically and identify various interpretations. Furthermore, Yin stated that researchers should have an analytic strategy for the data gathered from the research. The analysis depends greatly upon inductive reasoning (Merriam & Tisdell, 2016). Patton (2015) offered that patterns are the common findings from participants, while themes lend themselves to the interpretation of the pattern. For this collective case study, I concentrated on analyzing the themes from the collected data and employed inductive reasoning to create interpretations of the themes discovered in the data. I began the process by transcribing the individual interviews and the focus groups interviews. Next, I employed member checks of the transcripts by participants

to ensure that I effectively communicated their thoughts. This was accomplished after member checking each interview and focus group. My focus was on the data analysis as I studied the transcripts. I then completed notes and annotations also termed as codes on multiple tables to distinguish common themes (Merriam & Tisdell, 2016). In the course of the first cycle coding, I reread the data and established 139 codes from the interviews, focus groups, and Google Forms. Originally, I intended to use NVivo to analyze the codes, but found it simpler and more efficient to use tables to list the codes. In the course of the second cycle of coding (Merriam & Tisdell, 2016), I narrowed the codes to 16 themes. Common data were gathered and entered into tables. These common characteristics were developed into categories. The categories were studied for common themes. Upon careful examination of the data in its entirety, four final themes and 13 subthemes emerged. My research questions were answered by these themes as I progressed from inductive reasoning to deductive reasoning and concluded my data analysis to present the results of this collective case study (Merriam & Tisdell, 2016).

### **Trustworthiness**

The trustworthiness of the research and findings was imperative, and I ensured the credibility and reliability, dependability, and transferability of this collective case study through a variety of validation strategies. My study utilized one-on-one interviews, focus group interviews, and participant journaling to provide multiple sources of data collection, known as triangulation, and to provide for a rich account of participant experiences and differing perspectives (Creswell, 2013). Limitations of the study were participant bias and honesty.

### **Credibility**

Regarding credibility, Patton (2015) proclaimed, “One barrier to credible qualitative findings stems from the suspicion that the analyst has shaped findings according to her or his

predispositions and biases” (p. 700). I was transparent and honest in my study and in its relation to self and bracketed out my own experiences to relay my participants’ experiences accurately. Additionally, I tried to minimize predispositions and biases I had by bracketing my own experiences and journaling my thoughts before and after the one-on-one interviews and focus group sessions. Research and studies from both mediums (Chromebooks and textbooks) of learning were included to represent both pros and cons of utilizing these resources in the classroom. I was entirely open to the possibility that my worldview was incorrect.

### **Dependability and Confirmability**

To assure dependability within the collective case study, I maintained a journal after conducting one-on-one interviews and bracketed my own thoughts and assumptions. In this manner, I set aside my own judgments and reflected on the interviewees’ experiences.

Triangulation and member checks were also conducted and achieved to assure dependability and confirmability. Additionally, I described with rich, thick details the specifics of the findings and participants, while maintaining confidentiality through the use of pseudonyms. Lastly, focus groups met with the researcher to discuss questions and reaffirm findings from journal entries.

### **Transferability**

To aid in the transferability of this collective case study and to assist in the possible replication of the study, I incorporated rich, thick descriptions when I detailed my data collection and analysis. The procedures were described in extensive detail, assisting in the ability for replication. The data obtained in this research study is such that the readers will be able to use their individual perspective and understanding of the information to arrive at an independent conclusion (Yin, 1981).

### **Ethical Considerations**

The first step in proceeding in an ethical manner was completed by obtaining the approval of the Liberty University's IRB for this collective case study. Informed consent was completed by all participants involved in the study to ensure concerns were addressed and information about the research study was disclosed. Additionally, all names of participants and sites were replaced with pseudonyms to ensure confidentiality. All collected data were saved to an external flash drive and stored in a locked filing cabinet. Member checks, bracketing, and triangulation further increased validity and ensured ethical standards were met. Confidentiality of participants was protected by the researcher and all audio and electronic recordings and files were locked and secured in a safe to which only the researcher had access.

### **Summary**

Chapter Three detailed the qualitative research methods used in the collective case study to understand the experiences of middle school teachers' use of textbooks and Chromebooks in the classroom. The central research question sought to discover commonalities and emerging themes in the experiences of middle school teachers utilizing textbooks and Chromebooks in the classroom. The three sub-questions sought to further understand and relate the experiences of the participants based on Mayer and Moreno's (2003) CTML. The site for the collective case study was defined as the boundaries of Central County School System and the participants' perspective classrooms. My role as researcher was detailed to allow for identification and understanding of my personal relation to the topic of study. Upon IRB and site approval, triangulation was conducted through the collection of data through semi-structured open-ended interviews, participant journaling, and focus group interviews. Bracketing of my personal experiences, judgments, and presumptions was conducted to minimize biases. The researcher analyzed the



collected data and coded to identify commonalities and emerging themes. To ensure trustworthiness, triangulation, member checking, bracketing, and rich descriptions were integrated into the study. Additionally, findings were discussed, including IRB compliance, as well as confidentiality of site and participants through the use of pseudonyms. This collective case study sought to fill the gap in the research on experiences of middle school teachers using traditional textbooks and Chromebooks in the classroom. The findings of this study may allow all stakeholders, including schools and teachers, to make informed decisions on the use of textbooks and Chromebooks when implemented into the curriculum and classroom.

## **CHAPTER FOUR: FINDINGS**

### **Overview**

The purpose of this collective case study was to understand the classroom experiences using Chromebooks in place of textbooks among middle school teachers in the Central County School System (pseudonym). The purpose of this chapter is to briefly discuss the participants and examine common themes that emerged from the collected data. Detailed descriptions assist in understanding the experiences of the participants involved in this study. This collective case study analyzed the experiences of 15 participants, all of whom currently teach one of the core content areas of math, social studies, science, and language arts, in Central County, Georgia, middle schools. Results of the study are included in this chapter and utilize data collected from one-on-one interviews, focus groups, and participant journaling. There is a presentation of the teacher participants in Table 1, followed by a discussion of the themes, subthemes, and research questions.

### **Participants**

The group of research participants for this study included 15 teachers, all of whom had a minimum of three years' experience teaching solely with textbooks and a minimum of two years exclusively teaching with Chromebooks. The 15 participants represented five of Central County, Georgia's six middle schools; one of the six middle schools was excluded from the research as the researcher was a teacher at this school. Although it had no bearing on the research, the participants in this study included two males and 13 females; all of the participants held a bachelor's degree, six held a master's degree, and nine held an education specialist degree. At the time of the research, some of the participants taught multiple grade levels and subjects ranging from sixth through eighth grade. Lastly, all of the participants were certified in regular

education, with some holding additional certifications in special education, gifted education, and/or administration. A brief overview of each participant is listed below. To protect the identities of all participants involved in this study, the name of the participant's school was excluded. Pseudonyms were assigned randomly and are in no way connected to the participants given name, gender, or race.

### **Alana**

Alana is in her 23rd year of teaching language arts and in her 13th year of teaching eighth grade gifted language arts. While she uses Chromebooks daily in her classroom, she tries to limit use to only a portion of the class time. She stated that with Chromebooks,

[There is] not as much interaction with the material as opposed to when it is tangible and students can retain more when manipulating a paper and pencil. Students grow weary of the Chromebook and simply close it, which is more difficult to do with a paper and pencil.

### **Amy**

Amy currently teaches eighth grade social studies to regular education, gifted, and special education students, but previously taught high school. She is in her 10th year of teaching. Even though she has a class set of textbooks, she rarely uses them and has always supplemented her lessons with materials outside of the assigned textbooks. When she taught high school students, she shared, "The textbooks were often left in students' cars, at home, or in their locker. At least now they are more likely to bring a Chromebook to class since it contains all of the materials for every class."

**Brandon**

Brandon is in his seventh year of teaching language arts and reading support to eighth grade students. He shared in his interview, “Some students don’t like reading on paper and don’t like reading aloud; however, on the Chromebook, I can assign lower level texts for my struggling readers in my reading support class.” Brandon expressed Chromebooks have helped with classroom management since students are more engaged.

**Charlotte**

Charlotte is in her 14th year of teaching. As a sixth grade special education teacher, she teaches all content areas. In her language arts class, Chromebooks are not used unless students are using a reading program or taking an assessment. In her math class, students must ask permission to use the Chromebook since they have access to a calculator and she is trying to teach students computation without using a calculator. She shared, “Students are quick to click and don’t read the entire passage in social studies, but become distracted with clicking, unlike when they use their textbook.”

**Cynthia**

Cynthia is in her 25th year teaching. She currently teaches language arts to eighth grade students. A confessed “textbook junkie,” Cynthia shared in her interview that while

Chromebooks are

good for reinforcement, the editorial process is unreliable and inconsistent on terminology and expectations, whereas if I share a document with students, as opposed to granting open access to the Internet to locate information, the results are much more accurate.

This sentiment was shared among many participants, who asked students to use the Chromebooks as a virtual dictionary or thesaurus to assist with their writing.

### **Diane**

Diane is in her eighth year of teaching. Currently, she teaches science to sixth and seventh grade regular education, special education, and gifted students. Her special education students especially like using the voice to text feature on the Chromebook to assist with writing. She wrote in her journal that this feature “enables students who write illegibly or have dyslexia to have a level playing field.” Unlike textbooks though, “Chromebooks are not always a reliable resource when researching and monitoring for learning . . . I can’t say ‘go to page 55’ like I can when we use a textbook.”

### **Heather**

Heather teaches sixth through eighth grade language arts and is in her 19th year of teaching. She appreciates the access to “so much more information online; textbooks are more limited and difficult to read since they are written above grade level, but most of my students choose to respond with paper and pencil when given the choice.” Heather shared her students have trouble switching from tab to tab and will often ask for her to print materials in order to have a paper copy.

### **Jamie**

Jamie has taught eighth grade science for 17 years. She uses Chromebooks in her classroom two or three times per week and likes that her students can work at their own pace when she shares information on the Google Classroom platform. She often uses Chromebooks for simulations and to research reading articles in physical science. Jamie shared, “Some students

prefer paper because the Chromebook slows them down; it just depends on the individual student.”

### **Julie**

Julie teaches sixth grade social studies to regular education, gifted, and special education students and is in her 18th year of teaching. Julie states she “does not use technology for technology’s sake, but rather I assign something creative for students to manipulate and tell them to draw and create using their Chromebook.” She uses the online version of the social studies textbook but feels students think everything is a game when using the Chromebook. This game mentality shared by students was noted by several teacher participants.

### **Lynn**

Lynn currently teaches language arts and science as a special education teacher and is in her 14th year of teaching. She uses a hybrid of both Chromebooks and paper learning materials with her students. She believes students should be comfortable using Chromebooks since they will be tested in high school and college on a computer and will more than likely use a computer when they begin a career. Lynn shared, “Students are more interested in Chromebooks because they feel empowered, but they become easily distracted and it becomes difficult to monitor.”

### **Matt**

Matt is in his 10th year of teaching. He teaches eighth grade social studies to gifted, special education, and regular education students. Prior to teaching, Matt was the digital learning specialist for a different local school system and assisted teachers and students with implementing iPads that were assigned in the district. He intentionally took a teaching position in a content area where he would not be confined to a textbook. He voiced his concern with the effects of focus, attention, and addiction to the screen when implementing Chromebooks:

“Students no longer have the stamina or attention span when reading and it is possibly because of increased screen time and instant gratification, so it is more difficult to get them to read longer texts on a screen.”

### **Monica**

Monica has been teaching for 28 years. For the past 12 years she has taught eighth grade science and math to regular education, gifted, and special education students. She enjoys the interactivity when using Chromebooks and shared “there is less sharing, like with textbooks, and the students especially like the immediate feedback they receive in Google Classroom.” She would still like to use textbooks on occasion, but stated that they are old and falling apart.

### **Patsy**

Patsy teaches all content areas as a special education teacher and is in her 16th year of teaching. She shared, “My special education students often rush through the assignment so they can play games on their Chromebooks.” She appreciates the ability for differentiation when implementing certain reading programs but is concerned students do not use the available tools provided to them such as underlining, highlighting, and read aloud.

### **Susan**

Susan is in her 19th year of teaching. She teaches language arts to eighth grade gifted and regular education students. One of her favorite aspects of teaching eighth grade is the focus on reading novels together as a class and the discussions resulting during and after the reading. Even though her class spends 95% of their time in her class on the Chromebooks, she believes in the importance of face-to-face teaching and interaction with her students. Susan shared, “Balance between Chromebooks and paper learning is critical and Chromebooks need to be used while face-to-face with the teacher, not independently.”

## Results

The purpose of this collective case study was to understand the classroom experiences using Chromebooks in place of textbooks among middle school teachers in the Central County School System. The data collected from the one-on-one interviews, focus groups, and participant journaling were analyzed and coded to identify common themes. Upon careful review of the collected data, as the researcher, I decided to organize the data into tables and analyze the data without the use of a computer program. This chapter details the steps used to analyze the data and discuss the themes that developed. Following the theme development is a discussion of research participants' response to the research questions.

### Theme Development

Four main themes and various subthemes emerged from the collected data. These themes were the result of the analysis process. Upon careful review of the data collected, I decided to organize the data into tables and analyze the data without the assistance of a computer program. After reviewing participant interviews multiple times and transcribing responses from in person interviews, focus groups, and journal responses, I began to recognize significant words, phrases, and statements after transcribing all three methods of data collection. Common themes emerged and were organized with correlating subthemes detailed in Appendix H.

**Theme 1: Learner preference and differentiation.** The first theme to emerge from the data to understand the classroom experiences of middle school teachers in the Central County School System using Chromebooks in place of textbooks was the need for learner preference and the importance of differentiation. During the interview process, participants shared the benefits of allowing students to choose the method from which to access information and display knowledge and expressed how students performed better when using the platform they were



most comfortable using. Students often requested paper copies of assignments shared on the digital platform, Google Classroom, and for reading novels and other texts. Additionally, participants expressed the importance of differentiation and students' learning styles when incorporating Chromebooks into the learning environment, especially for kinesthetic learners who may learn best through hands-on activities that are able to be touched and seen in three dimension. Students with learning differences, such as those who were gifted or in the special education program, often had unique needs for learning and displaying knowledge. Three subthemes that emerged from the theme Learner Preference and Differentiation include (a) learning styles, (b) students perform better when comfortable, and (c) students with learning disabilities.

*Learning styles.* One of the factors participants agreed was useful when teaching with Chromebooks was the students' learning style. Diane explained how her students who were auditory learners would often use the read aloud feature on their Chromebook, while those who were more inclined to being a hand-on learner would rather gain knowledge from "something interactive that they can put their hands on. Or even things they can create."

Karen shared:

Aside from extreme kinesthetic learners, the Chromebook kind of hits all the targets, right? So we have visual learners, we have linguists who can just straight up read it like it's an ereader, we have our kids who can play games with mechanisms that can sort of hit the kinesthetic learners. We've got our artists, who can express themselves graphically, our logicians; it hits everything.

*Students perform better when comfortable.* Participants spoke extensively on the importance of allowing for student choice when possible. In language arts classes, Patsy shared:

Some students express the desire to utilize paper texts to touch and see and to incorporate reading strategies they had been taught. On the other hand, some students feel they can gain a deeper understanding of vocabulary I've taught by utilizing Chromebooks due to their ability to conduct research online and provide dictionary and thesaurus features. Often, student preference depended on their comfort level when using Chromebooks and technology in general and the access, or lack thereof, to the Internet at home to complete assignments. When interviewed, most teacher participants agreed that students should be seen as individuals with unique needs. Most participants agreed on the importance of not simply using technology for the sake of using technology, but rather only when it is comfortable and useful for the students when aligned with the curriculum.

*Students with learning differences.* Most every teacher agreed that students with learning differences loved utilizing Chromebooks for learning. Gifted students were able to delve deeper and research topics of interest and students who received special education services appreciated voice to text and read aloud features. Lynn shared about students in her special education class: "Students with autism and other special needs love the Chromebooks. Some special education students can't communicate and aren't interactive and use no eye contact and they are excited because it's hands-on and visual with color and they are engaged." Sharon expressed that Chromebooks "leveled the playing field for my students with disabilities so they don't feel so different because they can type if their handwriting is illegible."

**Theme 2: Balance and importance of quality applications.** The second theme to emerge from the data was the need for balance between Chromebook usage and traditional paper textbook or workbook usage and the importance of utilizing quality applications. Every single teacher participant emphasized the importance of implementing balance when utilizing

Chromebooks. Amy shared, “Students may prefer the Chromebook, but a balance is critical and they need to be used when face-to-face with the teacher.” The use of quality applications, most participants asserted, was crucial in order to most effectively teach students. Three subthemes that emerged from the theme Balance and Importance of Quality Applications include (a) paper and Chromebooks are complementary, (b) presentation of text matters, and (c) features of quality applications.

***Paper and Chromebooks are complementary.*** Matt explained how he used a primary source document for students to analyze on paper prior to his students researching further on the topic using Chromebooks. Susan shared a similar experience where she had students read a novel in paper format and then implement the Chromebook into the lesson:

My students read *The Outsiders* and when they encounter a word they don’t know, they look it up on their Chromebooks. Same thing if they want to know what an author looks like or they need a summary of what they just read because they didn’t understand it . . . they can just look it up on the Chromebook. Sometimes when they use the Chromebook, they don’t take an assignment as serious as they would if it were on paper. They feel everything is a game.

The majority of participants felt the Chromebook was best used when either side by side with another resource such as a textbook, workbook, or primary source, or by dividing the amount of class time spent on using Chromebooks with textbooks.

***Presentation of text matters.*** When deciding whether to present textual information to be read by students on the Chromebook, most participants concurred the presentation or display of the text should be taken into account. Matt explained, “Sometimes I have to break up the text into chunks because if it is longer than a text or tweet, they don’t want to read it.” Diane shared,

“I have to chunk the text because if it is too long when shared on the Chromebook, they feel defeated.” Susan’s students use the enlarge feature to zoom in if the text is too small. Alana’s students will either use the zoom out or split screen feature to make the text smaller in an effort to gauge the length. Julie stated, “Many of my students don’t enjoy reading longer texts on their Chromebooks. Many say it gives them a migraine and they will ask me to dim the lights. Some have even purchased blue light glasses.”

*Features of quality applications.* Although some programs and applications are required to be used by the county or individual schools, teachers still have freedom to select programs and applications that best fit their curriculum and classroom needs. When interviewed about the features needed for an application to be of good quality, data from participant responses produced five main features. First, the application must be concise. Teacher participants preferred programs with less distractors like extraneous sounds, pictures, and embedded hyperlinks. Another important feature was the program’s ability to differentiate. Susan shared, “I really like the program Readworks because it differentiates based on the student’s reading level.” Amy also appreciated the application Gallopade for her social studies classroom because the text is written at a lower reading level. She stated, “My advanced students can read the paper textbook that is written on their grade level, but for those who are struggling readers, it’s nice to have an alternative.”

The ability to provide meaningful data was another desired feature. Some of the most useful applications participants mentioned included those that collected and analyzed data teachers could use to better their instruction. Another determining feature that aided in selection of an application was the ability for creativity. Applications that allowed for students to color and draw maps, manipulate items on the screen, and create were considered to be of high quality.

Lastly, the applications need for a remediation component was found to be important. A quality application gave feedback when a student answered a question incorrectly. This helped students better understand the material by explaining why their answer was incorrect. The most beneficial applications would also adjust to a student's ability, either by modifying the reading level or the difficulty of questions following a reading passage.

**Theme 3: Factors influencing learning.** The third theme to emerge from the collected data was the factors influencing learning. A student's engagement was often measured through body language. Diane asserted, "I can see the confusion in their face. I build a relationship so they also feel comfortable enough to say they're struggling." When students were engaged with a Chromebook assignment, they spent more time on the Chromebook and did not simply skim the material. Focus and attention was another factor to influence learning. Students who were predisposed to attention or focus issues were also more likely to hyper-focus on the Chromebook to the point of concern. Brandon shared:

Kids don't have the stamina for reading and it's an issue when staring and losing their place on a screen, so I break it up with hands-on learning, because their attention span is so short. Possibly because of screen time. They are used to instant gratification and it's more difficult to get them to read longer texts and comprehend. My students with ADHD [attention deficit hyperactivity disorder] love to play games on the Chromebook to the point of addiction where they hyper-focus and it's all they want to do.

In addition to student engagement and attention concerns, oral discussions and question-and-answer sessions were found to be important by almost every single participant. By conducting these discussions and also listening to students' conversations with one another, the participants

were able to better gauge if students understood the material being taught. Three subthemes emerged that include (a) engagement, (b) focus and attention, and (c) oral discussions.

**Engagement.** The importance of engaging students in the learning process when utilizing Chromebooks was mentioned by almost every participant. Most of the participants agreed that the use of Chromebooks engaged students more than textbooks; however, there was a fine line between engagement and staying on task. Brandon shared that students were “more engaged when using Chromebooks because there’s more info to look up and research further.” However, Charlotte shared that “textbooks seem to make them more focused and less distracted than clicking on a Chromebook.” Additionally, the interactive nature of Chromebooks was mentioned by several teacher participants, including Heather who stated, “Interaction while learning is essential.” Amy shared how Chromebooks were “easier to engage students.” Susan agreed, stating that Chromebooks were a “more engaged platform they understand; however, students prefer paper to annotate.” Alana declared:

There’s not as much interaction with the material [Chromebooks] as opposed to when it’s tangible and they can take a deep dive for retention and manipulate paper and pencil.

Technology you can turn off, like a cell phone, it is out of sight, out of mind, unlike the textbook.

**Focus and attention.** Several teachers concurred that students tend to be less attentive and focused when they utilized Chromebooks for learning purposes. Jamie expressed, “They can find information faster on a Chromebook and see a variety of illustrations, but they are always playing games and not staying on task.” Charlotte and Julie also shared a frustration with the amount of time students play games on their Chromebooks instead of staying on task and completing their assignments. For those students with focus and attention issues, the distractions

associated with Chromebooks seemed to increase, and participants shared their frustrations with the difficulty in monitoring student activity on Chromebooks, even with the use of monitoring programs.

***Oral discussions.*** Another factor to influence learning included oral discussions with students before, during, and after Chromebook usage. Keeping an open dialogue with students, participants asserted, allowed for questions to be asked and explanations to be given. Teacher participants expressed the importance of listening to student conversations to assess learning and discern if confusion occurred. Even when the participants utilized Chromebooks to project a lesson to the class, the importance of explaining and discussing the material was evident. Charlotte shared, “When I read the math word problems aloud to the class, while it’s projected onto the whiteboard, I will see the grade in IXL [math program] go up and I know they understand.” All teacher participants expressed the importance of walking around the room to monitor student Chromebook usage as it also allows for the observance of student body language, facial expressions, and conversation among students. Amy stated:

Oral question and answer sessions and open dialogue with discussion questions allows me to see just how deep students understand the material. Social Studies isn’t like math with problems. It’s not black and white and I may not know how to remediate if there isn’t a discussion.

**Theme 4: Benefits and concerns.** The fourth and final theme to emerge from the collected data was the benefits and concerns associated with teaching for learning with Chromebooks as opposed to textbooks. Most participants appreciated the creativity component Chromebooks afforded. Heather shared, “I am more involved because I’m creating my own curriculum and can pick and choose.” Matt agreed that Chromebooks encouraged creativity,

allowing for “more interesting work because I can supplement more, explore more avenues, and gather more resources with different perspectives and in different ways.” Another benefit observed by teacher participants was the independence and responsibility Chromebooks gave to students. Almost every participant expressed that students used Chromebooks for researching information related to the curriculum.

The main concerns addressed by participants were the difficulties involved in the process of monitoring Chromebook usage along with the amount of time required to create quality lessons and assignments. Jamie shared in her interview, “I spend more time monitoring on-task behavior and preparing documents in the correct format and uploading and creating a lot; it’s cumbersome and slows me down some.” Four subthemes emerged that include (a) creativity, (b) independence and responsibility, (c) monitoring usage, and (d) amount of time spent on lessons.

***Creativity.*** When asked how her teaching practices had altered using Chromebooks instead of textbooks, Amy stated, “I’m more open to experimenting and creating assignments, and kids are more receptive because they can create engaging material they can publish on YouTube and can record and share with their parents.” Alana explained, “Chromebooks have opened the floodgates to a whole new world and there is so much more I can do digitally, like research poems and stories to share.” The opportunity to explore more avenues for practice and examples allowed for more interesting activities. Additionally, participants appreciated that Chromebooks allowed students to hear information from someone other than the teacher.

***Independence and responsibility.*** Brandon shared, “When I create WebQuests, the students have access to infinite resources so it’s more creative for them, and me.” The ability for students to answer their own questions by researching on the Chromebook was a common



feature mentioned by every single teacher participant. However, almost all participants also noted the importance of reviewing expectations, proper usage, and reliable resources with students using Chromebooks. Amy emphasized, “On the first few days of school, I spend a significant amount of time showing and explaining school and classroom rules and where to locate reliable sources online.” Patsy shared in her journal, “It makes them more responsible. Most students treat them well, others don’t, but some will purposefully break them knowing we don’t have enough replacements, or they’ll forget their chargers but I have a charging station in my room.”

***Monitoring usage.*** All participants expressed that they review rules and expectations for proper Chromebook usage at the beginning of the school year. Charlotte grew frustrated with students’ ability to roam the Internet instead of engaging with lessons: “I’m busy policing students’ Chromebook use through Blocks i or GoGuardian [online Chromebook monitoring programs for teachers], but they are sneaky and can work the system. It’s exhausting.” Several participants agreed that there was a lack of focus when reading text on a Chromebook and although there are restrictions in place on student Chromebooks implemented by the Central County School System, some students have learned how to circumvent the restrictions. Additionally, participants shared their students’ tendency to multitask and open multiple tabs simultaneously, making the task of monitoring off-task usage extremely difficult. Students would peruse sites, such as YouTube, viewing videos unrelated to the curriculum content. Every single participant mentioned the necessity of walking around to monitor students’ use on Chromebooks. Not only did this provide for the ability to see students’ screens without the use of a monitoring application, but it also allowed participants the ability to listen to student conversations to assess

comprehension. Additionally, participants were able to observe body language, which was viewed as an indicator of understanding or frustration.

*Amount of time spent on lessons.* Matt expressed the “amount of time spent on creating digital lessons is cumbersome.” This was a common sentiment expressed by many participants. With the implementation of Chromebooks, teachers in the Central County school districts’ middle schools were required to post virtual lessons into the Google Classroom online platform. Additionally, participants complained of the overwhelming amount of emails, Google Meet, and GoGuardian messages they received from both students and their parents. Lynn shared in her focus group session:

I have 122 students and they have instant access to their grades, which is great, but they also have access to my email and will email me a message even though they are sitting in the room with me at the time.

### **Research Question Responses**

The purpose of this collective case study was to understand the classroom experiences using Chromebooks in place of textbooks among middle school teachers in the Central County School System. The research questions that shaped the study focused on how teachers described their overall experiences instructing students with Chromebooks in place of textbooks.

Participants gave rich, detailed accounts through individual semi-structured interviews, focus group interviews, and participant journaling. Responses to these questions are explained in detail below.

**Central Research Question.** The central research question for this study asked, How do middle school teachers in Central County experience using Chromebooks instead of traditional textbooks for instructional purposes in the classroom? The teacher participants in this study

described their experiences through thoughtful responses that ranged from positive to negative. Participants routinely shared the need for mindfulness of learner preference and quality applications when utilizing Chromebooks. Additionally, the need for balance between Chromebooks and traditional paper resources was found to be helpful in the retention of information by students. While responses were unique to the individual participants' experiences of teaching with Chromebooks instead of traditional textbooks in their individual classrooms, their experiences revealed commonalities which led to the development of four themes through data analysis and saturation. The four themes identified in this study consisted of (a) learner performance and differentiation, (b) balance and importance of quality applications, (c) factors influencing learning, and (d) benefits and concerns.

**Sub-question 1:** The first sub-question asked, How do teachers describe information processing changes when replacing traditional texts with Chromebooks? The goal of this question was to understand and gain insight into how teachers described the changes in processing when replacing textbooks with Chromebooks. Additionally, the question addressed information processing as it pertained to Mayer's cognitive theory of multimedia learning (Mayer & Moreno, 2003). Based on the analysis, the following subthemes were identified as factors as it relates to information processing changes when replacing traditional texts with Chromebooks: (a) learning styles, (b) students perform better when comfortable, (c) students with learning differences, (d) paper and Chromebooks are complimentary, and (e) presentation of text matters. When asked to describe the process of Chromebook implementation in the classroom, all of the participants agreed that Google Classroom was a required application used by Central County Schools through which participants uploaded assignments, upcoming assessments, and lesson plans. Most respondents asserted that they also used Chromebooks to

administer assessments and to allow students to further research topics addressed in the curriculum or lesson taught. Susan shared:

I placed a resources tab in Google Classroom with a link for students to quickly access an online dictionary and thesaurus, so even if they're writing an essay on paper, they have their Chromebook open to access tools. I like how Chromebooks foster independence, especially for students with learning differences.

The ability for students within the special education or gifted learner programs to gain a sense of freedom and independence was a common response from participants. Students with illegible handwriting were able to type their assignments and students who wished to delve deeper into the lesson were able to research further using the Chromebook. Observed differences when using Chromebooks instead of textbooks included differing abilities among students in regard to those who were more technologically savvy and those who were not. Additionally, skim reading and decreased focus were mentioned as observed differences. Several participants stated many students also requested paper copies of the material and the majority of respondents emphasized the importance of balancing Chromebooks with face-to-face discussion and instruction. Giving students a choice of using the Chromebook or paper to display their knowledge was a common response from the participants. Karen shared, "Differentiation is important to allow for different paces and learning styles."

**Sub-question 2:** The second sub-question asked, How do teachers describe the process of active learning? The goal of this question was to understand the process of active learning by having teachers describe in their own words the traits seen when observing students involved in the learning process. Data analysis revealed four subthemes that corresponded with the process of active learning, which include (a) engagement, (b) focus and attention, (c) oral discussions,

and (d) features of quality applications. Additionally, the question addressed active learning as it pertains to Mayer's CTML (Mayer & Moreno, 2003). When asked how observation of learning was accomplished, almost every participant explained the importance of walking around to observe students' body language and to listen to conversations. Most participants also used monitoring programs, such as GoGuardian or Blocksi that allowed viewing of students' screens on the teacher participants' screens. This monitoring feature allowed participants to view students' screens in real time to assess how much time was spent on a particular slide or screen before moving on to the next assignment, therefore enabling teachers to gauge active learning.

Strategies students employed when utilizing Chromebooks included manipulating the Chromebook by flipping the keyboard completely behind the screen to hold like a textbook, altering the appearance of the text by enlarging or decreasing the font size, and employing the speech to text feature. By enlarging text, students could remove their glasses, and by decreasing the size of the text, students were able to gauge the length of the passage. Students often used the speech to text feature if they struggled with handwriting or spelling. Participants affirmed students with underlying attention issues or diagnoses were more likely to hyper focus on games. Lynn stated:

Special education students love the Chromebooks. Some students can't communicate and aren't interactive and use no eye contact and they are excited because it's hands-on, visual with color, and they are engaged. But, the downside is the addiction and sometimes we have to use it [Chromebooks] as a reward because it's all they want to do.

**Sub-question 3:** The third sub-question asked, How do teachers describe differences in pedagogical practices in the classroom when utilizing Chromebooks rather than traditional textbooks? With the implementation of Chromebooks in place of textbooks, it is beneficial for

educators to share differences in pedagogical practices when transitioning from one medium to the other. The goal of this question was to understand how instructional changes occur in an effort to share useful techniques with other educators (Mayer, 2014). Following data analysis, four subthemes were identified as factors as it relates to differences in pedagogical practices in the classroom when utilizing Chromebooks rather than textbooks: (a) amount of time spent on lessons and behind the screen, (b) creativity, (c) independence and responsibility, and (d) monitoring usage. The participants shared the appreciation for virtual field trips and simulations to engage students when using the Chromebook, but emphasized the importance of discussion after lessons. Jamie stated, “After completing a lesson using the Chromebook, I always have a discussion with the class, including an oral question and answer session, to ensure understanding.” Participants also shared the preferred mode of learning for most students is the Chromebook; however, Alana shared:

I prefer old fashioned paper copies of texts because students will glaze over and move too fast going forward and skip around when on a screen. There is less engagement, less critical thinking, and not as deep of learning and it’s just easier to miss things. They try adjusting the font size to see all the pages at once because of too much scrolling. When allowed to read independently, they all bring in paper books from the book store, public library, or media center.

The available applications on Chromebooks were considered useful by participants if they were concise, differentiated, collected data, and allowed for remediation. Even with the inclusion of time saving applications, participants shared their frustrations with the amount of time spent on creating digital lessons. Jamie stated, “Preparing documents in the correct format and uploading and creating a lot of material has slowed me down.” Brandon asserted that the benefits of

creating engaging lessons seemed to outweigh the time spent creating lessons, “It gives me more freedom. I create WebQuests and it is more creative for them. There are infinite resources.”

While Chromebooks allowed for engagement and creativity, the lure of distractions online, unstable Internet connectivity, and additional time spent being the “Chromebook police” were negative aspects that impacted participants’ pedagogical practices. Karen stated,

Chromebooks allow for independent problem solving, but take away some ownership for me since I am now just a facilitator and provide resources. It is 3D learning and a differentiated experience because the search history for every student will be different.

Rural areas of the county often experienced unstable Internet connections or frequent disruptions and outages at home and school. Additionally, some students did not have Internet access at home to complete lessons on Chromebooks. Finally, most participants mentioned complaints of headaches, eye strain, and screen fatigue as physical symptoms experienced by students and themselves when reading text on Chromebooks. To lessen these effects, students would request for the lights to be dimmed in the classroom, dim the brightness of their Chromebook screen, or wear blue light glasses.

### **Summary**

Chapter Four provided an overview of each teacher participant in this study and described the results of the data analysis. For this study, a collective case study model was utilized and data were collected through in-person interviews, focus groups, and participant journaling from the 15 teacher participants. After analyzing the data, reoccurring, relevant, and meaningful words and statements were separated into themes and subthemes. The four themes that emerged were (a) learner preference and differentiation, (b) balance and the importance of quality applications, (c) factors influencing learning, and (d) benefits and concerns. Through

these four themes, the experiences of teacher participants were described in rich detail through narrative form in the results of this chapter.

The data collected in this study addressed the central research question and three sub-questions. Teacher participants detailed their experiences utilizing Chromebooks instead of traditional textbooks in the middle school classroom. Participants routinely spoke of the need for learner preference to be allowed when using Chromebooks for learning as well as the ability for differentiation when using Chromebooks. Maintaining a balance between teaching and learning with Chromebooks and paper materials as well as the importance of quality applications was another common theme that emerged. Participants expressed the factors they believed to have the most influence on students' learning as engagement, minimizing distractions, and face-to-face discussions after lessons. Overall, most participants appreciated the benefits provided by Chromebooks but expressed their concerns with their exclusive utilization in the middle school classroom.



## **CHAPTER FIVE: CONCLUSION**

### **Overview**

The purpose of this qualitative collective case study was to understand and describe the experiences of 15 middle school teachers who utilized Chromebooks instead of traditional textbooks in Central County middle school classrooms. This chapter provides a summary of the findings, discussion of the findings, implications of the study, delimitations and limitations, and recommendations for future research. Chapter Five concludes with a summary.

### **Summary of Findings**

This study examined the experiences of 15 middle school teachers utilizing Chromebooks instead of traditional textbooks in five Central County middle school classrooms. Data were gathered using one-on-one interviews, focus group interviews, and participant journaling. Data were analyzed and four common themes emerged that described teacher experiences when replacing textbooks with Chromebooks in the middle school classroom: (a) learner performance and differentiation, (b) balance and importance of quality applications, (c) factors influencing learning, and (d) benefits and concerns.

The central research question for the study asked, How do middle school teachers in Central County experience using Chromebooks instead of traditional textbooks for instructional purposes in the classroom? This question sought to understand teachers' experiences of utilizing Chromebooks in place of textbooks in the middle school classroom setting. The 15 participants provided detailed descriptions of their experiences. Participants routinely spoke of the need for learner preference to be allowed when using Chromebooks for learning, as well as the ability for differentiation when using Chromebooks. When discussing their experiences using

Chromebooks in the classroom, the participants routinely had a generally positive attitude towards the implementation of Chromebooks for learning purposes.

Although the implementation of Chromebooks was often viewed in a positive light, there were still many concerns raised among the teachers. Issues such as the inaccessibility to the Internet for some students when working from home as well as the unreliability of Internet in the classroom frustrated many participants. Additionally, participants shared students would often forget to charge their Chromebooks or forget their Chromebooks altogether, resulting in the need for paper copies of assignments since there were no extra Chromebooks to lend students. The ability to engage students seemed to be a common experience with the participants, and the majority of teachers experienced an increase in student engagement through the implementation of educational applications and games geared towards the curriculum being taught in the classroom. On the other hand, almost all participants agreed that the ability for students to lose focus due the lure of online distractions was often too great and students would visit unrelated sites, requiring teachers to continuously monitor student activity in order for students to remain on task. This factor was found to be quite time consuming, frustrating, and seen as a barrier to student learning since participants were using instructional time monitoring for off-task behaviors while simultaneously manually closing students' tabs when open to an inappropriate site through the use of the GoGuardian application provided by the school district.

Research Sub-question 1 asked, How do teachers describe information processing changes when replacing traditional texts with Chromebooks? Participants expressed the factors they believed to have the most influence on students' learning as engagement, minimizing distractions, and face-to-face discussions after lessons. Participants shared students were most engaged when they were allowed to choose from among an approved list of review games and

when allowed to use Chromebooks simultaneously with paper novels, workbooks, textbooks, or traditional paper and pencil. Another factor participants attributed to student learning was minimizing distractions in the classroom. Accommodations recommended by the majority of participants included dim lights, blue light glasses to reduce “screen fatigue,” and headphones for individual students. Face-to-face discussions with students upon completion of independent Chromebook usage were mentioned by all participants as a key factor in student learning.

Research Sub-question 2 asked, How do teachers describe the process of active learning? Participants talked about the importance of walking around the room, sometimes with a rolling desk, to monitor students and listen to their conversations and to observe body language. The majority of participants mentioned how students manipulated Chromebooks by folding or flipping the screen to mimic a book as well as zooming in or out and dimming the background light on the screen. Additionally, almost all participants shared that some students request paper copies of assignments and this seemed to assist with maintaining attention and focus. Special education teachers appreciated the level playing field the Chromebook provided by enabling students with poor penmanship or spelling abilities to type and use the voice-to-text feature on the Chromebook. Gifted teachers enjoyed the ability Chromebooks provided for allowing students to “dive deeper” into the research.

Research Sub-question 3 asked, How do teachers describe differences in pedagogical practices in the classroom when utilizing Chromebooks rather than traditional textbooks? Maintaining a balance between teaching and learning with Chromebooks and paper materials as well as the importance of quality applications were mentioned by all participants. The ability to attend a virtual field trip or conduct a simulation or experiment was mentioned by almost half of the participants as being positive changes in pedagogical practices. Additionally, discovering

useful applications with the ability to differentiate, collect data, and allow for remediation were seen as helpful changes to the lesson planning process. However, even with the use of time saving applications, several participants shared that too much time was spent creating digital lessons and being the Chromebook police. Almost all participants agreed the preferred medium of learning for students, when given the choice, is Chromebooks. Participants constantly attempted to balance the use of Chromebooks along with non-Chromebook assignments but appreciated the independent problem solving Chromebooks allowed for their students.

### **Discussion**

The purpose of this collective case study was to understand the experiences of Central County middle school teachers who use Chromebooks in place of traditional textbooks in the classroom for student learning. Data were analyzed and four common themes emerged that described teacher experiences when replacing textbooks with Chromebooks in the middle school classroom: (a) learner performance and differentiation, (b) balance and importance of quality applications, (c) factors influencing learning, and (d) benefits and concerns. This section will discuss the results of this study and the correlation between the findings and the empirical and theoretical literature reviewed in Chapter Two as well as provide additional information to contribute to the process of implementation of Chromebooks in the classroom.

### **Empirical Discussion**

Four themes were identified from this study that related to the empirical research found in the review of the literature. The themes that emerged were (a) learner performance and differentiation, (b) balance and importance of quality applications, (c) factors influencing learning, and (d) benefits and concerns. The supporting data for the aforementioned themes and the relationships with empirical research are described below.

**Learner performance and differentiation.** Studies in the literature regarding learner performance and differentiation reaffirmed the significance of a student-centered approach to learning (Ackerman & Lauterman, 2012; Smallhorn, 2017). Additionally, differentiation when teaching students with differing needs, such as gifted learners or students receiving special education services, was found to be especially critical (May & Elder, 2018; Singer & Alexander, 2016). Several participants discussed the importance of differentiation that allowed for different paces and learning styles. Participants shared that gifted students liked to dive deeper for more information and special education students appreciated the independence Chromebooks provided for them to research for further clarification. Prior studies emphasized that the mindfulness of educators when utilizing Chromebooks and the guidance of instructors to create a customized education were vital (Alsaeed, 2017; Leer & Ivanov, 2013; Seward & Nguyen, 2019). Participants agreed students with learning differences tend to be easily distracted with clicking tabs unrelated to the lesson, and while Chromebooks allowed for a more personalized approach to learning, it was imperative to constantly monitor students' use in order to maintain engagement and attention.

**Balance and importance of quality applications.** Another concept explored in this study was the importance of balancing Chromebook use with other resources and the benefits of quality applications. Previous studies found textbooks to be a "valuable springboard" for learning, but found students "learn best with a combination of technology and paper" (Arnold, 2013, p. 234). This was affirmed by participants, with several teachers sharing that the balance between Chromebooks and paper is important. Lynn stated, "My students will get bored with the Chromebook and request more hands-on activities that aren't so monotonous." Matt shared,

“Chromebooks are great, but balance is critical and they need to be used while face to face with a teacher.”

The use and integration of quality applications was found to be a critical factor in the empirical literature and was corroborated by the majority of participants. Reading for information involved high levels of concentration and a certain amount of intimacy with the document being studied (Singer & Alexander, 2016). Methods students employed included bookmarking, annotating, and highlighting within the document (Sun et al., 2013). Susan asserted, “Students manipulate text by zooming in or out and many students will ask for the lights to be dimmed or will dim their screens and flip the Chromebook in half like a book.” This study confirmed prior studies’ assertions that the “presentation of text and backlighting” matter when utilizing Chromebooks (Margolin et al., 2013; Porion et al., 2016; Walsh, 2016). The majority of participants agreed quality applications allowed for creativity, were concise, user friendly, and had the ability to collect data and remediate.

**Factors influencing learning.** Previous studies found “instruction (to be) most efficient when students engage in activities” (Vygotsky, 1978). Smallhorn (2017) claimed the manner, device, and platform suggested that students attending classes incorporating computers were strongly linked to learning outcomes, and poorly engaged learners were more likely to fail. Weng et al. (2018) hypothesized that curriculum needs to be developed in a new manner of interactivity between the learner and the computer to engage and motivate students in the process of learning. This study reaffirmed the significance of learner engagement, focus and attention, and oral discussion upon conclusion of a lesson. Several participants appreciated that Chromebooks were interactive and allowed for simulations and virtual field trips. Despite Chromebooks’ allowance for interactive engagement, several participants noted that students’ focus and attention were

waning and the lure of online distractions was always present. Jamie stated, “If a bells-and-whistles feature is there, that’s the first thing they do.”

Studies in the literature reaffirmed the need for social interaction and discussions when utilizing Chromebooks in the classroom. Waters (2018) asserted that when students work independently with a Chromebook, it takes away the most “human component in the learning process, which is social interaction—learning from one another and collaborating to solve problems, instead developing a relationship with their tablet but not with each other” (para. 12). Lau et al. (2017) stated that conversations among students and educators, which are commonplace in an instructor-led classroom but scarce in a classroom utilizing computers for instruction, are vital as a source of learning. This study reaffirmed the relevance of discussions upon the conclusion of a lesson. Almost every participant stated that question and answer sessions assist in gauging students’ knowledge and understanding of a curriculum topic. When asked how observation of learning was accomplished, almost every participant explained the importance of walking around to observe students’ body language and to listen to conversations.

**Benefits and concerns.** Previous studies found computers in the classroom created an “unintuitive, cumbersome process” (Wilson, 2017, p. 62) that teachers must work around with more traditional methods. This was reaffirmed by many participants who shared that they struggled to monitor student usage due to unreliable Internet and connectivity issues. Additionally, studies found the need for “innovative pedagogical practices” and “relational connectiveness” (Ng’ambi & Bozalek, 2013, p. 533) between teacher and student in order for learner confidence and growth to occur when using Chromebooks for learning (Cramp & Lamond, 2016). These prior findings were corroborated by this study and the participants. While several participants addressed the need for creative lessons, most participants shared that the

amount of time spent on creating engaging lessons was overwhelming. Many participants also complained of headaches, along with neck and eye-strain for both themselves and their students. Brandon stated, “Screen fatigue is very real.” Finally, most participants found that Chromebooks created a level playing field for students who may otherwise have required assistance with reading and writing but now utilized the read aloud and text-to-speech features on the Chromebook, which was not addressed in prior studies. These responses extend the previous research as these teachers felt that new technology adaptations aided in their students’ abilities to access the curriculum and complete assignments in a more meaningful way. Overall, this study contributed to the field of education by expanding perceptions of replacing textbooks with Chromebooks in the middle school classroom through authentic experiences from teachers directly involved with their implementation.

### **Theoretical Discussion**

The theoretical frameworks guiding this study were Mayer and Moreno’s (2003) cognitive theory of multimedia learning (CTML) and Vygotsky’s (1926) social constructivism theory. This study solidified Mayer’s CTML by highlighting the manners in which students learn using Chromebooks by processing information through two channels with finite capacity and the active nature of the process (Mayer & Moreno, 2003). According to Mayer’s CTML, humans can only process a finite amount of information in just one channel at a time, and they make sense of incoming information by actively creating mental representations (Mayer & Moreno, 2003). Additionally, 12 principles were established by Mayer and Moreno (2003) for assisting the learner when utilizing multimedia. For this study, six of the 12 -principles were integrated based on their relevance and application in the classroom environment. They included the following:



- Coherence Principle – the learner retains knowledge better when there are no extraneous words, pictures, or sounds.
- Redundancy Principle – the learner retains knowledge better when graphics and narration are used, rather than narration and on-screen text.
- Segmenting Principle – the learner retains knowledge better when information is presented in user-paced segments rather than as a continuous unit.
- Modality Principle – the learner retains knowledge better when graphics and narration are used, rather than from animation and on-screen text.
- Multimedia Principle – the learner retains knowledge better when words and pictures are used together, as opposed to words alone.
- Voice or Personalization Principle – the learner retains knowledge better when words are in conversational style in a friendly, conversational tone, as opposed to a formal or computer-generated voice.

Mayer and Moreno's (2003) coherence principle was affirmed by 14 of the 15 participants who shared that students would often have trouble maintaining focus when using a learning application containing attractive features that would distract from the content that was being taught. The redundancy principle applied to several experiences of participants who expressed the engagement students displayed during an interactive lesson involving graphics and narration when incorporating virtual field trips or laboratory simulations into a lesson. Regarding Mayer and Moreno's (2003) segmenting principle, the need for differentiation, allowing for user-paced segments and learning styles was mentioned by several participants. The modality principle emphasizes the importance of narration when utilizing on-screen graphics. This was corroborated by the majority of participants who shared that students would utilize the read aloud

feature when reading for information on the Chromebook. In the multimedia principle, the relevance of pictures and illustrations to accompany on-screen text was evident in the experiences of multiple participants who expressed the need for mindfulness of differing learning styles of students. Finally, the voice or personalization principle correlates with participants' experiences regarding the gauging of student knowledge acquisition through oral discussion and question and answer session at the conclusion of a lesson.

**Social constructivism.** Mayer and Moreno's (2003) CTML was viewed with a social constructivist paradigm, under which the learner is an active participant in the learning process (Vygotsky, 1926). Meanings are constructed by human beings as they engage with the world around them. Thus it is interpretive, since humans make sense of the world based on their own historical and social perspective. Additionally, meaning is always social, arising in and out of human interactions. Vygotsky's (1926) theory of social constructivism is relevant to this study as it is associated with the participants' experiences when interacting with students in the classroom setting. The participants in this case study affirmed the social constructivist theory in which learners take an active role in their learning and meaning is formed through interaction with others (Vygotsky, 1926). When interacting with a Chromebook, students made less eye contact with the instructor, and this was reaffirmed by the participant experiences in this study (Richert et al., 2011). Through this theory, knowledge and understanding are socially constructed and promotes student-centered learning with teachers as guides and facilitators instead of the ~~teach-er~~ lecture style traditionally seen in the classroom (Xu, 2018). While the participants described a decrease in social interaction among teachers and students, an increase in independent problem solving opportunities and student-centered learning was noted.

## **Implications**

The findings in this collective case study revealed the experiences of Central County middle school teachers who used Chromebooks in place of traditional textbooks in the classroom for student learning. The findings contain several implications for various stakeholders in the field of education. This section discusses the theoretical, empirical, and practical implications that emerged from this study.

### **Theoretical Implications**

This study used Mayer's CTML by highlighting the manner in which students learn using Chromebooks by processing information through two channels with finite capacity and the active nature of the process (Mayer & Moreno, 2003). According to Mayer and Moreno's (2003) cognitive theory of multimedia learning, humans can only process a finite amount of information in just one channel at a time, and they make sense of incoming information by actively creating mental representations (Mayer & Moreno, 2003). This theory suggests 12 principles to which learners should adhere when using multimedia for learning. Of the 12 principles, six were utilized for this study. Participants were asked how learning was observed in the classroom while using Chromebooks, and the participants' overwhelmingly responded that the best method of assessing students' knowledge was through interacting with students by engaging in oral discussions upon conclusion of a lesson. This reaffirms both Mayer and Moreno's (2003) voice or personalization principle as well as Vygotsky's (1926) social constructivism principle and implies that teachers should always engage with students in a conversational manner after completion of a lesson or assignment administered using Chromebooks. The data showed a correlation in what the participants believed were methods deemed vital in engaging students with theoretical knowledge of Mayer's CTML principles. Additional theoretical implications of

this study include allowing educators to select high quality applications free of extraneous words, pictures, or sounds; capable of analyzing data; allowing for remediation; user-paced and concise.

### **Empirical Implications**

Current research indicates a gap in the area of teacher perceptions on the influence of Chromebooks replacing paper textbooks in the classroom due to the continual improvements in technology and the newness of Chromebooks. There are conflicting research results regarding the medium's effect on student understanding and learning (Porat et al., 2018). A review of the empirical literature relating to learning from textbooks and Chromebooks included information processing changes, the process of active learning, and shifting pedagogical practices. This study adds to the current literature by addressing concerns such as student engagement and differentiation and contributes to what is known about factors influencing learning when utilizing Chromebooks. Participants routinely spoke of the need for learner preference to be allowed when using Chromebooks for learning. Students' quickly scrolled through text when presented on Chromebooks and skim reading of electronic text was reaffirmed in current studies (Lauterman & Ackerman, 2014). Also expressed were the factors participants believed to have the most influence on students' learning such as engagement, minimal distractions, and oral discussions after lessons. Current literature corroborated participants' assertion for teachers to be mindful of students with disabilities or learning differences, individual reading levels, and prior knowledge and familiarity with Chromebooks. Finally, this study further confirmed findings from prior research on the importance of maintaining a balance between teaching and learning with Chromebooks and paper materials.

## **Practical Implications**

The results of this research study have practical implications that can benefit curriculum developers, policy makers, district personnel, administrators, teachers, parents, students, and other stakeholders within the education community. All participants agreed meaningful engagement and delivery and the importance of relational connectiveness between teacher and student, along with a nurturing environment was imperative for student engagement and learning. One practical implication is for teachers to ensure that face-to-face interaction and oral discussions with students occur when implementing Chromebooks for learning in the classroom. Another practical implication is the majority of Chromebook assignments should be completed while in the presence of the teacher since many participants shared the struggles of monitoring student use and ensuring understanding.

It is beneficial for educators to share differences in pedagogical practices when transitioning from one medium to the other through collaboration with other educators. Participants routinely shared concerns regarding the amount of time spent creating digital lessons and agreed it was oftentimes overwhelming. Finally, all participants agreed that Chromebooks complemented traditional paper methods of delivering information and should be used in conjunction with one another. When deciding to implement Chromebooks in the classroom, district personnel should not forgo textbooks altogether when replacing with Chromebooks since the empirical literature and this study found students learn best when presented material through both mediums.

## **Delimitations and Limitations**

The delimitations for this collective case study, which were purposeful decisions I made as the researcher to limit or define the boundaries of the study, were numerous. First, participants

were restricted to those who had taught middle school for five years or more. This delimitation allowed for participants who had ample experience teaching with both textbooks and Chromebooks in the middle school classroom environment. Additionally, the boundaries of the study permitted only participants who currently taught in Central County middle schools in a core content area. This delimitation was included in order to allow for detailed experiences from participants in similar circumstances due to the relatively recent adoption of Chromebooks for all third through 11th grade students in Central County.

The first limitation, or possible weakness, of this study was that participants from only five of the six middle schools in Central County, Georgia, were represented. Due to the researcher's role as a teacher at the sixth school, it was not included in the research in an effort to minimize bias. Ideally, all middle schools would have been included to allow for a more thorough understanding of teacher experiences throughout the county. The next limitation of this study was the sample size: 15 teachers represented only a small number of middle school core content area teachers in Central County. Although sufficient for this study, the relatively small sample size may have provided for a limited view of the experiences of teachers who have replaced textbooks with Chromebooks in only one county out of 159 counties in Georgia.

### **Recommendations for Future Research**

Although this collective case study offered meaningful insight into middle school teachers' experiences using Chromebooks instead of textbooks in the classroom, additional research is needed to understand and improve the educational outcomes for students. In consideration of the study findings, limitations, and delimitations placed on this study, the researcher recommends future studies to include an expanded population of schools, participants, and students, including elementary and high schools. Additionally, the researcher recommends a

more diverse population sample to include urban and rural school systems to compare and contrast life experiences, background knowledge, technology familiarity, and access to Wi-Fi. In light of the recent pandemic and need for digital learning, a future topic of study may be to research the experiences and successes, or lack thereof, between students who learn remotely using Chromebooks and students who learn in a classroom setting. To further understand the common characteristics of students who learn remotely and those who learn while face-to-face with a teacher, future researchers may find it beneficial to conduct a phenomenological research design to describe the phenomena that have occurred through in-depth interviews. Finally, any future research should be conducted sometime in the future when students are allowed to return to in-person learning without the risk of being quarantined due to exposure and required to learn virtually.

### **Summary**

This research study examined middle school teachers' experiences utilizing Chromebooks instead of traditional textbooks in the classroom. As schools across the United States are opting to purchase online or digital versions of textbooks in lieu of paper versions, stakeholders in the field of education should remain mindful of the findings of this collective case study. This study used Mayer's CTML by highlighting the manners in which students learn using Chromebooks (Mayer & Moreno, 2003). Overall, most participants appreciated the benefits provided by Chromebooks but expressed their concerns with their exclusive utilization in the middle school classroom. Participants routinely shared that the most effective manner to assess students' knowledge was through interaction with students and engagement in oral discussions. Additionally, participants spoke of the need for learner preference to be allowed when using Chromebooks for learning. Also expressed were the factors participants believed to

be useful when engaging students utilizing Chromebooks for learning such as being aware of students with disabilities or learning differences, individual reading levels, and prior knowledge and familiarity with Chromebooks. Finally, this study reaffirmed the importance of maintaining a balance between teaching and learning with Chromebooks and paper materials.



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## APPENDIX A: IRB Approval to Conduct Research

### Consent

**Title of the Project:** A COLLECTIVE CASE STUDY OF MIDDLE SCHOOLS TEACHERS' EXPERIENCES USING CHROMEBOOKS INSTEAD OF TEXTBOOKS IN THE CLASSROOM

**Principal Investigator:** Holly Eimer, EdS, Liberty University

#### Invitation to be Part of a Research Study

You are invited to participate in a research study. In order to participate, you must be a 6<sup>th</sup> to 8<sup>th</sup> grade core content area teacher using Chromebooks for student instruction and have a minimum of three years of experience teaching solely with textbooks and a minimum of two years exclusively teaching with Chromebooks. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

#### What is the study about and why is it being done?

The purpose of the study is to understand the experiences of middle school teachers using Chromebooks in place of textbooks in the classroom.

#### What will happen if you take part in this study?

If you agree to be in this study, I would ask you to do the following things:

1. Participate in either a one-on-one interview with the researcher or a focus group session that will be led by the researcher and include three other teachers. Both the one-on-one interviews and focus group sessions will be recorded with an audio recording device to assist me later when compiling all of the data. Each one-on-one interview should take approximately 30 minutes, and the focus group session should take about 45 minutes to complete.
2. During a 10-day work period, write in a participant journal using guided prompts and provide perceptions and observations pertaining to the face-to-face interviews or focus groups.

#### How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

#### What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life. The researcher, Holly Eimer, is a mandated reporter.

#### How will personal information be protected?

The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential through the use of pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.

Liberty University IRB-FY 19-20-257 Approved on 6-22-2020
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- To ensure an ethical interview or response from each participant, the researcher will first ensure that each participant has completed a consent form.
- All focus group participants will be reminded that the information shared in the focus group is personal and confidential, and they will be asked not to share any information outside of the group. As the researcher, I cannot assure participants that other members of the focus group will not share what was discussed with persons outside of the group.
- All information including a list of pseudonyms of participants will remain locked in a key entry safe in the researcher's home during the research phase of this study. At the end of this case study, all written information will be scanned into separate PDF files, and the written portion of the information will be shredded. All digital voice recordings and PDF files will be stored on a password protected flash drive and locked in a key entry safe in the researcher's home for three years. At the end of three years, I will shred the password protected flash drive containing all digital voice recordings and PDF files from this study. From the very beginning of the research study until the time the password protected flash drive is shredded, the researcher will be the only person who will have access to the data.

#### **How will you be compensated for being part of the study?**

Participants will be compensated for participating in this study. Upon completion of the study, participants will receive an electronic Amazon gift card texted to their cell phone in the amount of \$25. Cell phone numbers will be requested for compensation purposes; however, they will be pulled and separated from your responses to maintain your confidentiality. Monetary benefits will not be pro-rated if a participant does not complete the study.

#### **Is study participation voluntary?**

Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

#### **What should you do if you decide to withdraw from the study?**

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

#### **Whom do you contact if you have questions or concerns about the study?**

The researcher conducting this study is Holly Diane Eimer. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [hdeimer@liberty.edu](mailto:hdeimer@liberty.edu). You may also contact the researcher's faculty advisor, Dr. Rebecca Bowman, at [rbowman3@liberty.edu](mailto:rbowman3@liberty.edu)

#### **Whom do you contact if you have questions about your rights as a research participant?**

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at [irb@liberty.edu](mailto:irb@liberty.edu).



**Your Consent**

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

*I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.*

The researcher has my permission to audio-record me as part of my participation in this study.

\_\_\_\_\_  
Printed Subject Name

\_\_\_\_\_  
Signature & Date

Liberty University  
IRB-FY19-20-257  
Approved on 6-22-2020

**APPENDIX B: IRB Exemption Letter**

IRB-FY19-20-257 - Initial: Initial - Exempt

irb@liberty.edu <irb@liberty.edu>

Mon 6/22/2020 8:51 AM

To: Eimer, Holly D <hdeimer@liberty.edu>; Bowman, Rebecca (School of Education) <rbowman3@liberty.edu>

**LIBERTY UNIVERSITY.**  
INSTITUTIONAL REVIEW BOARD

June 22, 2020

Holly Eimer  
Rebecca Bowman

Re: IRB Exemption - IRB-FY19-20-257 A COLLECTIVE CASE STUDY OF MIDDLE SCHOOL TEACHERS' EXPERIENCES USING CHROMEBOOKS INSTEAD OF TEXTBOOKS IN THE CLASSROOM

Dear Holly Eimer, Rebecca Bowman:

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46: 101(b):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

Your stamped consent form can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. This form should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible

modifications to your protocol would change your exemption status, please email us at [irb@liberty.edu](mailto:irb@liberty.edu).

Sincerely,

**G. Michele Baker, MA, CIP**

*Administrative Chair of Institutional Research*

**Research Ethics Office**

## APPENDIX C: Recruitment Letter

### A COLLECTIVE CASE STUDY OF MIDDLE SCHOOL TEACHERS' EXPERIENCES USING CHROMEBOOKS INSTEAD OF TEXTBOOKS IN THE CLASSROOM

Holly Diane Eimer  
Liberty University School of Education

Date

Mr. John Doe  
7th Grade Teacher  
Anywhere Middle School  
123 Education Blvd  
Anywhere, GA 12345

Dear Mr. Doe,

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctor of Education degree. The purpose of my research study is to understand the experiences using Chromebooks in place of textbooks among Central County middle school teachers in the classroom and I am writing to invite you to participate in my study.

You were selected as a possible participant because you are a 6th to 8th grade core content area teacher using Chromebooks for student instruction and have a minimum of three years of experience teaching solely with textbooks and a minimum of two years exclusively teaching with Chromebooks. If you are a middle school teacher, are 18 years of age or older, and are willing to participate, you will be asked to do the following:

1. Participate in a one-on-one interview with the researcher. The one-on-one interview session will be recorded with an audio recording device to assist the researcher later when compiling all of the data. The one-on-one interview session should take about one hour to complete.
2. Participate in a focus group interview session with three other teachers. The focus group interview session will be recorded with an audio recording device to assist the researcher later when compiling all of the data. The focus group interview session should take about one hour to complete and the focus group interview participants will be randomly selected.

3. For 10-15 minutes each day, during a 10-day work period, write in a participant journal using guided prompts, along with perceptions and observations pertaining to the face-to-face interviews or focus groups.

Your name and/or other identifying information will be requested as part of your participation, but the information will remain confidential. To participate, please complete the enclosed participant consent document and return it to the researcher, Holly Diane Eimer. The participant consent document contains additional information about my research. Please sign the consent document and return it to the researcher in the self-addressed stamped envelope provided.

Sincerely,

Holly Diane Eimer



## **APPENDIX D: Participant Consent Form**

### **A COLLECTIVE CASE STUDY OF MIDDLE SCHOOL TEACHERS' EXPERIENCES USING CHROMEBOOKS INSTEAD OF TEXTBOOKS IN THE CLASSROOM**

Holly Diane Eimer  
Liberty University School of Education

#### **Invitation to be Part of a Research Study**

You are invited to be in a research study to understand the experiences of Central County Middle School, a pseudonym for confidentiality, teachers who use Chromebooks in place of traditional textbooks in the classroom for student learning. You were selected as a possible participant because you are a 6th to 8th grade core content area teacher using Chromebooks for student instruction and have a minimum of three years of experience teaching solely with textbooks and a minimum of two years exclusively teaching with Chromebooks. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

#### **What is the study about and why is it being done?**

The purpose of this proposed collective case study is to understand the experiences using Chromebooks in place of textbooks among Central County middle school teachers in the classroom.

#### **What will happen if you take part in this study?**

If you agree to be in this study, I would ask you to do the following things:

1. Participate in either a one-on-one interview with the researcher or a focus group session with three other teachers that will be led by the researcher. Both the one-on-one interviews and focus group sessions will be recorded with an audio recording device to assist me later when compiling all of the data. Each one-on one interview and focus group session should take about one hour to complete and the focus group participants will be randomly selected.
2. During a 15-day work period, write in a participant journal using guided prompts, along with perceptions an observations pertaining to the face-to-face interviews or focus groups.

#### **How could you or others benefit from this study?**

Participants should not expect to receive a direct benefit from taking part in this study.

#### **What risks might you experience from being in this study?**

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

### **How will personal information be protected?**

The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential through the use of pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.
- To ensure an ethical interview or response from each participant the researcher will first ensure that each participant has completed a consent form.
- All focus group participants will be reminded that the information shared in the focus group is personal and confidential and they will be asked not to share any information outside of the group. As the researcher I cannot assure participants that other members of the focus group will not share what was discussed with persons outside of the group.
- All information including a list of pseudonyms of participants will remain locked in a key entry safe in the researcher's home during the research phase of this study. At the end of this case study, all written information will be scanned into separate PDF files and the written portion of the information will be shredded. All digital voice recordings and PDF files will be stored on a password protected flash drive and locked in a key entry safe in the researcher's home for three years. At the end of three years I will shred the password protected flash drive containing all digital voice recordings and PDF files from this study. From the very beginning of the research study until the time the password protected flash drive is shredded, the researcher will be the only person who will have access to the data.

### **How will you be compensated for being part of the study?**

Participants will not be compensated for participating in this study.

### **Is study participation voluntary?**

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

### **What should you do if you decide to withdraw from the study?**

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, apart from focus group data, will be destroyed immediately and will not be included in this study. Focus group data will not be destroyed, but your contributions to the focus group will not be included in the study if you choose to withdraw.

### **Whom do you contact if you have questions or concerns about the study?**

The researcher conducting this study is Holly Diane Eimer. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at hdeimer@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Rebecca Bowman, at rbowman3@liberty.edu

### **Whom do you contact if you have questions about your rights as a research participant?**

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

### Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

*I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.*

The researcher has my permission to audio-record me as part of my participation in this study.

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Printed Subject Name

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Signature & Date

## **APPENDIX E: Interview Questions**

### *Information Processing Changes*

1. Describe the process of Chromebook implementation in your classroom.
2. What are some differences you have observed when students learn from Chromebooks rather than textbooks?
3. What are some changes in the amount of time spent with reading text from a screen as opposed to reading from paper?

### *Active Learning Process*

4. How do you observe if learning is taking place in your classroom while using Chromebooks?
5. What strategies do students employ when engaging with Chromebooks for learning purposes?
6. How do students with learning differences respond to learning with Chromebooks?
7. What are some of the differences in homework completion you have noticed when students are instructed to utilize Chromebooks?

### *Pedagogical Practices*

8. How has the replacement of textbooks with Chromebooks altered your teaching practices or teaching methods?
9. How have students responded to the implementation of Chromebooks?
10. Describe the preferred medium of learning for students.
11. What programs have you implemented using Chromebooks and why did you select these programs?
12. Describe how students read text using Chromebooks for learning.

## APPENDIX F: Focus Group Questions

### *Information Processing Changes*

1. Describe the process of Chromebook implementation in your classroom.
2. What are some differences you have observed when students learn from Chromebooks rather than textbooks?
3. What are some changes in the amount of time spent with reading text from a screen as opposed to reading from paper?

### *Active Learning Process*

4. How do you observe if learning is taking place in your classroom while using Chromebooks?
5. What strategies do students employ when engaging with Chromebooks for learning purposes?
6. How do students with learning differences respond to learning with Chromebooks?
7. What are some of the differences in homework completion you have noticed when students are instructed to utilize Chromebooks?

### *Pedagogical Practices*

8. How has the replacement of textbooks with Chromebooks altered your teaching practices or teaching methods?
9. How have students responded to the implementation of Chromebooks?
10. Describe the preferred medium of learning for students.
11. What programs have you implemented using Chromebooks and why did you select these programs?
12. Describe how students read text using Chromebooks for learning.

**APPENDIX G: Participant Journal Prompts and Participant Examples**

1. What did you observe today regarding student Chromebook usage?
2. What did you find successful or unsuccessful in implementing Chromebook usage?
3. What programs did you utilize on the Chromebook today?
4. Approximately how much instructional and learning time was spent using Chromebooks today?
5. Approximately how much instructional and learning time was spent using resources other than the Chromebook today?

## Participant Journal

Day 1 of 10

Lynn

1. What did you observe today regarding student Chromebook usage? \*

Most students stayed on task and worked very well. However, some students used their Chromebook to message friends via email, look up videos on youtube, or were off task in other ways. Most of the time, it is the same students over and over who are not on task.

2. What did you find successful or unsuccessful in implementing Chromebook usage? \*

Successful: students able to access various resources at one time. Also, blocking web pages works well for getting students back on track. GG allows me to chat with students therefore offering support and immediate feedback.

3. What programs did you utilize on the Chromebook today? \*

GoGuardian (GG), Google Classroom, USATestPrep, Extensions, Google Meet

4. Approximately how much instructional and learning time was spent using Chromebooks today? \*

95%

5. Approximately how much instructional and learning time was spent using resources other than the Chromebook today? \*

5%

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## Participant Journal

Chromebook Survey

Day 1 of 10

Susan

1. What did you observe today regarding student Chromebook usage? \*

We took 9-week exams today. Several students logged into their classrooms but did not take their exams. They either left the google meet or stayed on, but were not actively doing what they were supposed to be doing. In other classes, we spent time reviewing. Again, some students were logged in and actively engaged while others chose to either check out or stay signed in, but walked away from the chromebook and didn't answer when called on.

2. What did you find successful or unsuccessful in implementing Chromebook usage? \*

Some students are very compliant with staying on task, but others do not stay on task and will either sign out of a google meet or will go to You Tube or games.

3. What programs did you utilize on the Chromebook today? \*

USATP, Google classroom, Gimkit, Quizizz

4. Approximately how much instructional and learning time was spent using Chromebooks today? \*

6.5 hours

5. Approximately how much instructional and learning time was spent using resources other than the Chromebook today? \*

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## APPENDIX H: Theme Development

Significant Statements	Subthemes	Themes
Personal abilities differ with some students being more tech-savvy than others.	Learning Styles	Learner Performance and Differentiation
Differentiation is important, to allow for different paces and learning styles.		
Gifted students like to dive deeper for more information and special education students can research for clarification.		
It is important to give students a choice.	Students Perform Better When Comfortable	
Some students request paper copies, while others prefer using Chromebooks.		
Students who aren't very good at spelling or penmanship feel more comfortable using Chromebooks.		
Chromebooks foster independence for students with learning differences.	Students With Learning Differences	
Students with diagnosed attention and focus conditions tend to be easily distracted with clicking tabs unrelated to the lesson.		
Gifted students appreciate the self-guided nature of Chromebook usage but will ask for paper copies often when reading long passages or novels.		

Significant Statements	Subthemes	Themes
Apps like Google Classroom are concise and user friendly.	Features of Quality Applications	Balance and Importance of Quality Applications
We're required to use certain apps, but I like when an app allows for creativity and differentiation.		
I choose which apps I use based on the ability it has for data collection and remediation.		
Balance between Chromebooks and paper is important.	Paper and Chromebook are Complimentary	
My students will get bored with the Chromebook and request more hands-on activities that aren't so monotonous.		
Chromebooks are great, but balance is critical and they need to be used while face-to-face with a teacher.		
Many students request paper version.	Presentation of Text Matters	
Students manipulate text by zooming in or zooming out.		
Many students will ask for the lights to be dimmed or will dim their screens and flip the Chromebook in half like a book.		

Significant Statements	Subthemes	Themes
Students learn best when engaged.	Engagement	Factors Influencing Learning
Chromebooks are interactive <del>and bad</del> allow for simulations.		
Chromebooks allow for virtual field trips.		
The lure of distractions online is always present.	Focus and Attention	
Students' focus and attention is waning.		
Anything on the screen that has "bells and whistles" features often distracts students.		
Class discussions after lessons are important.	Oral Discussions	
I always walk around to listen to discussions and observe body language.		
Questions and answer sessions after a lesson online is imperative.		

Significant Statements	Subthemes	Themes
So much time is spent on creating online lessons.	Amount of Time Spent on Lessons and Behind the Screen	Benefits and Concerns
Students complain of headaches and strain.		
Screen fatigue is very real.		
There are opportunities for creativity with Chromebooks.	Creativity	
Students seem to enjoy creating presentations using online resources.		
The possibilities for personalizing the curriculum allows teachers to be creative.		
Chromebooks allow for independent problem solving.	Independence and Responsibility	
Chromebooks level the playing field for students who may otherwise require assistance with read-aloud features and speech to text options.		
Most students are careful with their Chromebooks and remember to bring it to class.		
I'm always walking around monitoring like the "Chromebook Police."	Monitoring Usage	
It's difficult to monitor usage with unreliable Wi-Fi and connectivity issues.		
Technology is constantly changing and the student are sneaky and know more than I do so it's hard to monitor.		

**APPENDIX I: Audit Trail**

<b>Date</b>	<b>Entry</b>
April 14, 2020	Received permission from Central County School System to conduct study.
June 22, 2020	Received IRB approval to conduct study
June 25, 2020	Potential participants were emailed a recruitment letter and a link to a screening survey.
July 8 – 10, 2020	Conducted all one-on-one and focus group interviews
August 23, 2020	Conducted Focus Group Interviews
September 14 – 18, 2020	Collected participant journals
September 21 – 30, 2020	Transcribed one-on-one and focus group interviews
October 5 – 8, 2020	Completed one-on-one and focus group transcriptions and sent to participants for member checks / Received back from participants
November 11 – December 4, 2020	Completed coding and identified four themes. Completed Chapter Four and submitted to chair for review.
December 5, 2020	Began writing Chapter Five