TEACHERS' PERCEPTIONS OF PRE-PLANNED QUESTIONS PAIRED WITH FORMATIVE ASSESSMENT TECHNOLOGY

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Heather N. Byrd

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Student Name: Heather N. Byrd

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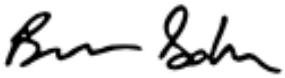
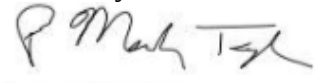
Dissertation Committee:

Signatures: (Print and Sign)

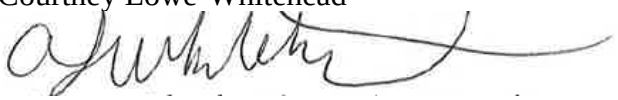
Dissertation Chair
Dr. Brian Sohn



Methodologist Member
Dr. P. Mark Taylor



Content Member
Dr Courtney Lowe-Whitehead



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Abstract

Current statistics in educational outcomes represent a population of students entering college or career lacking 21st century skills needed to be successful post secondary education. These 21st century skills demanded by current work force and colleges entail not only technology skills but the ability to think critically, problem solve, and collaborate. In response to these staggering statistics, educational leaders are implementing one-to-one initiatives. Much of the one-to-one technology is being utilized by educators to implement formative assessment technologies. In consideration of the use of these formative assessment technologies, some research has begun investigating the types and levels of questions that are being used in these situations—most of which has been noted to be low level when examined against questioning hierarchies. Also, research has primarily focused upon clicker systems and at a secondary or post-secondary level of education. Elementary schools are beginning to take part in these one-to-one initiatives and educational leaders are continuing to reason that instruction must be purposefully planned including questioning if students are to be better equipped with 21st century skills. A case study method of data collection and analysis was utilized in order to provide a rich-description of a bound case involving 3rd through 5th grade teachers. The ten participants were from an elementary school setting in the second year of a one-to-one implementation district initiative. Interviews, questionnaire, and observation data were collected and analyzed. Bloom's Theory of Mastery Learning was used as a theoretical framework for the study. Four overarching themes emerged reflecting perceptions of participants: professional learning is valued, influences on formative assessment design, relationships between data and instruction, and formative assessment technology allows for efficiency.

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Dedication

This dissertation is dedicated to my family and a teacher…

Andy- Your constant encouragement and belief in my dream to accomplish this goal kept me going—even when I wanted to give up. Thank you for being understanding when I worked late at night or all weekend, for loving me through the tears, and for keeping our sometimes chaotic, house running (and clean!). I love you.

Lakelee and Paisley- Thank you for understanding when mommy had homework.
You two inspired me to achieve this dream, and I hope my work inspires you to achieve yours. If you dream it, you can achieve it, and I will always support you in your endeavors. I love you.

My Parents and Step-parents- Mom and Dad, you taught me from a young age to dream big. Because of your constant belief in me and the example of strong work ethic you've displayed all of my life, I knew I could achieve this goal and how to achieve it as well. Mom, Tim, Dad, and Donna, without your support, encouragement, and the many times that you've helped with Lakelee and Paisley so that I could work, this wouldn't have been possible. Thank you, and I love you.

Mrs. Mertz- Your smile and words of encouragement since the time I was a fourth grader in your classroom taught me the importance of learning as well as the power of a strong relationship between a teacher and her students. Thank you for your lasting inspiration to never stop learning and to impact the lives of other students in the way that you have impacted mine.

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CHAPTER 1:
Introduction

Current statistics in education demonstrate a lack of population of prepared students who are college and career ready with 21st century skills demanded by the ever-changing needs of society, which supports calls for reform (Daggett, 2014). Millions of jobs paying $50,000 or more per year are unfilled despite having an abundance of people identified as unemployed or in need of employment (U.S. Department of Education, 2010). In recent reports, nearly 6.1 million jobs are unfilled, yet 4.2 million U.S. citizens are considered unemployed (U.S. Department of Labor, 2017). Former Secretary of Education, Arne Duncan, noted as early as 2010 that nearly 600,000 jobs are going unfilled due to a lack of preparedness, which continues to be the case. In a report by the Business Round Table (2013), nearly 95% of CEOs reported that potential and present employees lacked in skills needed to do jobs adequately. This chapter will describe the problem and background of preparing students with 21st century skills, the question being studied in this research, and the purpose and significance of the study.

Background

Not only are groups of students attempting to transition from secondary education to an immediate career failing to do so successfully, the body of students entering college before attempting to begin a career does not appear adequately prepared. Daggett (2014), founder and chairman of the International Center for Leadership in Education (ICLE), reported, “ACT’s national studies of remediation required for college freshmen show that 19.9% of those entering four-year programs and 51.7% in two-year programs need remediation.”Clearly, students are exiting secondary education unprepared for future learning or careers.

Due to these staggering statistics, calls for action by national educational leaders to reform and meet the demands of 21st century skills necessary for success in college and career have been made in recent years (Duncan, 2010; Stone, 2011; corestandards.org). One action component involves standards reform such as those provided by the Common Core State Standards initiative (corestandards.org). Other efforts at the national level have been outlined in efforts such as Race to the Top and the recent Every Student Succeeds Act (ESSA). Stemming from these efforts, the United States Department of Education implemented additional initiatives to support, outline, and offer direction in meeting 21st century college and career-ready demands. In the most recent version of the National Education Technology Plan (NETP) released by the U.S. Department of Education (2017), the needs of learners are outlined and include soft skills such as collaboration as well as skills like problem solving and critical thinking. In addition, the NETP describes the necessary addition of communicating through the use of multimedia sources and integrating such into core academic subjects. Within this list of skills, technology is only one of the skills that needs to be addressed. Critical, rigorous thinking skills are also identified as a problem area for learners. While the NETP outlines such strategies and necessities to meet the demands of 21st century learning, it is incumbent upon state-level and district-level educators to implement these initiatives. Before discussing state and district-level attempts to implement these initiatives, it is important to define college and career-ready.

College and career-ready defined

It is important to note and define clearly researchers' understanding and definition of college and career-ready. College and career-ready students are students equipped with both literacy and mathematical skills that allow them to readily employ and apply reading, writing, speaking, listening, language, and mathematical procedural practices and understandings to real

life situations with success (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). The Common Core State Standards are organized into two overarching categories: English Language Arts (ELA) and Mathematics. Students must demonstrate mastery in each of these categories in order to be considered college and career-ready. As outlined in the Common Core State Standards documents, college and career-ready students in ELA can: demonstrate independence, build strong content knowledge, respond to varying demands of audience, task, purpose, and discipline, comprehend as well as critique, value evidence, use technology and digital media strategically and capably, and come to understand other perspectives and cultures.

Mathematical demands, combined with ELA expectations for college and career-readiness, define students as being college and career-ready when these students can apply math content and practices fluently to solve real-world situations. By becoming college and career ready as defined above, students will be equipped with 21st century skills.

National initiatives to be college and career-ready

Daggett (2014), stated that schools today are impacted by five emerging trends: impact of digital learning, heightened demand for career readiness, increased emphasis on application-based earning, use of data analytics to implement growth models, and developing personal skills. College and career-readiness is evident in these five categories, as is the importance of using data and/or formative assessment results to guide growth and the development of such skills. The ICLE recommends that educational leaders must act proactively towards developing and providing a foundation which includes these skills (Daggett, 2010). One of the key tenets that has evolved from the center's research is taking a systematic approach to improve student performance. Educators in leadership have a role in shifting the structures of learning to meet

the demands and better prepare students (Daggett, 2014). It is essential that curriculum and instruction should be of high rigor and relevance to the students involved. The instruction and curriculum in these successful school settings are established by leaders and include the shift to drive literacy across the curriculum, achieve consistent use of technology applications across the curriculum, focus the system on student growth models, and adopt data analytics to monitor student growth and the effectiveness of various instructional practices.

One of the most prevalent initiatives at a national level involved the adoption of the Common Core State Standards by nearly all states within the United States. These documents provided a definition of college and career-ready, as mentioned above, and were created to provide educators with specific mastery levels in both ELA and mathematics (corestandards.org).

State and local initiatives for college and career-ready

At the Tennessee Department of Education (TDOE) educational leaders have attempted systematic approaches to address such shifts described above in order to develop 21st century college and career-ready students. Given that only 43% of students were considered proficient readers according to standardized testing, the TDOE (2016) has launched initiatives including the Read to be Ready program, which focuses on ensuring that students are on-grade level with literacy skills by third grade. The visionary document outlined establishing literacy curricula that is high in rigor and spans across diverse topics and content areas. Additionally, the state described its expectations for effective instruction, which was explicit, purposefully planned, and grounded in real-world applications in order to develop critical thinking and reasoning skills. In order to implement this vision, the state has provided on-going professional learning opportunities through creating a network of literacy coaches (TDOE, 2017). The network of

coaches involves over 200 educators from over two-thirds of the districts in the state, including the research district. These coaches meet regularly throughout the year for professional learning opportunities and provide job-embedded learning for teachers.

One of the focuses of the Read to be Ready program is developing teacher questioning (TDOE, 2016). High levels of questioning designed to increase rigor and relevance are lacking in 21st century classrooms as well (Brualdi, 1998; Hattie, 2012).The functions of society as a whole are based upon asking questions and problem solving to determine solutions or ascertain other areas to be considered. Hardman, Smith, and Wall (2003) reported evidence of whole group lessons which relied primarily on closed questions. Closed questions are those questions which have one clear right or wrong answer and typically rely on fact recall with no need to apply critical thinking skills. Approximately 15% of the teachers involved in the study never asked an open question, and spontaneous responses from students were a rare occurrence as well. Open questions are considered those which require critical thinking and application of knowledge along with a possible need for collaboration to respond most effectively. In fact, in a recent study, it was identified that nearly 500 questions were asked within an instructional block, yet the majority of such questions were within the lower level of cognition and critical thinking (Hattie, 2012).

The use of technology across curriculums as well as a focus of using data for growth purposes is necessary in classrooms as well. Teachers must be equipped in tools, knowledge, and strategies to most effectively instruct, utilize technology, and analyze and apply data gathered through technology. Presently, however, rather than do what is needed, teachers keep delivering content as facts while these facts are now easily accessible to students via a variety of technological devices (Daggett, 2014).Students involved in more active learning are less likely to

fail than those students involved in lecture-type settings. In the real world, life is not lived through lecture and thus, instructional settings should mirror reality (Duncan, 2010). To ensure that students enter careers or college prepared with 21st century skills, educational leaders must enhance the relevance of school settings. Opportunities available to teachers and students via technology, as well as proven, research-based teaching strategies may allow for educators to provide this appropriate school setting.

If educational leaders and researchers have identified there are success criteria for helping students become college and career-ready students and have outlined necessary expectations for helping students master 21stcentury skills, then why are the majority of teachers not delivering instruction that is active, engaging, and prepared with purposefully planned, rigorous questioning?

Theoretical Framework

Instruction that is purposefully planned, active, and rigorously balanced is not a new focus of educational research and learning. Bloom's Mastery Learning Theory (1968)introduced questioning with relation to instruction for educators as a primary topic for consideration. This study was grounded in Bloom's Mastery Learning approach, which requires the use of formative assessment and involves questioning at various levels to provide the educator with responses from the students allowing for demonstration of mastery or a lack of mastery for a particular concept or skill (Bloom, 1968). The educator then responds with further instruction and questions in order to move the student forward in their trajectory of learning. According to Armstrong (2017), Bloom and other colleagues identified levels of learning objectives, then subsequently designated this framework as Bloom's Taxonomy. The combination of the taxonomy and mastery learning ideally allows educators to prescriptively identify various levels

of rigorous or cognitive thinking objectives and design instruction, including questions that yield the desired learning outcomes.

For decades, as evidenced in the beginning works of Bloom, the concept of questioning in the classroom has been discussed and researched in-depth. This research has varied to some degree and focused upon numerous aspects of questioning and its role in the classroom. Much research has focused on the levels of questions (Christenbery& Kelly, 1983). A body of existing research has investigated the amount of questions asked during an instructional segment (Brualdi, 1998). Yet, others have studied the patterns of pre-service and in-service teachers' questioning skills (Brophy & Good, 1969; Diaz, Whitacre, Esquierdo, & Ruiz-Escalante, 2013; McCarthy, Sithole, McCarthy, Cho, &Gyan, 2016; Moyer &Milewicz, 2002; Schwartz, 2015; Wilen, 1991). Within this existing research, which encompasses a spectrum of academic content areas and levels, a body of research also exists on the aspect of pre-planning questions that are developed purposefully to direct students in the path of their learning trajectory, with the goal of mastery of a learning target (Evans, Wills, & Moretti, 2015; Womack, Pepper, Hanna, & Bell, 2015).

While much is known about the importance and impact of questioning upon learning and knowledge, there still exists a wide array of habits and practices of planning and executing questions for instructional purposes. Teachers are provided teaching manuals for most subject areas and pre-planned questions are available within these manuals. However, not all teachers use the manuals, and they may not contain enough questions, or rigorous enough questions, to ensure mastery of learning.

Purposeful planning conducted by educators ensures that an optimal opportunity for learning is provided for students on a daily basis. Planning that involves purposeful questions

aimed at mastering learning targets confirms that teachers are questioning at various levels of rigor and cognition, as well as seeking formative feedback from students (Keischnick, 2017). With the integration of technology into classrooms worldwide, it is becoming increasingly possible to collect this formative information from all students in an instantaneous manner. Thus, feedback and adjustment of instruction, including questions to be asked in the future can be more readily and effectively informed.

Teachers also attend workshops and professional learning opportunities focused upon the importance of questions. Some of these workshops attempt to train teachers to create their questions at varied levels of cognitive rigor (Appalachian Educational Laboratory, 1997). Yet many of these teacher development opportunities are short-term and often yield negative returns on implementation (Darling-Hammond, Wei, Andree, Richardson, &Orpanos, 2009).
In conjunction with questioning, equally important is the opportunity for students to respond to such questions. These responses provide insights into a learner's understanding and knowledge of a skill or topic. Research has investigated dialogue and classroom discourse between teacher questioning and student responses, which can be viewed as a means of formative assessment similar to that found in Bloom's Theory of Mastery Learning. Also, methods which maximize and minimize the amount and type of responses teachers may gather from students in this flow have been identified (Robataille, & Maldonado, 2015).

The idea of maximizing student responses for providing the teacher with formative assessment data has been incorporated with the use of technology tools in the classroom. Examples of early forms of technology used for the purpose included clickers, which students tend to offer asurface-level response of understanding in response to a teacher's questions (Troy &Bulgakov-Cooke, 2013; Mayer et. al, 2009). Over time, these tools have developed and with

one-to-one technology integration in the classroom, formative assessment responses can be expanded to gather student answers which have the potential to demonstrate a higher cognitive level understanding. Research in effective use of such tools within one-to-one K-12 settings is gaining momentum. In a review of integration, resources, and effectiveness of technology, Delgado, Wardlow, McKnight, and O'Malley (2014), reported that while several meta-analyses found technology integration to be effective, results may be biased due to poor methodology within the studies. In a meta-analysis on effectiveness of technology, the U.S. Department of Education (2009) reported that technology blended learning settings were overall more effective than mere face-to-face instruction. However, this study included more post-secondary studies than K-12 studies in the review. Studies in the K-12 span of education are more limited, but this field is beginning to expand. It is important to note here also that impact of professional learning in implementing technology is mixed in findings. Some studies report professional development has increased implementation efforts, while others found that knowledge of the teacher increased yet implementation did not (Uslu & Bümen, 2012).

The Need for Effective Professional Learning

As noted above, the professional learning aspects associated with implementation of effective questioning and technology practices have been inconsistent and overall ineffective in causing a transfer of these best practices to the classroom. On-going, job-embedded professional learning has been noted as an effective practice for educator growth (U.S. Department of Education, 2017). Within the NETP, the U.S. Department of Education specifies that effective educational leaders provide teachers with professional learning in technology integration that is informed in its design by experts and delivered in a method that is job-embedded, recurring, and teacher-led. The U.S. Department of Education also provides guiding principles for fostering an

on-going, job-embedded professional learning environment. These guidelines include: increasing online professional collaboration, providing individualized opportunities based upon teachers' needs, and participating in learning setting which are not like a typical conference setting but more interactive between the facilitator and participants. Collectively, these professional learning practices shift the focus of traditional professional development to a teacher-led approach, which includes the use of technology and is designed based upon teacher needs and interests.

In addition to these practices from NETP, which center around enhancing the necessary 21st century skills for educators and students, research on the use of peers as coaches and collaborative partners has yielded positive results in teacher development and growth (Byrne, Brown, & Challen, 2000; Hendry & Oliver, 2012). If implemented effectively, peer educators can use planning, observation, and discourse centered around pedagogy and action in an on-going practice as one of the most effective professional learning strategies (Byrne, Brown, &Challen, 2000).

The idea of using technology and peers is a newer model of professional development and has been referred to as technology-mediated professional learning (Brooks & Gibson, 2012). This model indicates that educators collaborate and work at an independent pace to grow in their instructional practices. All learning in this approach occurs within an on-line platform. In an ideal educational setting, teachers have access to one, if not all, of these types of professional learning models.

Bloom's Mastery Learning approach served as the framework for this study and informed the technology elements. This approach requires the use of formative assessment and involves questioning at various levels to provide educators with student responses that allow for

demonstration of mastery or a lack of mastery for a particular concept. Teacher skills at using rigorous instructional questions for formative assessment purposes continue to be inconsistent and perhaps underdeveloped. The practice of using purposeful questions for formative assessment purposes is not new to education; however, pairing this practice with formative assessment technology is newer and has a limited body of research. Therefore information about teacher perceptions and practices for implementing effective questioning paired with formative assessment technology will better inform the content and structures of professional learning in this area.

Purpose of the Study

Students are not meeting the demands set forth by colleges and careers, so educational foundations provided in elementary and secondary settings must adjust to ensure the success of students and society as a whole. In order for students to achieve necessary 21st century skills, instruction grounded in mastery learning theory allows teachers the opportunity to elicit higher rigor and relevance in the classroom as well as ensure that a span of cognitive thinking skills are mastered. Therefore, the purpose of this research study is to examine the perceptions of participating teachers regarding the use of combining purposeful, pre-planned questions paired with formative assessment technology. The use of these tools has potential to provide students with an opportunity to think critically, problem solve, and collaborate. It also allows teachers to inform future instruction due to instant feedback. Data collected through conversational interviews, observation field notes, and survey responses will be triangulated to validate findings regarding teachers' perceptions of formative assessment technology along with purposeful questions.

During the 2016-2017 school year, the school system involved in the study began to distribute technology devices to all schools within the district in an attempt become one-to-one in all grade levels by the 2019-2020 school year. These devices were Chromebooks, which operate utilizing Google Suites for Education. The research district also employed the use of teacher leaders to support classroom teachers in implementing the use of Chromebooks in one-to-one classrooms. These Tech Teacher Leaders were to introduce Chromebooks and attend district-level trainings throughout the school year. Subsequently, they were to re-deliver learning to colleagues in each school building. The initial trainings in the 2016-2017 school year were focused upon introducing teachers to Google Suite for Education, as well as additional formative assessment technology tools for classrooms ideal for one-to-one settings.

School A is one of the schools in the research district that began receiving devices for one-to-one implementation during the 2016-2017 school year. The school designated two Tech Teacher Leaders, one for grades K-2 and the other for grades 3-5. During the first year of this initiative, these teacher leaders served as a support system for troubleshooting and as model classrooms for implementing Google Suites for Education. These teachers were provided release days to support teachers and meet their needs during the implementation process. In addition, all other teachers in School A participated in system-designed modules for learning the basics of Google Suites for Education.

The research district also created an elementary-level position in January 2017 designed to support literacy in all content areas. This position was entitled Literacy Teacher Leaders. These teacher leaders were tasked with supporting fellow colleagues in the same manner as the Tech Teacher Leaders. One of the main focuses of their work to improve literacy instruction

was to support teachers in developing questioning that would be used with interactive read alouds, shared reading, and guided reading instruction.

By investigating the perceptions of teachers involved in a one-to-one initiative with embedded opportunities for professional growth, information collected from this study has potential to inform the content aspect of professional learning, strategic planning, and implementation efforts for the research district as well as other educational entities with regards to formative assessment, questioning, and the pairing of these two aspects through technology.

Research Question

The following research question was developed for this study:

> How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms?

The Researcher

During the 2017-2018 school year, the research district began to connect the work of the Tech Teacher Leaders (TTLs) and the Literacy Teacher Leaders (LTLs) to better inform and improve the effectiveness of the initiative. District-level leaders have continued to provide monthly professional learning sessions based upon the use of Google Suites for Education with the TTLs and on-going literacy training developed by the Tennessee Department of Education for the LTLs. District leaders have provided on-line learning sessions with Weston Kieschnick, author of *Bold School* (2017), to bring connections between content pedagogy and technology integration to enhance such pedagogy in all content areas.

At School A, the principal and researcher have discussed ideas to help lead, support, and inform the work of the teacher leaders to maximize the effectiveness. During the 2016-2017 school year, implementation efforts of both the TTLs and LTLs were at a surface level and

provided tools with sporadic application. Due to the researcher's role at a school not involved in the study during the 2016-2017 school year and the researcher's experience with designing professional learning opportunities as an elementary instructional coach in all subject areas, the principal of the research school and the researchers determined that on-going professional learning which would be technology-mediated and peer-coached, would be ideal and would yield a higher level of application. It was also determined that the research school would construct learning lab classrooms by using the LTL rooms and TTL rooms as exploratory, peer-interactive settings. Learning lab classrooms would consist of teachers pre-planning a lesson with the LTL and TTL and observing a model or co-taught lesson. Following the lesson, all teachers involved in the planning, observation, and teaching of the lesson would have a debriefing session to reflect on implementation of the lesson and best practices.

Significance of the Study

With many schools and school districts currently implementing one-to-one initiatives, the efforts of such initiatives should be designed and best informed by research and learning from others with previous experience in these initiatives. Additionally, questioning and the development and/or use of purposeful questions are methods classroom teachers can use to increase rigor and relevance. While attempting to successfully implement one-to-one technology in classrooms, questioning paired with technology may allow teachers to maximize learning outcomes. The study will contribute to educational research in two capacities.

First, the study examined teachers' perceptions of utilizing pre-planned questioning in the classroom for formative assessment purposes. Given that research has shown that pre-planned questions ensure that teachers are instructing and assessing across a span of cognitive thinking (Bloom, 1984; Martin, 2012; Schwartz, 2015; Gurl, Fox, Dabovic, & Leavitt, 2016), insights into

the perceived practices and understandings of teachers will potentially provide professional learning developers and providers information to structure and support teachers in better preparing questioning for formative assessment.

Secondly, this study examined teachers' perceptions regarding their practices of formative assessment technology paired with pre-planned questions. Research has made it evident that formative assessment technology allows the teacher to provide opportunities for all students to respond to all questions and teachers have perceived formative assessment technology as a positive tool (Wang, Chung, & Yang, 2014; Martin, Polly, Wang, Lambert, & Pugalee, 2016; Stoica & Pein, 2016). Collective feedback without such technology often results in insufficient evidence of student mastery because responses come from a sampling of students (National Research Council, 2001). Collecting perceptions about the combination of formative assessment technology and pre-planned questions will possibly inform future implementation efforts that seek to meet the demands of success in the 21st century.

Definition of Terms

Purposeful, pre-planned questions are questions that are designed before lessons begin by a textbook writer or editor (Mueller, 2016), a classroom teacher, or a group of teachers and colleagues.

Rigor in the realm of education corresponds to the level of thinking at which a student is asked to perform a task. It is often associated with the verb or action that a student is being asked to exhibit during teaching and learning. The range of levels of thinking according to Bloom (1956) spans from recall/remembering to creating (Daggett, 2016).

Relevance in the realm of education corresponds to the application of knowledge. It also ranges from simple application levels, such as labeling, to complex levels, such as developing or

devising. Questions such as, “Is it application? Is it real world? Is it unpredictable?” are associated with relevance of a situation in educational instruction (Daggett, 2016). *Formative assessment technology* is a technology tool that allows for responses from all participants in instructional settings (Kieschnick, 2017).

Summary

The first chapter provided an overview and introduction to the study. The problem of students exiting secondary schools unprepared for further learning in college or unprepared to begin a career was detailed. It included a contextual background for the study, identified the problem of study, and provided the question being researched regarding the perception of teachers using purposeful, pre-planned questions paired with formative assessment technology. Additionally, Bloom’s Theory of Mastery Learning, which serves as the theoretical framework for this study, was noted. Researchers’ information, the significance of the study, and key terms were also detailed in the first chapter. Chapter two provides a review of the literature related to the study. The chapter includes a thorough review and analysis of literature pertaining to questioning in the classroom and pairing questions with formative assessment technology.

CHAPTER 2:
REVIEW OF LITERATURE

Introduction

Learning should prompt students to think at a range of levels from low to high rigor in order to prepare them for 21st century colleges and careers. Therefore, educators that employ purposeful, pre-planned questions and utilize technology to enhance instruction, thus allowing for immediate evidence of learning mastery, are creating learning environments designed to adequately prepare students for the future. Although educators and technology may be separately effective in classroom settings, when educators utilize technology with intention, learning outcomes are maximized and students are better prepared for the future (Keischnick, 2017).

Chapter one provided the problem and purpose of the study. In addition, a brief overview of the theoretical framework, Bloom's Theory of Mastery Learning, was given as well as the question being studied, a description of the researcher, the related contextual elements of the study, and a list of defined terms.

In Chapter two, a review of the literature related to the study is provided and is based upon a review of 74 articles and 15 books. The chapter includes a thorough review and analysis of literature pertaining to questioning in the classroom and pairing purposeful, pre-planned questions with formative assessment technology. Chapter two begins with the historical background of the Mastery Learning Theory and is followed by a descriptive section on the key elements of mastery learning. From there, the chapter will discuss literature related to questioning in the classroom with specific attention to questioning patterns and planning purposefully. In addition, participation and feedback will be examined. After elements of

mastery learning are discussed, literature on formative assessment—the key element of mastery learning— will be presented. Models and types of technology integration will be explored. Finally, teacher perspectives in regards to the planning of questions and technology integration will be examined.

Search Methods

The review of literature was conducted through the use of the EBSCO database as well as ERIC. The search and review allowed me to define the theoretical framework, to identify similar studies, to refine the search criteria, and to locate most recent and relevant information on the topic of technology integration. I began the search for literature by using phrases such as "formative assessment technology" and "questions in the classroom" to explore the overarching topics. These results provided thousands of results. To refine the search, I added more specific search criteria, which was informed by the theoretical framework. For example, "feedback and formative assessment technology," "mastery learning and questioning," and "effectiveness of formative assessment" allowed a narrowed search and resulted in studies and articles more directly connected to my study. Also, identification of reviews and meta-analyses in these areas were specifically searched for by adding these terms during advanced searches. Additionally, a review of the reference lists from articles and studies in these more specific searches allowed for identification of other articles and studies that were relevant to the study.

Theory of Mastery Learning—Historical Background

Block (1970) presented a collection of works from the earliest leaders in the development of the theory of mastery learning. The concept of mastery strategies emerged in the 1920s through the work of Professor Henry C. Morrison (1926) and Carleton Washburn and Associates (1922) (as cited in Block, 1970). As a result, the basics of mastery in learning surfaced and

included: defining mastery as educational objectives, organization of learning units, a learning progression, diagnostic testing with feedback, and corrective instruction following diagnostic testing. These early forms were short-lived due to a lack of ability to maintain the pace of this type of learning. The idea of mastery in learning did not surface again until the late 1950s. The idea evolved in the 1950s by being a form of programmed instruction which was predicated on the idea that learning should progress from simple to complex. This format that was a pre-packaged method was found to be successful for only a portion of the students as well in that it relied on repetition and drill (Block, 1970).

Nearly a decade later, Carroll (1963) provided a conceptual idea for mastery learning. His model focused upon the aspects of aptitude and time spent learning. According to Block (1970) aptitude had been historically referred to as cataloging student learning levels. However, Carroll (1963) specified that aptitudes were the time needed to learn a task in an optimal instructional setting. His model also reflected much of the earlier focus on mastery in learning in that he determined that the learning would occur from simple to complex through a progression of such tasks. Therefore, Carroll's model of learning centered around the idea that a student's ability, in conjunction with the quality of instruction, interacted to determine the amount of time a student would need to achieve mastery. However, students are only provided a certain amount of time. Thus the degree of learning is impacted.

Following Carroll's work, Benjamin S. Bloom (1968) further studied the idea of learning for mastery and developed a working theory. Carroll (1963) proposed that if all students are distributed along the normal curve for aptitude, then given an equal amount of time and quality of instruction, learning or achievement for these students would be normally distributed as well. Bloom (1968) conjectured that while students' aptitude is typically in a normal distribution,

when instruction is adjusted to reflect appropriate type, to be improved in quality, and to be provided in adequate time, mastery is possible for nearly all students. Thus, if students are provided the appropriate instruction with reference to time and quality, then they can achieve mastery. In order to achieve mastery in learning, certain variables must be considered and certain operational procedures be in place. The following sections will further explain the variables and operational procedures as defined by the work of Bloom.

Mastery Learning Strategies Variables

One of the variables of mastery learning strategies, which was key to the work of Carroll (1963) as well as Bloom (1968) was aptitude. Bloom reasoned that aptitude had historically been viewed as a direct connection to achievement. Carroll (1963) specified that aptitude was the time needed for students to achieve mastery. The aptitude of students' learning still follows a normal distribution, but it is reflective of the time needed to achieve mastery. Thus, some students achieve mastery sooner than others. Bloom (1968) noted that there are students with special disabilities, and these disabilities will prevent these students from achieving mastery. These students are at the bottom 5% of the aptitude curve, but the remaining 95% of students within the normal curve are capable of achieving mastery when provided adequate time and appropriate, quality instruction.

In addition to aptitude, the quality of instruction is a variable of consideration in mastery learning. Guskey (2007) summarized this variable to be apparent in the relationship between variations in instructional practices of teachers. When small amounts of variance were evident, student learning exhibited large variance. Bloom (1968) referred to the variable of quality instruction as implementation of help that was aligned to the needs of the students. Historically, teachers were expected to teach the same standards using the same types of materials and

strategies for all students. Bloom (1968) suggested that to increase mastery, teachers must vary instructional methods and strategies to meet the needs and characteristics of the individual learner in order to decrease the variation in student achievement.

The third variable for consideration in mastery learning strategies is the ability to understand instruction. In earlier works, Bloom researched the impact of language and vocabulary skills of a student and the impact that these skills have on a student as a learner. Obviously, the more verbally capable a student is when entering a classroom of learning the more likely he or she is to understand the typical whole group instruction provided by the teacher. Therefore, since these verbal skills cannot be readily fixed, then Bloom suggested other ways in which teachers could modify the instruction in order to increase a student's ability to understand the instruction. These included: small-group study sessions, tutorial help, and vary instructional materials (alternative textbooks, workbook and programmed units, audio-visual methods, academic games).

In addition to aptitude, quality of instruction, and the ability to understand instruction, perseverance was deemed another key variable in mastery learning strategies. Perseverance is the time a student will work on or strive to achieve learning (Bloom, 1968). Perseverance varies depending upon a student's outlook towards a given task, and it can be increased with positive, repeated, successful interactions with a task. The need for perseverance can be decreased when students are provided high-quality instruction.

Time allotted for learning is also a variable of mastery learning strategies. Schools have been and continue to be entities which operate on a set time frame daily as well as yearly. Developers in the theory of mastery learning noted that students can achieve if given the amount of time needed for mastery (Carroll, 1963; Bloom, 1968; Block, 1970; Guskey, 2007). The use

of time, both for instruction and for students, must be valuable and effective to reduce the amount of time needed for learning. Bloom (1968) proposed a working method for mastery learning in direct consideration of the variables.

Operational Procedures of Mastery Learning Strategies

A set of procedures must be implemented in order for mastery learning to occur, and these procedures are applicable both prior to the instructional setting and within the instructional setting. Before instruction can occur, one primary precondition must be established in order to achieve mastery learning in students. This preliminary step involves setting the achievement criteria or learning objectives and has been an element of mastery learning since its earliest stages (Carroll, 1963; Bloom, 1968; Block, 1970). These objectives are informed and structured by the *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain*, which will be discussed later (Bloom et al., 1956). Additionally, the instructor must align the objectives to an assessment in order to determine what will suffice as evidence of learning mastery (Bloom, 1968).

Once the preconditions have been established, Bloom (1968) explained the operating procedures which would occur in the instructional setting to provide opportunity for mastery learning. Each unit has a higher rate of mastery learning for students when operational preconditions have been implemented. The key operating procedures include formative evaluation and alternative learning resources.

Formative evaluation involves utilizing the educational objectives and analyzing them into a hierarchy of learning units and tasks (Block & Anderson, 1975; Guskey, 2007). In alignment with the hierarchy, diagnostic tests are created to measure mastery of each unit of learning. These tests are brief, informal, and frequent. In addition, the assessments provide

feedback to both the student and the teacher regarding the student's current progress toward the goals of mastering an educational objective.

The formative evaluation procedure alone, however, is not sufficient enough to achieve mastery (Bloom, 1968; Black & Wiliam, 2009; Klute, Arthorp, Harlacher, &Reale, 2017). The use of specific suggestions based upon the results of the formative assessment and implemented through the use of alternative learning resources are what ensure mastery. There are four critical elements of mastery learning within the operational procedures of formative evaluation and alternative learning resources. They arecues, participation, feedback, and reinforcement.

Key Elements of Mastery Learning

The four aspects of the mastery learning theory including cues, participation, feedback, and reinforcement, operate simultaneously and must be present in order to achieve mastery (Bloom, 1968; Block; 1970; Guskey, 2007). However, their place in the learning may vary based upon students, teachers, time, and resources.

Cues

Cues in the classroom could refer to instructions, prompts, explanations, visuals, or questions (Bloom, 1984). Extensive research exists on the various forms of cues and their effectiveness. Focus will be given in this review to the area of questioning as cues.

Dating back as early as 399 B.C., questioning, in some form, has existed in classrooms across the world (Moberg, 2008). Educators have used cues, such as the various forms of the Socratic Method, to warrant responses and guide learners toward understanding and mastery. Research and learning in the area of questioning is multifaceted, including the types or levels of questions asked, the volume of questions asked in an instructional setting, and the practices of teachers in developing and using questions (Christenbery& Kelly, 1983; Bloom, 1984; Hattie, 2012; Martin,

2012; Schwartz, 2015; Gurl, Fox, Dabovic, & Leavitt, 2016; Mueller, 2016). The following sections will focus in on the existing research related to levels of questioning, its specific connection to mastery learning, and planning purposefully in relation to cues such as questions.

Taxonomies and their influence on learning. Bloom et. al., (1956) developed a hierarchy of educational objectives. It was this earlier work which informed much of the work on mastery learning and therefore needs to be discussed within this review. *Taxonomy of educational objectives: The classification of educational goals* was developed to provide a classification system similar to those found in categorizing scientific information but was done so in order to support educators in solutions concerning specificity of goals within curriculum and evaluations problems. The taxonomy itself was established as a hierarchy of six major classes including: knowledge, comprehension, application, analysis, synthesis, and evaluation.

The developers of the original taxonomy arranged these classes from a simple to complex level of cognition and assumed that learners must progress to higher levels of cognition. Arrangement of these objectives was completed in this manner due to the concept that cognitive levels spiral and integrate to form more complex levels of cognition, which is no longer the case in the newly revised version of the taxonomy and will be discussed later in this section (Bloom, 1956; Anderson et al., 2001). The original taxonomy provides specific explanations and descriptions of each of the classes. Ultimately, all such hierarchies created through educational research aim to inform decisions by educators to determine the level of thinking required for a particular learning unit and how to identify when learning objectives and goals have been mastered (Wilen, 1991).

From Bloom's work, numerous other researchers worked to develop other categorized structures of cognition (Christenbery& Kelly, 1983). Some of these hierarchies mirrored the

work of Bloom such as that of Sanders (1966) and Taba (1966), while others were not as sequentially organized like Smith and Hyman (as cited in Christenbery & Kelly, 1983). In relation to cues such as questioning in the classroom, mixed views exist on following such rigidity from simple to complex like suggested in the work of Bloom. Some researchers like those not as sequentially organized determined that these types or cues would need to overlap at times to ensure learning.

Within this concept of an overlap existing in these cognitive domains, a newly revised version of what is now commonly referred to as Bloom's taxonomy was developed and released in 2001 (Anderson et. al, 2001). The majority of educators are working with vague state-mandated standards. Thus, it was necessary to revise and revisit Bloom's original framework to support teachers in development of objectives, instruction, and assessment. Bloom's original framework provided a one-dimensional view of objectives, whereas the revised framework, which is more precise, provides a two-dimensional framework.

This two-dimensional, revised taxonomy streamlines objectives into two components, the cognitive process and knowledge (Krathwohl, 2002). The verb or cognitive process is one domain and the noun or knowledge is the other domain. The cognitive process contains six categories like the original, but adjustments to some category names were made including changing some into verb form to better fit the way in which they are utilized. The categories of the cognitive process are remember, understand, apply, analyze, evaluate, and create. In Bloom's original taxonomy, the knowledge domain categorized as follows—factual, conceptual, and procedural knowledge. However, in the revised version, metacognitive knowledge was added to the framework. Metacognition and its significance in being aware of one's own learning has received much attention in research and warranted a domain with the knowledge

dimension of the taxonomy (Anderson et al., 2001; Krathwohl, 2002). With the revised version drawing much attention within the last two decades of educational research and development, the use of it to guide instructional decisions such as to inform planning has been prevalent.

Planning Purposefully. As a result of much of the work of researchers who have categorized cognition, further research exists regarding how these hierarchies can be used by teachers for instructional purposes such as question development. The following section will describe the planning practices of educators specifically in the area of questioning in relation to taxonomies and mastery learning.

Bloom (1984) began to search for methods of instruction as effective as tutoring when utilizing a mastery learning approach. A distinction between the practices of teachers and educational curriculum developers in the United States as opposed to these practices worldwide was noted. In fact, the overarching common aspects of classrooms such as pedagogy and materials including assessments were most frequently found to yield low cognition (Bloom, 1984). Yet, in several studies referenced (Tenebaum, 1982; Levin, 1979; Mevarech, 1980), where a hyper-focus on planning and delivering instruction was present and included cues and assessment that range from lower to higher cognitive processes yielded higher performances on summative evaluations (as cited in Bloom, 1984).

Pre-planned questioning that is purposefully aligned to learning objectives is most effective in reaching learning outcomes (Bloom, 1984; Wilen, 1991; Hattie, 2012). Wilen (1991) synthesized suggested measures for effective development and application of questions for instruction. The first five guidelines involve how the questions should be developed and include: plan key questions to provide lesson structure and direction, plan questions clearly and

specifically, adapt questions to student ability level, ask questions logically and sequentially, and ask questions at a variety of levels.

While these suggestions surfaced from previous research and from Wilen's synthesis have been available for over two decades, varied practices and perceptions exists regarding guidelines. Danielson (2007) suggested that questioning should be created and occurring in the classroom in order to allow for cognitive exploration and to yield a body of evidence for teachers in order to determine student mastery of learning (as cited in Robitaille & Maldonado, 2015). However, pre-planned, purposeful questioning techniques are not happening consistently (Gonzalez, 2010; Smith & Lennon, 2011).

Participation

Related to the cues associated with mastery learning, participation is the enactment of the cues and the interaction of the students with explanations, prompts, and questions. These interactions vary within classrooms, schools, states, and nations (Bloom, 1984).

Early research available regarding mastery learning focused upon the interactions that occur and the effectiveness of these interactions compared to those in a one-on-one tutoring scenario (Bloom, 1968; Block, 1970; Bloom, 1984). "Approximately 20 percent of the students learning under convention instruction (whole group) do about as well as tutored students…about 80 percent of the students do relatively poor under conventional instruction as compared with what they might do under tutoring" (Bloom, 1984). Bloom reasoned that this inadequate performance of students was a result of the unequal attention students received, thus unequal participation on part of students. Awareness of classroom interaction and the shifting of perception of teachers have been utilized to equalize participation rate of all students. Additionally, supplying these

teachers with techniques and strategies proven to increase the equalization of participation in the classroom has occurred as well.

Bloom and his team of researchers worked to provide teachers with techniques such as sampling sets of students for feedback, providing further instruction including oral and visual representations, identifying and acknowledging correctness of a response, and randomized engagement opportunities. Nordin (1979) and Tenebaum (1982) reported that experimental groups, which received enhanced cues like those described above, outperformed the control groups in achievement (as cited in Bloom, 1984). Final achievement results in the Nordin study evidenced that the experimental group's students performed at a 93% rate above those students in the control group, and final achievement results in the Tenebaum study indicated that students in the experimental group performed at a 96% rate above those students in the control group. Thus, equal access to participation in a mastery learning setting led to higher achievement results.

When participation opportunities are varied, the responses on part of the student may span from basic recall of facts to in-depth responses that require critical thinking. It is the responsibility of the teacher to elicit such responses in whatever form is warranted (Harbour, Evanovich, Sweigart, & Hughes, 2015). Historically, teachers in the United States have relied heavily on textbooks and related materials to engage students in participation (Bloom, 1984). Until the last few decades most of these sources available in the United States relied on low-level questions or required a mere recall of facts (Pizzini, 1992; Risner, 1987; Tarman & Kuran, 2015). Some sources still remain in this category presently. Therefore, student participation has been oriented toward lower cognitive domains. While some lower level acquisition must occur in

order to obtain levels of higher cognition, it cannot be the only domain evident in the element of participation.

Recent research has shown that dialogue is now an important component of participation, which has shifted the appearance of teaching and learning in some classrooms. When maximized, the element of dialogue within the classroom has been found to support understanding, thinking, and development across subject areas and across the span of rigor and cognition (Wolfe, Crosson, & Resnick, 2006; Groenke, 2008; Hattie, 2012; Robataille & Moldonado, 2015). In a recent study by Bruni (2013), the experimental group of students who participated in social learning activities, which involved dialogue between the students and teacher, indicated a higher performance on post-test achievement and higher gains from the pre-test to the post-test. The control group was exposed exclusively to lecture, which allowed for no type of active participation in the learning. Hattie (2012) noted that it is equally important for teachers to listen as they talk to students. This interaction is collaborative in nature and ideally includes student-to-teacher, teacher-to-student, and student-to-student interactions. Within these interactions attentive listening being crucial for the teacher in order to inform instruction and ultimately provide a means for formative assessment also, which involves not only questioning and participation, but the last two elements of mastery learning—feedback and reinforcement (Slavin, 1987; Hattie, 2012). Listening will afford teachers insights into what the students know, what strategies are being employed, and where to aim the learning objectives in order to move students along their trajectory towards mastery.

To be able to structure such dialogue in the classroom and acquire evidence of learning, the teacher could enlist the strategy of questioning. Questioning can be used to enhance participation. Wilen (1991) referenced a study conducted by Pate and Bremer (1967) in which

teachers held various perceptions regarding the utilization of questioning in the classroom. Most responses to their survey indicated that interaction was a question-answer flow with basic recall of facts. Few responses suggested that teachers used questioning to elicit dialogue-like participation and/or critical thinking. Brualdi (1998), reported that similar findings were present. While teachers valued the use of questions, most utilized questions to gain fact recall from students. Brualdi identified that 200-300 questions per day were asked in the classrooms of study and nearly all questions were ranked at a low cognitive level. Hattie (2012) found that teachers viewed questions as a means to engage and make sure students are keeping up with the flow of the lesson quite often by requesting the participation of the students who will know the correct response. Therefore, it appears that teachers utilize questions to attempt to maintain attention and participation of some students, but it still remains unclear if teachers utilize questions to gain participation from all students and to elicit understanding at all levels of educational objectives.

Influence of Research on Questioning and Participation. While it seems that the perception and implementation of questions to gain participation varies, work in educational research, which has informed decision-making at local, state, and federal levels, has attempted to shift the focus of questioning so that it does in fact elicit participation through dialogue and classroom discourse (Robitaille& Maldonado, 2015). Race to the Top, a federally funded grant, required states that accepted federal monies to revisit their evaluation measures in an effort to improve instructional practices and outcomes. Many states who received the grant revised their evaluation instruments to include a component devoted to questioning and discussion techniques. Due to recent shifts as a result of efforts like Race to the Top, Common Core State Standards, and other initiatives, training and development of teachers regarding student questioning and

student participant has been prevalent. Specifically in the state of Tennessee used Race to the Top funds to implement a coaching network of in-service teachers to engage in training provided by the Institute for Learning at the University of Pittsburgh and Sopris (Tennessee Department of Education, 2015). These trainings were intended for multiple purposes, but one primary goal of the work was to improve teacher's questioning and engagement levels of students in both English Language Arts (ELA) and mathematics instruction. Sopris provided ELA professional learning, which included strategies such as interactive read-alouds in which the teachers pre-plan questions to use with a complex text for comprehension and critical thinking purposes to reach mastery of objectives. The use of assessing and advancing questions, particularly in math classrooms, and Accountable Talk strategies to ensure dialogue was the focus of the learning provided by the Institute for Learning. The professional learning sessions were provided during the summer months in a train the trainer model. Teachers attending training were to return to school in August re-deliver the instruction, and subsequently support teachers in implementing the questioning and participation techniques. Varied responses and implementation efforts occurred across the state. Outcome such as those evidenced in the approach utilized by the Tennessee Department of Education are common results as evidence in other research regarding professional learning structures (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Gonzalez, 2010; Smith & Lennon, 2011).

Feedback and reinforcement

According to Bloom (1968), feedback and reinforcement are pivotal concepts that changed the purpose of assessment. Assessment should be utilized for learning or formative assessment, which allows the teacher to acquire information or data to make determinations regarding feedback and reinforcement. Data or information gained from formative assessments

alone will not yield mastery in a student. Alternative resources may be used to provide specific feedback and reinforcement based upon the results of the diagnostic formative evaluation information. Thus, feedback is the data or information gained from formative evaluations which provides the educator with evidence of learning or a lack of learning (Hattie &Timperley, 2007), or as Sadler (1989) referred to feedback as a reduction force to eliminate gaps in mastery. Reinforcement is an agent to reiterate concepts not yet mastered, typically in a method differing than the original one employed by the instructor (John, Ravi, & Ananthasayanam, 2009).

Feedback, which connects to reinforcement, has been given an enormous amount of attention in the world of educational research. Numerous studies including extensive meta-analyses on the topic feedback have been conducted (Kluger & DeNisi, 1996; Hattie, 1999; Hattie & Timperley, 2007). Research regarding feedback has included many variables, regardless of the type of feedback. The most commonly researched variables included focus on promptness, rewards, praise, frequency, related data, and relevance (Sadler, 2010; Hattie, 2012). Overall, most research on feedback points to the overarching factors of form, timing, and effectiveness of which an infinite amount of combinations exist (Sadler, 2010). Therefore, it has been a difficult task to identify a specific combination of these factors associated with feedback which yield consistent results.

Within this body of research on feedback, evidence has been gathered regarding surface-level feedback. In this type of feedback, the focus is on the educator informing the student if a response is correct or incorrect, and typically the responses being evaluated for correctness tend to be for lower level questions or information recall items (Kulhavy, Yekovich, & Dyer, 1976; Kulhavy, 1977; Peeck, van den Bosch, & Kreupeling, 1985; Heubusch & Lloyd, 1998). Other studies have examined feedback in more complex manners and recognize that like the continuum

of levels in the educational objectives within *Bloom's Taxonomy*, there are a range of types of feedback from simple to complex (Hattie &Timperley, 2007). Hattie and Timperley asserted that there are four levels of feedback. The first level is focused primarily on the task and is informative in nature, such as correct and incorrect response. This level of feedback most often would correspond to the lower cognitive and knowledge levels of the revised version of Bloom's Taxonomy; however, this feedback could be provided for more complex tasks as well (Anderson et. al, 2001; Hattie &Timperley, 2007). Feedback at the second level focuses upon the process, or an integration of ideas to complete a task, and requires more complexity and integration of thinking and knowledge to achieve (Hattie &Timperley, 2007). The third level of feedback aims at student self-regulation. This level is closely related to the metacognitive knowledge added to the revised version of Bloom's Taxonomy (Anderson et. al., 2001). The fourth level of feedback is more closely associated to the idea of praise and often can be unrelated to the cognitive domain or the knowledge domains; therefore, it is often least effective (Hattie &Timperley, 2007). It is important to note that these various levels each have their own place in the structures of teaching and learning. The second and third level of feedback are reasoned to be most effective in learning, but in order to build knowledge and confidence in learning the other two levels must also be present.

In relation to these levels, Hattie (2012) speculated that feedback must inform the following three questions. Where am I going? How am I going there? Where to next? Feedback should help advance a student's learning trajectory in the following three stages—novice, proficient, and competent learning in respect to the learning objectives. In order to acquire such information to guide and inform the feedback, assessment must be prioritized. "Assessment can be considered to be activities that provide teachers and/or students with

feedback information relating to one or more of the three feedback questions…" at any of the four levels (Hattie & Timperely, 2007, p.101). In order to be able to provide such diverse, effective feedback; however, attention must be drawn back to the topic of formative assessment.

Formative Assessment

As mentioned above, formative assessment has become a historical concept in the realm of education and educational research. Bloom (1968) brought the beginnings of great attention to the idea, and along with Airasian (1970) and Block (1970) provided the educational community with a clear, broad definition and underlying expectations for implementation of assessment that is formative in nature. In order to implement assessment that is formative in nature, the educator creates or utilizes brief, diagnostic assessments aligned to the learning objectives, which have been established communicated to the students (Bloom, 1968; Airasian, 1970; Block, 1970). The learning objectives have been broken into units, and assessments are created for each grouping. These short assessments are then administered and subsequently provide data to the teacher regarding student mastery and non-mastery. Giving the assessments frequently allows the teacher to respond with the feedback, correctives, and reinforcements in a timely manner before the gaps in learning become exceedingly problematic (Block, 1970).

While the description above of formative assessment sounds simple, the actual creation and utilization of such assessments is quite a complex procedure (Block, 1984). To plan accordingly, a teacher must identify which elements of a unit are required for the students to learn new content (Airasian, 1970; Bloom, 1975). Then, an identification of the cognitive levels needed to master the content must be made and is often done with use of the taxonomy of educational objectives. The educator must also identify the relationships between the cognitive levels and content as well as arrange these in a hierarchy of learning. Once this beginning,

complex process is done, this information can be used to design and construct instructional plans as well as tools for assessment (Airasian, 1970). Creating the repetitive use of formative assessments is also complex. It is insufficient to merely score the assessment. Each assessment should be analyzed student-by-student and item-by-item in order to identify patterns to inform the feedback, corrective, and reinforcement aspects (Airasian, 1970; Bloom, 1975).

Given that the actual creation and use of formative assessment is so complex, it is commonly viewed by educators as confusing, time-consuming, and unrealistic. In response to the views of educators, extensive reviews of literature were conducted regarding the effectiveness of formative assessment (Black and William, 1998; Kingston & Nash, 2011; Klute, Apthorp, Harlacher, and Reale, 2017). Within each of these reviews of research findings, an overwhelming amount of evidence pointed to the effectiveness of the use of formative assessments to promote learning and in fact to better prepare students for college or career. However, some suggestions surfaced as a result of these reviews to better support educators in implementation efforts given that the use of formative assessment can be such a complex concept.

In the most recent review conducted through the Regional Educational Laboratory (REL), a focus on what works in specific subject areas was reviewed (Klute, Apthorp, Harlacher, & Reale, 2017). It is important to note here that the team of researchers only utilized studies which pertained to reading, writing, and math as social studies and science studies were not available that fit the parameters of the study. The use of formative assessment in these studies was divided into two main categories: student-directed and other-directed (computers or educators). The use of both approaches to formative assessment was effective in mathematics. However, in reading formative assessment that was directed by a teacher or computer was more effective than a

student-directed approach. In writing, neither form was noted as effective due to not being substantively effective or a lack of evidence.

In recognizing that many formative assessment tools are readily available to teachers due to technology, Black and Wiliam (1998) encourage improvement in formative assessment through careful selection of tasks that align with the learning objectives, as well as the inclusion of dialogue between students and teachers during the completion of the tasks. It is necessary for educators to construct instruction and assessment such that it allows students to demonstrate through communication understanding and mastery. Evidence points to the need of promoting such dialogue. Additionally, the selection of quality test items is also recommended to support teachers. To best identify or develop good questions, which is a difficult task, collaboration among educators is recommended. While these suggestions were made nearly 20 years ago for educators with the idea of supporting them in planning, creating, and utilizing resources for formative assessment purposes, it is important to note again that current practices in this realm continue to be inconsistent and err on the side of using lower-level cognitive questions (Gonzalez, 2010; Smith & Lennon, 2011).

Formative assessment, while seemingly simple in concept, requires complex understanding by educators utilizing it. Additionally, the approach taken as student, computer, or teacher directed may be effective, but most importantly it is the action in response to data that make it most effective. Rapid growth in the area of technology has made sources more readily available to teachers and has also provided formative assessment in a technology format (Timmis, Broadfoot, Sutherland, & Oldfield, 2016). The following section will discuss the integration of formative assessment technology into education settings and the implications of its use to promote the formative assessment of a continuum of learning objectives.

Integration of Formative Assessment Technology

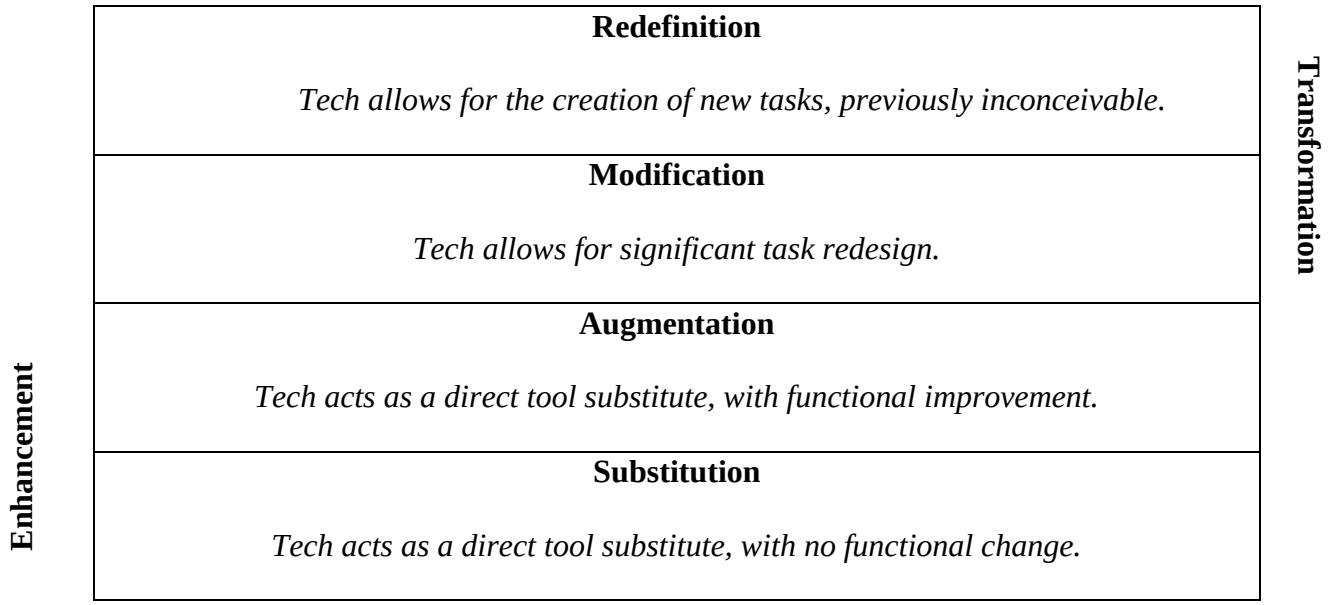
The integration of technology into classrooms is growing at an astounding rate, and the use of digital tools for assessment purposes has been a major focus of the use of such technology over many decades of integration (Timmis, Broadfoot, Sutherland, & Oldfield, 2016). Historically, the work has been aimed at mass, rapid assessment that lowers the cost for testing on a large scale. However, Timmis, Broadfoot, Sutherland, and Oldfield (2016) reason in a review of literature on formative assessment technology that the focus of technology integration is primarily upon the efficient, consistent approach it provides for administering assessments as oppose to the consideration of how technology could impact the teaching-learning-assessing relationship. While much of this focus is likely due to the fact that this testing is mandated at the state level, consideration of the approaches local school systems around the world are taking to integrate technology is important to mention here as well. Two main models of technology integration can be prominently found in education: Technology Pedagogical Content Knowledge (TPACK) and the Substitution Augmentation Modification Redefinition (SAMR). For the purposes of this study, the SAMR model will be the focus of discussion. The SAMR model is utilized by the research district involved in the study and is a commonly used model.

SAMR Model of Technology Integration.

The SAMR model of technology integration is essentially based on using traditional pedagogical methods as a foundation to using technology to transform or enhance instruction (Moroder, 2013, as cited in Brantley-Diaz & Ermter, 2016). The SAMR approach is considered to be more straight-forward than some of the more complex models such as TPACK and is based upon a continuum of integration levels: substitution, augmentation, modification, and redefinition (Puentedura, 2006: Hamilton, Rosenberg, & Akcaoglu, 2016; Kihoza, Zlotnikova,

Bada, & Kalegele, 2016; Schrock, 2016). Figure 2.1 below is based upon the work of Puentedura (2006) provides a visual explanation of this model.

Figure 2.1



As evident in the Figure 2.1, the lower levels of the continuum, substitution and augmentation, serve to enhance instruction through the use of technology (Puentedura, 2006; Hamilton, Rosenberg, &Akcaoglu, 2016). The upper levels of the continuum, modification and redefinition, allow an educator to transform instruction by completely redesigning or creating a new task not possible without the use of technology. It is important to note that while this model is widely accepted and is being implemented, its simplistic nature is also viewed as a deficit by some (Hamilton, Rosenber, & Akcaoglu, 2016; Kieschnick, 2017). Just as the revision of the original taxonomy of educational objectives has added dimension to this construct, technology integration researchers and reviewers deemed that this model is too linear for what typically occurs in the classroom or the real-world (Hamilton, Rosenberg, & Akcaoglu, 2016). In addition, Kieschnick (2017) reasoned that using the model in isolation will not lead to the

necessary rigor and high levels of cognition needed to be present in today's classrooms. Due to the fact that it has received little attention in the realm of peer-reviewed journals, the application of the model has fostered multiple interpretations by educators, as well as a stronger focus on technology product selection as opposed to attempting to create optimal teaching and learning cycles utilizing technology (Hamilton, Rosenberg, & Akcaoglu, 2016).

The SAMR model has the potential to assist in guiding the use of formative assessment technology, despite the lack of specificity of these terms within each model. While the case of using such a model to help select and appropriately use a technology tool is growing, many educators select a tool to implement technology due to a directive, regardless of whether or not it will support students in meeting an educational objective effectively (Hamilton, Rosenberg, & Akcaoglu, 2016; Kieschnick, 2017). In the following sections, the options, benefits, and weaknesses of formative assessment technology tools available are discussed.

Formative Assessment Technology Options and Benefits

Software and hardware technological tools now exist that are developed around the concept of formative assessment, in part because technology has become both more affordable and more prevalent. Tools such as SMART Boards and ActiveBoards, along with their individualized clicker systems, have become prevalent in classrooms across the United States from the elementary to the post-secondary level (Troy & Bulgakov-Cooke, 2013; Mayer et. al, 2009). Thus, almost instantaneously, a teacher may pose a pre-planned, purposefully designed question and formatively assess students' understanding or mastery of the question. Within these systems, some varied levels of questioning can occur depending upon the type of clicker. Some clickers may only allow multiple-choice responses with a closed set of answer options. Other

response systems have a built-in key pad and will allow for short answer, sentence-like responses. Therefore, the built-in key pads lend themselves to more open-ended questioning.

Clickers are only one type of student response technology system. Many schools and systems both in the United States and worldwide are shifting to the 1:1 device approach with the purpose of enhancing improving learning and achievement as well as increasing opportunities for students to develop 21st century thinking skills (Islam & Gronlund, 2016). Students are now being provided with devices such iPads, Chromebooks, or laptops (Delgado, Wardlow, McKnight, & O'Malley, 2015; Islam & Gronlund, 2016). Students may utilize these devices to provide recall of facts via software and online tools, but may also engage in short answer and extended responses.

Additionally, these devices provide students with readily available access to research tools, texts, and other sources that may support learning, responses, and participation in instruction. They also provide the teacher an immediate opportunity to determine mastery and begin plans for targeted feedback and reinforcement based upon responses. In a recent international review of 1:1 implementation by Islam and Gronlund (2016), it was reported that several studies (Dunleavy et. al, 2007; Great Maine Schools Project, 2004; Ingram et. al., 2008; Zucker & McGhee, 2005), "…indicate that computer technology improves teachers' computing skills, enhances quality and flexibility in teaching, and increase the ability to formatively assess learning that leads to qualitative feedback for both students and teachers."

Other technology programs, such as *Blackboard*, allow teachers to assess formatively (Ben-Jacob, M, & Ben-Jacob, T., 2014). Some school systems, mostly at the secondary and post-secondary levels, are implementing courses, using formats like *Blackboard* (Delgado, Wardlow, McKnight, & O'Malley, 2015). Although these programs are compatible with clicker

systems, they also allow for online discussions, creation of presentations via slide shows, or game-like quizzes to demonstrate (Ben-Jacob, M, & Ben-Jacob, T., 2014).

Google Apps for Education (GAFE), is similar to *Blackboard* and provides similar tools for learning and assessment purposes, such as Forms, Sheets, Slides, Docs, and Classroom (Bray, 2016). According to recent statistics about Google's prevalence in classrooms across the United States, "…more than half the nation's primary- and secondary-school students –more than 30 million children—use Google education apps…" (Singer, 2017). Google Classroom is one element of the education apps and is an on-line system that allows teachers to make assignments and provide feedback to students. Nearly 15 million students use Google Classroom. Google has deemed the use of Google Chromebooks and Google apps as a means for developing students to be better prepared for colleges and careers (Singer, 2017).

If teachers have access to the necessary technology, they may maximize the insight to student understanding not only in at the end of units of learning but throughout a lesson. Bloom, as well as other researchers, deemed it necessary to gather student responses through questioning and assessment tools. Until recently, most of this was done through paper-pencil tasks or in-class discussions. However, these methods only warranted responses from a sample of the student class population (Hattie, 2012). As Kieschnick (2017) conjectured that "By leveraging technology tools in questioning, all students get the opportunity to answer your pre-planned, rigorous questions." Recent reviews of one-to-one implementation efforts occurring internationally indicated that the use of technology tools has increased the frequency of communication between teachers and all students, as well as, from student to student by providing a collaborative atmosphere for learning (Islam & Gronlund, 2016). While positives

regarding formative assessment technology are evident in literature, some challenges do exist for integrating it into classrooms.

Challenges with Formative Assessment Technology Integration

Research regarding formative assessment technology tools is increasing. Technology tools over the past three decades have afforded teachers with the capability to assess in bulk quickly and receive results instantly, which provides quick, formative information (Merrel, Cirillo, Schwartz, & Webb, 2015). Some of the newer technology tools are similar in format and feature multiple-choice questioning, but they also provide immediate feedback communicating to students and teachers whether responses are incorrect. However, it is important to acknowledge that some disadvantages are inherent to multiple choice questions. These questions limit responses to lower-level and mid-level cognitive questions. In like manner many of the questions for these programs are pre-determined and created by the company that sells or provides the tool. Some of these questions align with teaching objectives, but others do not.

Additionally, overarching factors have contributed to the identification of further impacts in integrating technology. Shapley et al (2009), noted some major factors that may have negative effects on technology integration including personnel turnover, software and hardware issues, and lack of infrastructures to support integration initiatives (as cited in Islam &Gronlund, 2016). Shirley and Irving (2015) reported similar concerns, specifically in the area of teacher professional learning related to technology. Technology will not solely increase learning mastery. Prepared educators are also necessary.

Teachers' Perceptions of Formative Assessment and Pairing It with Technology

Formative assessment technology has benefits and challenges regarding implementation as identified in research, but consideration of teachers' perceptions about formative assessment and technology for this purpose is limited. This section will provide an analysis of the available research about teachers' perceptions related to the practices of formative assessment. A recent review of formative assessment focused upon factors that influence teachers' implementation of formative assessment provided a foundation for this analysis (Izci, 2016). From this review and further database searches, 5 additional, relevant studies were reviewed as well.

Perceptions of formative assessment.

While formative assessment has been in education for decades, the wide-spread attention of this practice increased in the early 2000s simultaneously as the No Child Left Behind (NCLB) policy brought great attention to the concept of standardized assessments for accountability purposes and achievement gap closures (Clark, 2011). Research has noted that teachers' attitudes concerning formative assessment have been impacted by the presence of high-stakes assessments (Izci, 2016). Teachers' perceived the importance to be in mastery of basic skills and focus shifted from critical thinking and problem solving to completion of a less complex task (Clark, 2011). School cultures focused upon the results of such high-stakes testing often yielded teachers that did not perceive formative assessment as beneficial typically due to time constraints to cover a lengthy list of standards for high achievement results (Izci, 2016).

Research about teachers' perceptions of formative assessment has also focused on the use of benchmark or interim assessments often provided to teachers by the school system or an external source (Christman et al., 2009; Abrams, McMillan, & Wetzel, 2014). These studies, which were qualitative in design and utilized interviews, open-ended survey, and focus groups,

identified factors influencing perceptions and include: question or item quality, guidelines for how to use the results, time to analyze and plan for adjusting instruction and technology availability that provides immediate results. Abrams, McMillan, and Wetzel (2014) in a study involving a sample of teachers from 15 different schools and representing varied levels of performance, noted that while teachers' perceived benchmark formative assessments as important, they varied in perception about the usefulness of the results due to the influences listed above. Also, when provided with benchmark assessments, teachers were unlikely to develop their own additional assessments to be used for formative purposes between administration of interim assessments.

More recent studies on teachers' perceptions of formative assessment have focused on the shift to develop 21st century learners that are prepared with critical thinking and problem solving skills. The Math Design Collaborative (MDC) and Literacy Design Collaborative (LDC) were established through the Bill and Melinda Gates Foundation as professional learning opportunities built upon a system of expectations to believe in and systematically implement formative assessment (Lawrence & Sanders, 2012; Moore & Sanders, 2012). Teachers within these collaborative groups have reported increases in the value of, the application and frequency of, and the ability to utilize formative assessment. Additionally, teachers, who saw themselves as facilitators, encouraged students to actively learn, and valued critical thinking skills are more likely to consistently and effectively implement formative assessment (Lawrence & Sanders, 2012; Moore & Sanders, 2012; Izci, 2016).

Perceptions of formative assessment technology.

As noted above, one influence on teachers' attitudes and perceptions toward formative assessment involves the use of technology to provide instant data. Given that learning is an

interaction between teachers and students, which allows the teachers insights into student understanding, researchers reason that technology is a tool that can enhance the amount of interactions (Lee, Feldman, & Beatty, 2011). Research is broad in the area of using classroom clicker systems as these tools have been present in learning much longer than devices such as Chromebooks. Specific research on teacher perceptions of formative assessment technology thus far has primarily focused upon systems like clickers or specific online products (Feldman & Capobianco, 2007; Beatty et al., 2008; Lee, Feldman, & Beatty, 2011; Troy & Bulgakov-Cooke, 2013; Martin, Polly, Wang, Lambert, & Pugalee, 2015).

Research has shown that teachers' perceptions of formative assessment technology such as clickers are varied depending upon both intrinsic and extrinsic factors (Lee, Feldman, & Beatty, 2011). In studies conducted by Feldman and Capobianco (2007), Beatty et al. (2008), Lee, Feldman, and Beatty (2011), researchers utilized qualitative methods to collect data through observations, interviews and open-ended surveys to examine teachers' perceptions of formative assessment technology. Extrinsic factors including the actual hardware or software as well as time needed to learn technology tools and plan for them have been found to be one of the major areas affecting perception (Feldman & Capobianco, 2007; Beatty et al., 2008; Lee, Feldman, & Beatty, 2011). Some teachers perceive that these outside factors are not worth the time and effort necessary to use them effectively while others have recognized them as hurdles but then viewed them as manageable and worthwhile. Teachers noted that insufficient support in learning the tools, and access to enough tools were all factors that made formative assessment technology less desirable. Additionally, pressure to meet the curriculum expectations was evident in perceptions about formative assessment technology and most often connected to the lack of sufficient time.

Intrinsic factors that have been noted to influence the perceptions of formative assessment technology also include knowledge of operating technology, integrating the tools into the existing curriculum, and developing questions to structure formative assessment. While professional development has shifted teachers' perceptions that stem from intrinsic from negative to positive, there are still variations in these results (Lee, Feldman, & Beatty, 2011). Teachers' perceptions reflect that question development or item construction is one of the top factors influencing implementation efforts and perceptions (Feldman & Capobianco, 2007; Beatty et al., 2008; Lee, Feldman, & Beatty, 2011). Some teachers like those in *Teacher Learning in TEFA* (Technology Enhanced Formative Assessment) research project, acknowledge overall that they do receive more evidence of student learning through the formative assessment tools, but they perceive the development of questions to be complex (Beatty et al., 2008). In other studies, the use of pre-made questions provided to teachers through technology products was still a point of contention as teachers' perceptions indicated that some of these questions were not rigorous or complex enough to meet the expectations of the curriculum or standards Feldman & Capobianco, 2007; Lee, Feldman, & Beatty, 2011).

Summary

In summary, much is known about questioning in relation to the classroom, yet implementation of question planning, as well as execution of questioning continues to be inconsistent. In addition, technology has become a major focus in education and research is beginning to emerge about its practices and effectiveness. While questioning is older and technology is newer, both need to be further scrutinized because the combination of these two instructional tools is imminent in many one-to-one classrooms. Technology provides the opportunity for participation and feedback, which could compliment the questioning occurring in

the classroom. However, the effectiveness of such practice is limited because questioning continues to be confined to lower-level cognitive domains. Additionally, it is important to consider the perception of teachers regarding questioning and formative assessment technology. Teachers' perceptions of use and development of formative assessment and of formative assessment technology have shown thus far that these practices are influenced and varied by factors such as time, support structures, item quality and type, and professional learning in these areas. Current research regarding these perceptions has focused upon the use of clicker systems and on-line, pre-packaged formative assessment systems. Combining the possibility of teacher-created or pre-packaged, high quality questioning paired with formative assessment technology tools, as well as limited professional learning in the area of questioning and technology tools, could result in another education initiative that yields small student learning outcomes and achievement. Therefore, it is necessary to continue researching teachers' perceptions of formative assessment technology paired with high quality questioning and utilizing newer tools such as Google apps for education to best inform on-going and future one-to-one implementation efforts.

CHAPTER 3:
METHODOLOGY

A qualitative research approach was chosen for this study for several reasons. Qualitative research is grounded in work that is done to interpret, construct, or uncover meaning of an experience (Mason, 2002; Merriam & Tisdell, 2016). This study's purpose was to examine and interpret teachers' experiences regarding the use of purposeful, pre-planned questioning paired with formative assessment technology.

Qualitative research also places value on the context and natural settings (Ary, Jacobs, Sorensen, & Walker, 2012). This type of inquiry examines the relationship that occurs naturally between the participants and the context. In this study, this involves elementary school teachers in a public school setting.

Additionally, qualitative research also is conducted with the intent to collect a rich description of a phenomenon versus examining isolated variables (Ary, Jacobs, Sorensen, & Walker, 2012). The use of interviews, field notes, audio recordings, and observations allow for the in-depth examination of participants within a study (Merriam & Tisdell, 2016). This study utilized each of these data collection methods to investigate and uncover meaning of experiences of teachers in grades 3-5 participating in a one-to-one technology initiative.

Finally, this study due to its evolving nature, utilized qualitative research. In qualitative studies, the design is emerging as the new data is collected and inductively analyzed (Ary, Jacobs, Sorensen, & Walker, 2012). Unlike quantitative design, where all aspects are specified prior to data collection, qualitative studies involve a pre-determined overarching method yet within the chosen method on-going analysis informs and sometimes warrants adjustments to elements such as questions used in interviews. In this study, multiple means of data collection

were employed and analyzed inductively. This interpretation of the data was ongoing (Merriam & Tisdell, 2016) and is possible in qualitative research if the researcher is the primary instrument of data collection and analysis. By solely conducting the interviews and observations and collecting the survey information, the researcher will be the primary instrument of data collection in this study.

Various methods of qualitative research exist. For the purposes of this study, the researcher utilized a case study approach. Yin (2003) reasoned that case study methods are strong in nature because they allow for exploration and construction of meaning in real-life contexts. Six elements of design were identified that are necessary to consider in case study design: study question(s), propositions, unit of analysis, logic linking the data to the propositions, and criteria for interpreting the findings. The following sections further describe these characteristics of case studies in relation to the design methods for this study.

Research Design

Yin (2003) specified that case study design should be involved and informed by the questions of research and any propositions stemming from theoretical framework. This study sought to explore the question: How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms? Elements and operations of mastery learning include questions, feedback, participation, reinforcement, and formative assessment informed propositions. Propositions considered during design included, but were not limited to: formative assessment technology impedes and enhances instruction; pre-planned questioning has potential to enhance formative assessment; feedback, participation, and reinforcement are affected by teacher instruction methods; professional learning impacts the implementation of questioning, formative

assessment, and technology integration. These propositions will inform what to study purposefully as data is collected and will also inform and connect to data analysis.

For the purposes of this study, the concept of case study methodology as defined by Merriam and Tisdell (2016) in that as a detailed, deep description of a bounded case was a point of reference. It is this element of a bound system, or unit of analysis (Yin, 2003; Merriam& Tisdell, 2016), that distinguishes case studies from some other qualitative approaches. Exploring a particular program, individual, or group is what defines the boundaries and determines the case. This case study encompassed teachers in grades 3-5 who were involved in a one-to-one technology initiative

Participants and Setting.

Determination of participants in the case study was conducted via purposeful sampling, a common method in qualitative studies which will purposefully and potentially provide the researcher with rich data (Merriam& Tisdell, 2016). The main criteria for selection of participants was access to one-to-one classroom settings. Typical sampling, which reflects average conditions or characteristics (Merriam & Tisdell, 2016), was also considered. Convenience sampling was utilized because the researcher's school reflected the system average of one-to-one classrooms and would provide the easiest access with minimal disruptions. Additionally, the sampling was narrowed to teachers in grades 3-5 because they all had one-to-one settings and reflected a typical span of experience in teaching and technology integration practices of school settings. Samplings of this nature allow for the potential understanding of the perceptions of teacher practices and causes of such practices to emerge (Flyvbjerg, 2006) Study participants were teachers in grades 3-5 from one elementary school in East Tennessee. Four 3rd grade teachers, two 4th grade teachers, and four 5th grade teachers participated in the

study, for a total of 10 teachers. There are 9 female teachers and one male teacher within the group. One teacher has 20 years of teaching experience, one teacher has 16 years of teaching experience, five teachers have between 10 and 14 years of teaching experience, and three teachers have 6 or less years of experience. These teachers utilize paired team teaching. One member from each team teaches the ELA content and the other member teaches mathematics. Science and social studies content is also divided among team members, but distribution of this content varied among the pairings.

The research school opened in 2002 and is comprised of 25 general education classrooms, two special education/CDC classrooms, one special education behavior classroom, two Head Start classrooms, and one pre-kindergarten classroom. The building is designed with two main wings. One wing is comprised of the K-2 students and the other wing consists solely of students in grades 3-5.

The school population is comprised of approximately 500 students in grade pre-K-5. English Language Learner (ELL) students comprise 10% of the student population and students with disabilities comprise 15% of the student population. The student population is 76% white, 14% Hispanic, and 10% African-American. Approximately 70% of students participate in the free and reduced lunch program.

Data Collection Methods

Yin (2003) reasoned that effective case study includes a variety of data sources that will then be triangulated to promote validity of the case. Due to the nature of this case study, the data were collected through interviews, documents, and non-evaluative lesson planning observations. The following sections provide an in-depth description of each means of collection and its relevance to the study.

Interviews.

Interviews were the primary source of data collection for this study. Interviews are the most common form of qualitative, and specifically, case study research (Mason, 2002; Merriam& Tisdell, 2016). A semi-structured approach consisting of primarily open-ended questions was used for the interviews to construct understanding, not merely excavate knowledge (Mason, 2002; Merriam & Tisdell, 2016), and a protocol was utilized to maintain consistent data collection methods (Creswell, 2007). The protocol along with the set of questions was included in the appendix. The order and wording of the questions were delivered with flexibility and participants were sometimes asked additional questions, based on their initial responses, to clarify or further explore a topic. Questions were focused around six aspects that Patton (2015) deemed necessary for a quality interview: experience and behavior, opinion and values, feeling, knowledge, sensory, and background or demographic questions.

During the study, participants were able to select the location of the interview—the researcher's office, the school conference room, or the classroom of the participant—in order to promote the level of comfort for the interviewee. Interviews were recorded and transcribed because these are preferred methods for collected and maintaining most accurate data collection for interviews (Merriam& Tisdell, 2016). A small digital recording device was used to reduce the obtrusiveness.

The goal of the study was to identify perceptions of teachers with regard to pairing pre-planned questions with formative assessment technology. Via the use of interactive interviews, in-depth data was collected as a result of the open exchange between the researcher and participants.

Documents.

In addition to interviews, data was collected through documents. A less obtrusive collection of information to construct meaning can be done through the gathering of documents in a case study (Merriam& Tisdell, 2016). Documents used in this study are considered researcher-generated because they were developed by the researcher and completed by participants at the request of the researcher.

Documents in this study were collected via an online format using Google Suite for Education. The researcher developed a questionnaire utilizing Google Form application. Each participant received a standardized questionnaire to minimize bias and potentially provide a bank of responses that would provide a true measure (Mason, 2002) of perceptions regarding formative assessment technology paired with pre-planned questions. Participants received the document through the Google platform. This method allows for authenticity of the document (Merriam& Tisdell, 2016) since it is shared and only accessible to the individual's email address programmed by the researcher within the Google Form sharing option in the application. By utilizing the Google platform as opposed to a less secure one, the responses collected in the document are protected and ensure that only the participant has access.

Questions within the online data collection document were developed with attention to the theory of mastery learning and were open-ended in structure. Propositions connecting to the theoretical framework described in the research design section were evident within the question items. They were diversified around the six areas of focus mentioned previously regarding interview questions to provide a dense collection of information (Patton, 2015). Patton's six areas of focus for interview questions and the questionnaire provided to participants are both included in the appendix.

Observations.

Observation was also used to collect data for this study. The role of a researcher may be a participant or non-participant in the study and may vary across that spectrum in involvement with the study (Creswell, 2007; Ary, Jacobs, Sorensen, & Walker, 2012). When researchers act as the observer as a participant, they are not participating in activities of the group but do interact with participants during the observation. For the purposes of this study and to prevent bias, the researcher maintained the role of observer as a participant during observations of planning sessions with each grade level team.

Pairs of teachers in each grade level that teach the same content area (ELA or Math), met for a 35-minute planning session. The participants were informed in advance that the session would be observed for the purposes of the study and that the researcher would interact but not interject concerning the planning activity. This information was provided to participants to maintain a stance of full disclosure and ensure that participants understood the researcher's observation was non-evaluative in nature and conducted for data collection purposes only (Ary, Jacobs, Sorensen, & Walker, 2012).

Field notes are a common practice for data collection during observation. Typically, the researcher takes brief notes and then promptly expands these to a dense description of the interactions occurring during the observation (Ary, Jacobs, Sorensen, & Walker, 2012). For this study, field notes were the primary data collection method for the observations of lesson planning sessions. The researcher used paper and pencil to take brief, bulleted notes. Immediately after the observations were complete, the researcher then expanded the notes to a more detailed record of events.

Ethical Considerations

Due to the researcher's role as assistant principal at the research school, it was important to consider the researcher's relationship with study participants. While the researcher sought to maintain a professional stance, repeated interactions with the participants may have created an informal dynamic that prompted ethical vulnerability on the part of the researcher. However, as noted by Flyvbjerg (2006), understanding is developed and optimal when researchers are immersed in the context of the study.

A notable delimitation of this study was the selection of teachers in grades 3-5 to be research participants based on their access to Chromebooks for one-to-one instruction. Teachers in grades K-2 within this school setting had limited access to Chromebooks. Additionally, the recording devices used to audio record observations of planning conversations captured the most accurate data during interviews and observations, but may have also caused participants to be apprehensive and not as complete or truthful in their responses. Finally, because teachers were made aware in advance that lesson planning sessions were going to be observed for the purpose of the study, interactions between the teachers may have been different compared to non-observed planning sessions (Green, Cailli, & Elmore, 2006).

Data Analysis

Some methods of qualitative research require on-going, simultaneous collection and analysis of data (Mason, 2002; Yin, 2003; Green, Cailli, & Elmore, 2006; Merriam& Tisdell, 2016). From the first interview, data must be analyzed and then adjustments to the approach made, if necessary, to continue the collection of additional data (Creswell, 2007; Merriam, 2016). Although it may appear to be pre-designed and conducted according to plan, changes vital to ensure the collection of trustworthy findings are made in case studies as data is analyzed.

This method is often referred to as the constant comparative method (Glaser & Strauss, 2017). This constant cycle allows for a focused collection of data aimed at answering the research question(s) (Flyvbjerg, 2006; Merriam& Tisdell, 2016).

Data analysis began in this study after the first participant was interviewed. Each analysis informed the subsequent interviews, researcher-generated documents, and observations.

Data analysis was managed through coding. Coding provides qualitative data with symbols or shorthand notations that help categorize, retrieve, and organize according to an attribute (Saldana, 2016). Codes were pre-determined based upon elements of the theoretical framework. Pre-determined, descriptive codes included question planning practices, questioning hierarchies, participation, feedback, and reinforcement, preference of formative assessment without technology, preference of formative assessment technology, technology integration, and professional learning. Value coding was applied in later rounds of coding given that the nature of the research study question is focused upon the perceptions of teachers.

Codes were applied to interviewees' responses as well as any dialogic interactions between the researcher and the participant; however, the pre-determined questions for the basis of the interview were not coded. Questionnaire responses and all field notes from observations were coded as well. A codebook was maintained with a list of each code.

Following the coding process with each piece of data, these small labeled units were then compared to one another and categorized into classes that emerged as a result of the comparison (Merriam& Tisdell, 2016). Beginning with the first transcript, a running list of categories was developed and evolved with each comparative analysis. Eventually, some categories were subsumed into one category, thus condensing the list to reflect the themes that emerged after all data were analyzed (Saldana, 2016). The category names were refined and developed as each

new set of data was acquired. Saldana (2016) notes that codes are a means to label vital elements, clustering them together by patterns allows for emergence of categories, and ultimately, this process is analyzing the connections between the patterns. This process is an inductive one in the early stages as categories and themes emerge then as saturation occurs it moves to a deductive one with latter pieces of data being examined against the categories (Merriam & Tisdell, 2016). Categories were also constantly examined with respect to the research question and whether the category answered the question.

Once all categories were identified through the comparative analysis they were sorted topically. Units of data within each topical category allowed for rich descriptions and contained sub-topics relevant to each overarching theme. Rich descriptions resulting from topical sorting provided a holistic understanding of teachers' perceptions of pre-planned questions paired with formative assessment technology (Merriam & Tisdell, 2016).

Trustworthiness

It is important to note elements of the research design that were incorporated to increase the trustworthiness of the study. When examining the trustworthiness of a study, the terms credibility and transferability are common (Ary, Jacobs, Sorensen, & Walker, 2012; Merriam & Tisdell, 2016).

Qualitative studies, including case studies, commonly use triangulation as a means of ensuring internal validity and credibility (Yin, 2003; Merriam& Tisdell, 2016). Triangulation was utilized within this study. Multiple methods of data were collected, including interviews, researcher-generated documents, and observations. These sources of data were compared or checked against each other with consideration of the question of study.

Member checks were also implemented for validity purposes. Transcripts from interviews and observations as well as draft versions of analyses and conclusions were presented to the participants (Creswell, 2007; Merriam, 2016). This approach allowed for participants to review documents and provide input regarding if the data, analyses, and conclusions were accurate interpretations of their experiences and eliminated misinterpretations .

Additionally, peer debriefing was employed as a means to ensure trustworthiness. This method of validation involved utilizing a peer to review and pose questions about the study's methods including data collection and data analysis (Creswell, 2007; Merriam, 2016). The researcher shared raw data and analyses with the peer reviewer. The peer reviewer was a graduate student with a background in qualitative research studies. Also, a record of all debriefing sessions was maintained.

Some researchers suggest that case studies are unable to be generalized or are non-transferrable. Flyvbjerg (2006) proposed that the correct view of this concept should reflect the following:

"One can often generalize on the basis of a single case, and the case study may be central to scientific development via generalization as supplement or alternative to other methods. But formal generalization is overvalued as a source of scientific development, whereas 'the force of example' and transferability are underestimated."

In-depth data collection involving observations and interviews has potential for transferability in this study because the participants and context are similar to typical education settings in the United States.

Summary

The third chapter provided a description of the methodology of the study. Included in the chapter were explanations and justifications of the case study research design, as well descriptions of the participants and setting. Additionally, the data collection methods, including interviews, observations, and researcher-generated documents were outlined, as were the methods of data analysis. The third chapter concluded with an explanation of the elements that ensure trustworthiness of the study. The fourth chapter will present the findings of the study, and the fifth chapter will provide a discussion of the findings, as well as implications for future research.

CHAPTER 4:
FINDINGS

The purpose of this research study was to examine the perceptions of participating teachers regarding the use of combining purposeful, pre-planned questions paired with formative assessment technology. The sections that follow in this chapter provide a description and analysis of the findings from data gathered to address the guiding research question for this study:

> How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms?

In Chapter 1, information was presented regarding the overarching problem facing society in which students are entering college or a career post-secondary education without being prepared with 21st century skills. Additionally, Chapter 1 introduced the theoretical framework, for this study—Bloom's Theory of Mastery Learning. Chapter 2 provided an in-depth review of related literature based upon the theoretical framework as well as the conceptual framework of this study. Within the conceptual framework. elements of mastery learning, formative assessment, questioning, technology implementation models, and professional learning were examined with attention to the research question. The methods for this qualitative case study were presented in Chapter 3.

Chapter 4 includes a description of the participants and is followed by a presentation of the findings. Data were collected through a combination of interviews, surveys and observations. Interviews were conducted to allow a rich collection of data from participants regarding their perspectives related to elements of formative assessment, technology, pre-planned questions, and the combination of these elements. The questionnaire utilized open-

ended questions focused upon the comfort level of participants in relation to the key elements examined in the interview. Additionally, the observation of planning sessions allowed the researcher to collect data in an authentic setting of practice. The researcher used these three data sources in order to triangulate responses and determine overarching themes in this bounded case. Participants were selected from a school that was in year two of one-to-one implementation in grades 3-5.

Findings are organized by the three data sources. A description of the data sources, as well as a table and a narrative description of the common themes for each data set are provided. The chapter concludes with a presentation of the four overarching themes which emerged from the data. Details describing the process and how these themes were determined are presented and discussed throughout this chapter.

Description of Participants

Purposeful and convenience sampling was used to collect data for this study from an elementary school in East Tennessee. All participants have Google Chromebooks for each student in their classroom and have all participated in some form of training regarding one-to-one implementation. The research district provided six district-created, online modules entitled *Google Basics*, which 80% of the participants completed. Also, Level 1 Google Certification has been promoted by the district, and 30% of participants have received this certification. One participant is Level 2 certified through Google. Additionally, summer training and after-school training sessions led by technology teacher leaders were held during the 2016-17 and 2017-18 school years. In like manner, 90% of the participants have attended at least one of these additional learning opportunities. One study participant served as a technology teacher leader.

This study involved educators with various levels of experience and backgrounds. Teacher participants' experience range from 3.5-20 years. All participants are in a current role in which they team-teach with another educator, and it is at least the second consecutive year of this present role for all participants. Within these teams, teachers either teach math or ELA, as well as one additional content area, such as science or social studies. A table (Appendix A) details each participant's grade level and content area of instruction.

The results are presented in this chapter in a narrative and tabular format of the data collected from interviews, a questionnaire, and observations. The findings section includes common themes emerging from the responses and observational data in both tabular and narrative forms. Finally, the summary section of Chapter 4 presents common themes across the sets of data.

Interview Description

Interviews were conducted in person with all 10 participants. The researcher used an audio recording application to record the conversation. The researcher used an interview protocol (Appendix B). The first three interviews were conducted, transcribed, and a first round of coding was completed. Based upon the results these transcripts, the interview protocol was revised and two additional questions related to the levels and rigor of questions were inserted (Appendix C).

All data in the interview transcripts were first analyzed individually. Some predetermined codes were utilized, but value coding also allowed for additional codes to emerge as evident in the data. A codebook was maintained throughout the process to reflect updates of codes. The final list of codes is presented in a table (Appendix D). Each subsequent interview

was compared to previous interviews and new emerging codes were noted in previous interview transcripts as applicable.

Codes were sorted into categories throughout the analysis phase. Initially, sorting was notated by hand in the codebook, but a tabular system was subsequently used to better organize the codes and categories. The tabular system also aided in identification of common themes among responses.

Member checks were conducted to ensure the validity of the interpretation and analysis of the responses. Transcripts were presented to each participant after coding for verification that the codes reflected the meaning of each participant's words. Additionally, peer review sessions were also conducted with a graduate research assistant for validity. In these discussions, samples of raw data were shared with the peer reviewer and compared to the data collection and analysis methods outlined in Chapter 3. A log of debriefing sessions with the peer reviewer was maintained (see excerpt in Appendix E). The following section will provide the interview findings in tabular and narrative format of the interview results.

Interview Findings

The first four interview participants responded to nine questions. The remaining six participants responded to 11 questions once the interview protocol was adjusted based upon the analysis of the first three interviews. Additional questions were asked of the participants based upon responses when further elaboration was desired in relation to the theoretical and conceptual framework.

Analysis of data from the interview questions allowed for identification of common themes. The 10 questions were grouped into four categories: formative assessment in general, formative assessment with technology, preparation and planning, and professional learning. The

data was reviewed and analyzed within these categories to determine common themes. The occurrence of a code across a category for at least six participants identified a common theme. Table 4.1 displays the common themes across the categories of questions Column one represents the category, column two represents the question, column three represents the themes, and column four represents the number of participants referring to the theme**.** Following the table, the common themes are presented in narrative form.

Table 4.1

Common Themes by Interview Question Categories

Category	Questions	Themes	Number of References
Formative assessment in general	Q1: Tell me about how you use formative assessment in your classroom.	*Teacher instruction methods are affected by formative assessment results*	*n=10*
		Awareness of student performance levels based on formative assessment data is evident	*n=9*
		Preference for formative assessment using paper and pencil	*n=6*
	Q2: Describe a time when using formative assessment worked well for you.	*Preference for discussion or oral formative assessment methods*	*n=7*
		Preference for formative assessment using technology	*n=8*
		Teachers should be interacting and observing students during formative assessment	*n=6*
Formative assessment with technology	Q3: Has becoming one-to-one changed or impacted your use of formative assessment? If yes, how has it changed it?	*Formative assessment technology is enjoyed or loved by students*	*n=7*
		Formative assessment technology allows for immediate feedback	*n=9*
	Q4: What differences do you see in formative assessment with technology tools and formative assessment without tech tools?	*Teacher instruction methods are affected by formative assessment results*	*n=6*
		Formative assessment technology requires less time of teachers	*n=7*
		Feedback, participation, and reinforcement are affected by instruction methods	*n=8*
	Q5: What types of technology tools for formative assessment have you used? Describe how you use them.	*Technology can enhance formative assessment*	*n=6*

	Q6: How do you see technology affecting the aspects of feedback, participation, and reinforcement that go along with formative assessment?	*Pre-planned or premade questions from formative assessment technology are beneficial* *Awareness of student performance levels based on formative assessment data evident*	*n=6* *n=8*
Preparing or planning	Q7: How do you plan or prepare for using formative assessment and/or formative assessment technology tools?	*Pre-planned or premade questions from formative assessment technology are beneficial*	*n=7*
		Pre-planned or premade questions from textbooks or other print sources are beneficial	*n=6*
	Q8: Tell how you determine the questions you will use for formative assessment. Are they program-based, teacher created, etc.?	*Questions should align to standards*	*n=7*
		Questions should be varied in style and some should require higher order thinking	*n=9*
	Q9: Do the levels of rigor of questions factor in to your choice of questions in any way? If so, how?	*Sometimes it is necessary to create questions for formative assessment*	*n=8*
Professional learning	Q10: What professional learning have you participated in regarding one-to-one implementation? Formative assessment?	*Professional learning related to technology classroom practices is prevalent*	*n=10*
		Collaboration is key in growing professionally	*n=6*
	Q11: What impacts did these professional learning opportunities have on your practice?	*Continued growth in technology practices is important to improving teacher practice*	*n=7*

Formative Assessment in General.

The first category included two questions, and responses identified six common themes. First, all participants referred to formative assessment data and how it provided evidence of student performance levels. Use of the formative assessment results to inform instruction was also discussed by 9 out of 10 participants. Regarding using formative assessment results, Participant G noted, "…so I really feel like that gives me a good representation of what the kids know. Plus it goes back and tells me well 68% of students missed this question or you know 90

something percents got this one right, so I know I can just move on from that. It even tells what specific students missed a question." Most participants made similar comments in reference to what students know and how the teacher uses the results.

Eight of 10 participants referenced a situation during these questions that involved formative assessment technology. Eight participants responded in a similar manner to Participant J, who is quoted below.

> "…we just did a Kahoot over prepositions. 'Can you identify a prepositional phrase in a sentence? Can you identify a preposition?' Just to kind of see what they could do on their own, and of course Kahoot is just a game for them so we're enthused and excited about that…so I was able to tell then at that point okay, one more step and we're ready for our final assessment on it… I felt comfortable enough with both groups—my higher group and my lower group –that they had enough to where we could move on to our final piece and then the final assessment."

Participants C and D, who both teach 3rd grade, expressed that tech impedes their instruction because it does not provide accurate data due to reduced effort on part of the students when using technology for formative assessment purposes. Formative assessment involving written responses and oral discussions were noted as successful by Participant C. Participant D described using the math textbook as a resource in a successful formative assessment situation. In response to interview questions regarding formative assessment, seven participants indicated a preference for formative assessments that did not involve technology.

Additionally, six participants referenced that formative assessment, irrespective of form, should involve interacting and observing students. These participants explained that they watch

students solve problems or reason through questions. They also noted how they interact with students based upon student responses to questions.

Formative Assessment With Technology.

Eight common themes developed regarding formative assessment with technology. Awareness of student performance levels based on formative assessment data and instructional methods being affected by these results was evident in responses about formative assessment technology. Participants A, E, F, G, I, and J indicated that formative assessment technology provides them data to determine mastery and also noted that this data informs decisions about future instruction. Most of these participants described using the results as they discussed each question from the assessment with students.

In addition to using data to inform instruction and develop awareness of student performance, seven participants detailed that formative assessment technology is enjoyed or loved by students. Participants B, G, H, and J Suggested that students favor technology over paper-pencil tasks, which is a notable difference in formative assessment with technology as opposed to formative assessment without technology. Participants C, D, E, G, H, and J emphasized that students love technology. Participant G stated, “I think maybe it engages the students a little bit more when they’re not just seeing black and white.” Similarly, participant J expressed, “It makes it more entertaining for the kids so we can get through it a lot quicker.”

Seven participants noted that feedback, participation, and reinforcement were affected by instructional methods. Varied opinions concerning these seven elements were evident among these seven participants.

Participants A and I expressed that because students gave less effort when using formative assessment technology, this method did not enhance instruction in their classrooms. These participants also shared that their instruction methods affected the type of feedback and participation that they receive from students. Participant A mentioned that when terminology such as "pop quiz" was used, greater effort was evident on assessments. Participant I stated that because she used a lot of discussion and created a culture of a "safe place, brave place," student participation and feedback was improved.

Participants C, E, F, H, and J all denoted that all students participate with the use of formative assessment technology. Participants J and F opined that the anonymity associated with formative assessment technology has promoted an increase in participation. Participant D explained that because of the game-like nature of numerous formative assessment technology tools, "…it encourages participation." Other participants expressed similar ideas reflecting this increased interest and participation when using the one-to-one devices.

All participants, excluding Participant B, indicated a preference for the immediate feedback that they received from formative assessment technology tools. Participants A, D, E, H, and J expressed a preference for using formative assessment technology to acquire immediate results, and also noted that it was much less work than the analysis of results in paper-pencil formats. However, participant H stated that it is harder to for the teacher to provide feedback when using technology because there is no place to write comments. .

Seven participants expressed that formative assessment technology required less time of them. Participants A, C, D, F, G, and J recalled that technology hastened the formative assessment process. These participants indicated that the programs, not the teacher, provided the feedback. Also, the actual process of taking the assessment hastened because often there are

time constraints built into each question. Participant E noted that she could also access premade questions, which accelerated the preparation process when utilizing formative assessment technology.

Six participants indicated a preference for formative assessment technology because of the availability of premade questions. While sometimes they may preview and adjust these questions, these participants mentioned that they rely on questions from technology sources for formative assessment in their classrooms. Participants F and G, both ELA teachers, explained that they prefer to use premade questions from tech sources because it is difficult to create their own questions. Participant G suggested that her preference was partially due to the variety of types and levels of questions available through formative assessment technology.

Findings also detailed that six participants noted an overall enhancement of formative assessment when using technology tools.

Preparing or Planning.

All responses in the categories of preparing and planning involved the aspect of questions, which was evident in four emerging themes. When discussing planning, participants B, D, E, F, G, I, and J described how they rely on premade questions from technology for formative assessment. Additionally, participants A, B, C, D, F, and I select premade questions from textbooks or other non-technology sources for use in formative assessment. Participants who utilize formative assessment technology for premade questions in ELA, math, science, and social studies repeatedly referred to online programs such as Study Island, Kahoot, and Nearpod. Two of these teachers, participants B and G, noted that creating pre-planned questions was a difficult task and required a large amount of an educator's time. Participant B said, "I think when you're into higher order thinking text like that (*The Miraculous Journey of Edward*

Tulane) it takes a lot pre-planning." All participants that taught ELA expressed that they use premade questions in some manner for design of formative assessment.

All of the participants mentioned above, with the exception of participant G, noted that they sometimes find it necessary to create their own questions. Participant H stated that she creates her own questions as well. Both 5th grade math participants, H and I, often create their own questions during the lesson based upon student responses to other questions or problems.

One other commonality emerging from the interview data involved alignment of questions to the standards. Standard alignment was important to participants A, D, E, F, G, H, and J when selecting or creating questions. Participant J stated,

> "I want to make sure that they align with the way I've taught it...the way that the standard says and Study Island does 9 times out of 10 an amazing job. But still there are those few questions that pop up that's like, 'Okay, why is this one in with this standard? What is their purpose of asking it this way?' Things like that."

Nine of 10 participants suggested that questions should be varied in style and some questions should require higher-order thinking skills. All of these participants described formative assessments in which there was a balance of questions ranging from low-level to higher-order thinking. Participants C and F stated that they made emphasized the inclusion of higher-order questions due to state testing expectations (TNReady). Participants C and H referred to students' ability levels when considering the levels of rigor of the questions. Participant C said that the questions she asks depend on the level of students. Additionally, participant H stated that she asks the same questions to both of her classes, which are ability grouped, but the supports she provides may differ based on the ability levels of students within each class. Participant E and J referenced selecting questions in formative assessment

technology programs and noted that they like a variety of levels, but they do not want to include questions that are "tricky." Participants A and G noted how formative assessment technology allowed supports for students with reading difficulties such as read-alouds which provided these students with better access to a variety of questions.

Professional Learning.

Three common themes developed from the responses to the two questions that addressed professional learning. All 10 educators have participated in some form of professional development designed to improve technology skills. All participants attended district-provided training within the last two school years. Participants B, C, D, F, G, and H explained that some of their professional learning occurred as a result of collaboration with peers within and across school buildings. Participant B stated that collaboration with a technology teacher leader in the research school fostered learning of one-to-one implementation. Also, participants B, E, F, G, H, I, and J voiced that they prefer to continue to develop their knowledge regarding the effective use of technology in the classroom.

Document Description

Documents in this study were collected via an online format using Google Suite for Education. The researcher developed a questionnaire utilizing Google Form application. Each participant received a standardized questionnaire consisting of seven open-ended questions (Appendix F). Questions were similar in concept to those used during the interview process, but the questionnaire utilized the phrases "How comfortable do you feel…" or "How important is it to you…" at the beginning of most questions. Professional learning questions were omitted from the questionnaire because the researcher only asked these questions during the interview to

acquire knowledge of participants' current experiences in professional learning related to the topic of this study.

Responses were submitted anonymously and were automatically generated into a Google Sheet for data analysis. Responses from the questionnaire were coded with the same list of codes used in the analysis of the interview questions. Data from the questionnaire are displayed in tabular and narrative form in the following section.

Document findings

Responses to each question were coded. Findings are presented in Table 4.2 to identify common themes among groups of questions. The occurrence of a code across a category for at least six participants identified a common theme. Column one represents the category, column two represents the question, column three represents the themes, and column four represents the number of participants referring to the theme. The table is followed by a narrative to discuss patterns within questionnaire categories.

Table 4.2

Common Themes by Questionnaire Question Categories

Category	Question	Themes	Number of References
Formative assessment in general	Q1: How often do you use formative assessment in your classroom?	*Teacher instruction methods are informed by FA results*	n=8
	Q2: How comfortable do you feel in your practice of using formative assessment in your classroom?	*Sometimes it is necessary to create questions for formative assessment*	n=7
	Q3: How comfortable do you feel in designing your own questions for a formative assessment?	*Continued growth in formative assessment and questioning practices is important to improving teacher practice*	n=6
	Q4: How comfortable do you feel in using formative assessment results to inform your instruction?		
Formative assessment with technology	Q5: How comfortable do you feel using the one-to-one technology in your classroom?	*Continued growth in technology practices is important to improving teacher practice*	n=6
	Q6: How important is it to you to have access to formative assessment technology programs that include questions developed by the program and not requiring you to create them?	*Pre-planned or premade questions from formative assessment technology are beneficial*	n=6
	Q7: Describe a time when using formative assessment technology worked well for you in your classroom.	*Questions should align to standards*	n=7

Formative Assessment in General.

Three common themes emerged from the four questions focused upon formative assessment in general. For example, eight of 10 participants expressed a high level of comfort in using data from formative assessment to inform future instructional decisions. One of these 8 participants who noted using data to inform instruction explained, “Being able to use formative assessment results to inform my instruction is the main reason I use formative instruction.” Two participants expressed a lower degree of comfort, and one of these teachers stated, “I don’t always know which route I should take after a formative assessment.”

Participants also indicated that it is sometimes necessary to create questions for formative assessment. Seven participants stated that they create their own questions, but responses indicated varying levels of comfort when creating these questions. One participant explained that creating lower level questions is preferable, but "when assessing more rigorous standards I feel less confident in designing my own and would prefer using a textbook series or online component for a formal assessment." Two participants noted that they are improving in this area. Two other participants expressed that question development is extremely challenging.

Six participants expressed that continued growth in formative assessment and questioning practices is necessary if teaching practices are to improve. One participant explained, "I'm comfortable (with designing questions), but I'm always looking for ways to improve my questioning for student learning." Other participants voiced similar desires to grow, but some participants indicated that creating challenging questions or how to best utilize results and responses from formative assessments can sometimes be problematic.

Formative Assessment With Technology.

Three themes emerged in response to questions regarding formative assessment technology. As a desire to grow in relation to questioning and formative assessment was noted above, a similar theme emerged regarding the importance of continued growth in technology practices for teachers. Six participants relayed that one-to-one technology is newer to their classrooms; while they have implemented some elements, there is still room for development. One participant stated, "I love technology in the classroom, but feel there is SO much more I can be doing with it. I am always willing to try new things out." This statement is reflective of others' comments.

The benefits of pre-planned or premade question were also noted. Six participants believed it was important to have access to formative assessment technology programs that include premade questions. Two participants suggested that using these programs is time-saving, and three participants expressed that these premade questions are beneficial because they align to state testing and standards.

It was also determined that aligning questions to standards is essential. Seven participants emphasized the importance of ensuring that questions are aligned to state standards. Three participants expressed that formative assessment technology provides questions aligned to standards, and four participants expressed that they wanted formative assessments to include questions that match the standards. Three participants indicated that questions are previewed prior to use, but these questions do not always align with state standards. Additionally, two participants denoted that they sometimes create their own questions to use in formative assessment technology platforms.

Field Notes Description

Three planning sessions, one per grade level within the research school, were observed and involved teams of teachers developing lesson plans for upcoming days or weeks of school. Two 3rd grade math teachers, two 4th grade ELA teachers, and two 5th grade ELA teachers participated in the lesson planning observation sessions. The majority of discussions occurred among grade-level teachers, but the researcher participated in conversations if participants asked questions.

Field notes were collected using paper and pencil. Notes were then typed into a bulleted format to be coded in the same manner as the interview and questionnaire data. The notes were also expanded to a typed description of the observation (Appendix G).

Field Note Findings .

Findings of the field notes are provided in the following section in a tabular format representing common themes across the three observations. Table 4.3 displays the common themes across the sessions. The occurrence of a code across at least two planning sessions was identified as a common theme. In addition to the table, a narrative description is provided for each theme.

Table 4.3

Common Themes Across Planning Sessions

Themes	**Participant E & F**	**Participant A & D**	**Participant G & J**
Teacher instruction methods are affected by formative assessment results	yes	yes	yes
Collaboration is important for effective planning	yes	yes	yes
Awareness of student performance levels based on formative assessment data is evident	yes	yes	yes
Preference for formative assessment using paper and pencil	yes	yes	no
Preference for formative assessment using technology	yes	no	yes
Premade resources are beneficial but need to be reviewed and adjusted sometimes to better align	yes	yes	yes
Feedback, participant, and reinforcement are affected by instruction methods	no	yes	yes
Questions should align to standards	yes	yes	yes
Questions should align to a test	yes	yes	yes
Study Island is a preferred formative assessment technology tool	yes	no	yes
Planning for formative assessment relies on prior experience with similar lessons	yes	yes	yes

Eleven themes emerged from the field notes and descriptions from observations of lesson planning sessions. Seven of these themes were evident in all three planning sessions. These seven themes will be discussed first and will be followed by a description of the four themes evident in at least two of the three planning sessions.

Awareness of student performance levels based on formative assessment results, as well as teacher instruction being affected by these results, was evident in all three planning conversations. Participants E and F noted performance levels of application of grammar skills in their students' writing and discussed how this would inform subsequent writing instruction. Participants G and J planned for instruction regarding figurative language, and discussed that their students had previously demonstrated knowledge of similes and metaphors but would require additional direct instruction on adages and idioms. While reviewing results from the state assessment from the 2016-17 school year, Participant A noticed that her scores related to the concepts of area and perimeter were lower than scores in other areas. Subsequently, Participant A shared with Participant D that she planned to adjust her instruction to better allow for adequate time to teach these concepts. These participants also recounted that their students were struggling to master some math facts, and fluency standards needed to be addressed in a different manner.

Discussions also indicated that collaboration is important for effective planning. These three sets of teachers meet on a weekly basis to collaboratively plan instruction. During these specific sessions, Participants E and F shared that they have constant access to a shared document for their weekly and unit plans for ELA and social studies. Each teacher constantly updates this document to support their instruction. Participants A, D, G and J shared physical files, which contained resources for the skills and standards they were discussing. Each team

member had access to these files and discussed elements within the files in a collaborative nature to determine whether to use items for instruction in the upcoming lessons, and if so, how to use these items effectively.

The remaining four themes that were reflected in all three planning sessions centered around preparation or planning for a formative assessment. Questions being aligned to standards and/or tests were reflected in all three conversations. Along with the focus on alignment, these conversations evidenced that premade resources are beneficial but should be reviewed and sometimes adjusted to better align. For example, when participants G and J were examining practice tests provided by the state, they determined how to use the documents for formative assessment purposes and decided to add additional questions to the assessments that would align with grammar standards. Participants E and F had a similar discussion, noting that they needed to structure the formative assessments to mirror the structure of the state tests. Also, participants A and D explored the standards for area and perimeter and determined what questions and activities from their textbook would best align with the demands of the state test and standards. Additionally, these participants referenced prior experience in previous years with similar lessons, which affected their decisions in the observed planning sessions.

Preferences also emerged for certain types of formative assessment during the planning session. Two of the three sessions emphasized the use of paper and pencil methods of assessment as being a preferred method for a particular standard or skill. As participants A and D mapped out assessment tasks for area and perimeter, they decided to use paper and pencil methods. Participants E and F determined that they would do a simple true/false type assessment with paper and pencil on social studies standards currently being taught. A preference for using formative assessment technology emerged from two of the three sessions. Participants E, F, G,

and J, all ELA teachers, all of whom are ELA teachers, discussed using Kahoot and Nearpod to provide formative assessment for an upcoming unit on grammar skills. Participant J shared that he used Nearpod last year on a particular standard, and suggested he could likely utilize Kahoot as well to address the same standard Additionally, these two sets of participants referenced Study Island as a preferred tool for formative assessment.

As determined in two of the three observations, feedback, participation, and reinforcement were affected by instruction. Participants G and J discussed how they could structure difficult state-provided practice tests they were using for formative assessment. Together they discussed breaking the most difficult texts down to smaller segments and using them over the course of three days as they thought this would provide better participation and opportunities for feedback and reinforcement to be more well-received. Participants A and D were reviewing questions in the math curriculum and noted how the wording of some questions was problematic to students. They discussed methods to address some of these aspects in introductory lessons to prevent possible confusion as students respond to particular questions or scenarios.

Comparison of Interview, Questionnaire, and Observation Data

The interview, questionnaire, and observation data were triangulated to examine similarities and differences across the three data sets. All sets of data were coded with the same set of codes and subsequently categorized to determine common themes across the each set of data. Common themes that occurred across two of the three sets of data were considered sub-themes. These sub-themes were then organized into categories to allow for overarching themes to emerge. Categorization was conducted across steps of the triangulation process with consideration of the theoretical and conceptual framework.

The list of all common themes across the interview, questionnaire, and observation data and documentation related to triangulation is presented in Table 4.4.

Table 4.4

Triangulation across the interviews, questionnaire, and observations

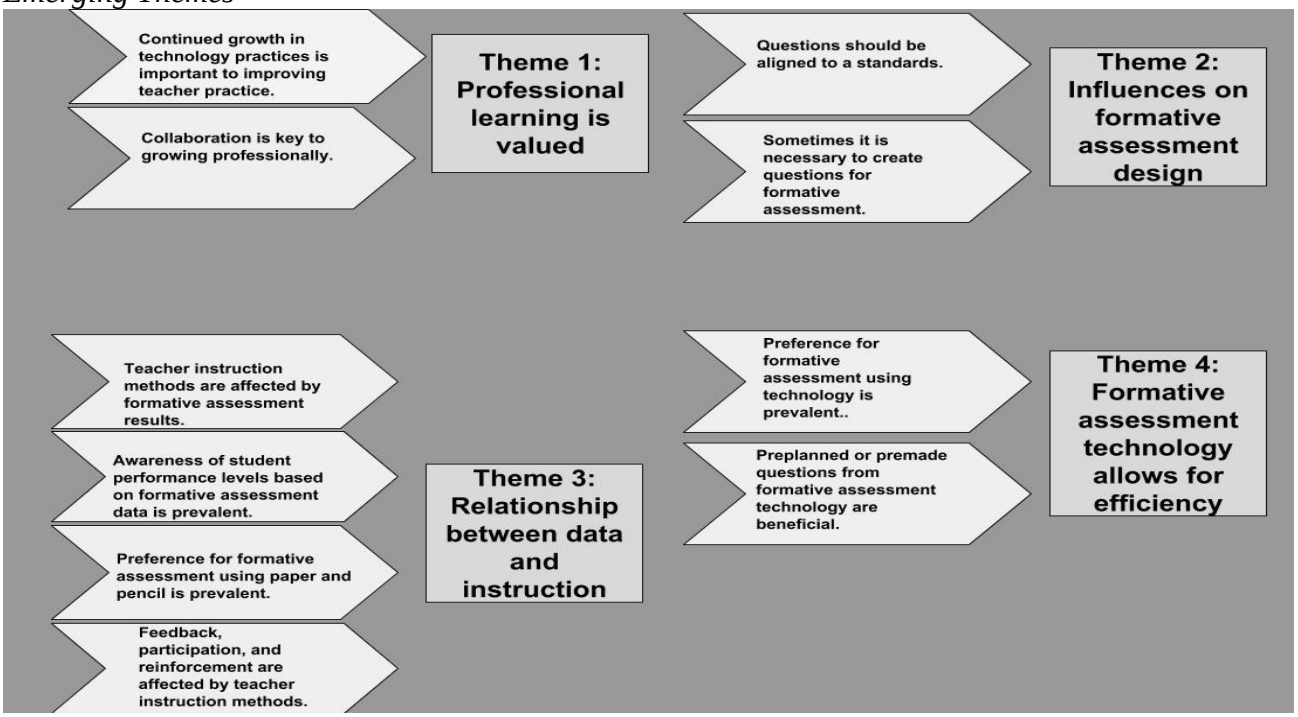
Common Themes	Interviews	Questionnaire	Observations
Teacher instruction methods are affected by formative assessment results	Yes	Yes	Yes
Awareness of student performance levels based on formative assessment data is evident	Yes	No	Yes
Preference for formative assessment using paper and pencil	Yes	No	Yes
Preference for using formative assessment with technology	Yes	No	Yes
Preference for discussion or oral formative assessment methods	Yes	No	No
Teachers should be interacting and observing students during formative assessment	Yes	No	No
Formative assessment technology is enjoyed or loved by students	Yes	No	No
Formative assessment technology allows for immediate feedback	Yes	No	No
Formative assessment technology requires less time of teachers	Yes	No	No
Feedback, participation, and reinforcement are affected by instruction methods	Yes	No	Yes
Technology can enhance formative assessment	Yes	No	No
Pre-planned or premade questions from formative assessment technology are beneficial	Yes	Yes	No
Pre-planned or premade questions from textbooks or other print sources are beneficial	Yes	No	No
Questions should be aligned to standards	Yes	Yes	Yes
Questions should be aligned to tests	No	No	Yes
Questions should be varied in style and some should require higher order thinking	Yes	No	No
Sometimes it is necessary to create questions for formative assessment	Yes	Yes	No
Professional learning related to technology classroom practices is prevalent	Yes	No	No

Collaboration is key to growing professionally	Yes	No	Yes
Continued growth in technology practices is important to improving teacher practice	Yes	Yes	No
Premade sources are beneficial but need to be reviewed and adjusted sometimes to better align	No	No	Yes
Study Island is a preferred formative assessment technology tool	No	No	Yes
Planning for formative assessment relies on prior experience with similar lessons	No	No	Yes
Continued growth in formative assessment and questioning practices is important to improving teacher practice	No	Yes	No

The triangulation process identified the occurrence of common themes across the interview, questionnaire, and observation data. These identified themes that emerged within at least two sets of data were then categorized based on the meaning of each theme with attention to the theoretical and conceptual frameworks. It is important to note that a third set of data in which the theme did not occur also did not provide contradictory data to the theme. These common themes were subsequently referred to as sub-themes and consideration of the frameworks also allowed for the labeling the overarching themes. Figure 4.1 displays the overarching themes and corresponding sub-themes.

Figure 4.1

Emerging Themes



Summary

Chapter 4 presented the results of the research conducted to determine the perceptions of teachers in grades 3-5 in a bound case regarding the use of pre-planned questions paired with formative assessment technology. Interview, questionnaire, and observation data collected from 10 educators from an East Tennessee elementary school were presented. Findings from each data set were organized by common themes that emerged and were presented in tabular and narrative forms. The chapter concluded with the presentation of the overarching themes, which emerged from triangulation of all three sets of data, and categorizing common themes that were present in at least two of the data sets, including interviews, questionnaires, and observations.

Chapter 5 includes a summary of the study, and presents a conclusion of the findings related to the research question by further discussing the four overarching themes. Additionally, implications and recommendations are provided in the final chapter.

CHAPTER 5:
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Chapter 5 presents a summary of the study, which is followed by conclusions and recommendations based upon the data analysis provided in Chapter 4. The summary outlines the study, and a discussion is presented with attention to the overarching themes presented in Chapter 4. Finally, the researcher will provide recommendations based upon the findings for future studies and educator practice.

Summary of the Study

At the state and national levels, recent reforms in education have called for students to be better prepared with 21st century skills (Duncan, 2010; Stone, 2011; corestandards.org). Technology proficiency, critical thinking, problem solving, and collaboration are included in these skills. (U.S. Department of Education, 2017). Bloom's Mastery Learning Theory, which requires the use of formative assessment and involves questioning students at various levels of thinking to determine mastery of a concept, provided a theoretical framework for this study (Bloom, 1968). This framework's variables, including cues, feedback, participation, reinforcement, and formative assessment, as well as purposeful planning of such elements with effective one-to-one implementation practices, informed and guided the structure of this study. While attempting to successfully implement one-to-one technology in classrooms, questioning paired with technology may allow teachers to maximize learning outcomes and meet the demands of recent education reform.

The purpose of this study was to examine the perceptions of teachers regarding the use of pre-planned questions paired with formative assessment technology. One research question guided the investigations of the study:

How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms?

A case study method of data collection and analysis was utilized to provide a rich-description of a bound case involving teachers in grades 3-5. The 10 participants were from an elementary school setting in the second year of a one-to-one implementation district initiative. The data collection began with interviews, which were conducted with each participant using an interview protocol that consisted of questions constructed with attention to the theoretical and conceptual framework of the study. Next, an online questionnaire with open-ended questions related to formative assessment, question development, and one-to-one technology was distributed to all participants via Google Forms. Last, the researcher observed teacher teams from each grade level participating in lesson planning sessions. Field notes were collected during the observations.

The constant comparative method is a common practice in qualitative research (Creswell, 2007), so data in this study was analyzed continuously. Each analysis informed a subsequent analysis. Pre-determined codes were used in initial stages of coding with the transcripts, along with value coding as new patterns emerged from the data (Creswell, 2007). The same set of codes was used to analyze the questionnaire responses and field notes. Coding allowed for themes to emerge from the data.

Interview questions were grouped categorically and common themes within each category were identified. The same process was repeated for questionnaire and observation data. Triangulation involved comparing the three sets of common themes and identifying emerging themes present in at least two of the three sets of data. These themes were considered subthemes and were grouped into similar categories based upon meaning, which then allowed for

overarching themes to emerge. All analysis was constantly compared to the research question to ensure data was informing the inquiry. The following section details the overarching themes which emerged in relation to the theoretical and conceptual framework.

Discussion

Pre-determined and value coding allowed for the following themes to emerge from the interview, questionnaire, and observation data: professional learning is valued, influence on formative assessment design, relationship between data and instruction, and formative assessment technology allows for efficiency. The following sections include a discussion of each of the overarching themes with relation to the existing data, the present study, and aspects of the theoretical and conceptual frameworks of this study.

Theme 1

Prior to the present study, the professional learning aspects of effective questioning Gonzalez, 2010; Smith & Lennon, 201) and technology practices (Timmis, Broadfoot, Sutherland, & Oldfield, 2016) have been reported as ineffective in causing a transfer of these best practices into actual instruction. Recent research on effective professional learning recommends ongoing, job-embedded professional models as an effective practice for educator growth (U.S. Department of Education, 2017). Some research studies focused upon one-to-one integration report professional development has increased implementation efforts, while others found that knowledge of technology skills increased yet implementation of these skills did not improve (Uslu & Bümen, 2012). Teachers have also noted in other studies that insufficient support in learning the technology tools was a factor that made formative assessment technology less desirable.

The value placed on professional learning was an overarching theme of this study evidenced in participants' responses. This theme was present in both the questionnaire and interview data. The research school is involved in a district-wide one-to-one initiative grounded in utilizing teacher leaders for professional learning related to technology. This model is aligned with those models recommended in research provided by the U.S. Department of Education (2017) as an effective method for professional learning.

This overarching theme placing value on professional growth was evident in two subthemes. Evidence in this study supporting this theme neither supports nor disputes previous research about implementation efforts related to professional learning (Uslu & Bümen, 2012). However, findings in this study do support research from other studies, which found that when teacher learning is not adequately supported in one-to-one implementation, educators view the use of technology less favorably (Feldman & Capobianco, 2007; Beatty et al., 2008; Lee, Feldman, & Beatty, 2011).

All teacher teams, other than one, expressed that collaboration with colleagues for either planning for instruction or increasing technology implementation skills positively influenced professional learning. Participants frequently referred to the impacts of the learning sessions led by tech teacher leaders or tech teacher leader interactions in the classrooms. One participant described a specific experience of working in her classroom with support from the tech teacher leader.

> "…last year Google Classroom was new, and I said, 'I really don't understand how to use this can you help me?' And she said, 'Absolutely.' She came in, and she was amazing. So she taught my class while teaching me…she kind of came in and modeled it …I'm

over there taking notes so I watched her teach my class, and she taught me teaching my class. So I mean it's probably more informal but that was extremely helpful to me." In addition, some teachers noted that they not only had learned about technology from the designated tech teacher leaders within the building, but from other colleagues that had begun to naturally emerge as leaders in instruction involving technology.

Similarly, all participants noted within the desire to continue to grow professionally in the area of technology implementation and practices. "I want to know…I want to get better at including technology into my lesson I just don't know how necessarily or I just don't know the right route," expressed one participant. All participants made similar statements at some point during the data collection.

This theme informs the research question because it identifies how educators involved in initiatives designed to meet the demands of the 21st Century perceive the professional learning that is involved. The research district utilized a teacher-led model involving job-embedded and ongoing learning, which is fostering desire among teachers in the research school to continue to learn effective one-to-one implementation practices and value the learning that is already occurring within the building.

Theme 2

Keischnick (2017) conjectures that planning involving purposeful questions aimed at mastering learning targets will increase the chances that teachers are questioning at various levels of rigor and cognition and are seeking formative feedback from students. Outside factors influencing the purposefulness or practices of planning emerged as an overarching theme in this study. Participants in the study referenced in multiple pieces of data that they perceived external influences as affecting their choices of questions for formative assessment purposes.

Two sub-themes, which were evident across all three sets of data, allowed this overarching theme to emerge. During the observations with the three teacher teams, the discussion of questions which were aligned to standards was evident. Additionally, aligning questions to the state standards was also evident in the interview and questionnaire data. Anderson et. al, (2001) reasoned in the revised Bloom's Taxonomy that most educators are working with vague state-mandated standards, and supporting teachers in development of objectives, instruction, and assessment is necessary. However, teachers in the present study viewed the state standards as a factor affecting their choice of questions, whether these questions were selected from a premade bank of questions or teachers were creating their own questions. It is important to mention, however, that formative assessment technology tools were utilized by most of the participants as a source for higher-level questions because these programs provided premade questions that were more conducive to meeting the complex demands of the state standards.

Teachers' design of their own questions also influenced formative assessment design. As evidenced in questionnaire data, the majority of teachers expressed a confidence in creating their own questions, particularly for lower-level questions. This finding supported the previous works by Pate and Bremer (1967), Wilen (1991), Brualdi (1998), and Hattie (2012), who all noted that questions may be valued by teachers, but most questions developed by teachers and used in instruction tend to be lower-level, recall type questions.

Study participants also expressed, in interviews, that it is sometimes necessary to create their own questions because in some instances, the premade questions available in print and online do not specifically align to state standards in various content areas. During the observations, it was common for the teams to utilize premade items, but to supplement these

items with teacher-made questions or edit the premade questions to better align with state standards. It was unclear if these teacher-created, standard-aligned questions were higher or lower level based upon the data. However, it is evident that standard alignment influences question development or selection.

The overarching theme concerning the influences on formative assessment design pertains to the research question because it provides factors perceived by teachers to influence their selection or creation of assessment questions. Pre-planned questioning that is purposefully aligned to learning objectives is most effective in reaching learning outcomes (Bloom, 1984; Wilen, 1991; Hattie, 2012). Identification of the cognitive levels needed to master the content must also be made and can be done with use of the taxonomy of educational objectives (Airasian, 1970). Evidence in this study displays that participants are considering questions that align to state standards. However, this external factor of standards appears to be influencing question selection and development greater than the consideration of cognitive levels.

Theme 3

The four elements of Mastery Learning Theory, including cues, participation, feedback, and reinforcement, operate simultaneously and must be present to achieve mastery (Bloom, 1968; Block; 1970; Guskey, 2007). Similarly, the concept of formative assessment made the relationship between teaching, learning, and assessment a pivotal concept for educators (Bloom, 1968). Within this study, an overarching theme about the relationship between data and instruction emerged from the common themes within each set of data.

Four subthemes related to teacher decisions affecting the relationship between data and instruction were identified in the interview, questionnaire, and observation data. Overwhelmingly present in two categories of the interview question responses and in all three

lesson planning observation conversations, the awareness of student performance levels based on formative assessment data was noted. Participants made comments in both of these data sets reflecting knowledge about student mastery levels. In reference to utilizing one formative assessment technology program, one participant stated:

> "…then I'll go back, and it can show me you know the percentage of how many got it correct or how many missed it so I can really see, 'Oh, this question you know we're not understanding or we need to review this concept'…or you know 'Oh, most everyone got this one right. You all are on track with this one.'"

Participants made similar statements at some point during the interview or lesson planning, and most participants made similar statements on numerous occasions during the data collection process. The use of formative assessment involving questioning at various levels to provide the educator with student responses allowing for demonstration of maser or lack of mastery for a particular concept or skill is at the center of Bloom's Mastery Learning Theory (Bloom, 1968). Researchers who followed Bloom described the same purposes for formative assessment (Block & Anderson, 1975; Guskey, 2007; Black & Wiliam, 2009; Klute, Arthorp, Harlacher, &Reale, 2017), and the findings of this study provide evidence of teachers perceiving the importance of using formative assessment to have awareness of levels of student mastery.

Also, the aspect of feedback, participation, and reinforcement being influenced by teacher instruction methods was a subtheme supporting the overarching theme of the relationship between data and instruction. Throughout the interview process and observation sessions, teachers discussed examples of how the results they received were influenced by their choice of instructional methods. Therefore, the feedback, participation, and reinforcement methods were impacted as well.

Previous research has made it evident that formative assessment technology allows the teacher to provide opportunities for all students to respond to all questions (Wang, Chung, & Yang, 2014; Martin, Polly, Wang, Lambert, & Pugalee, 2016; Stoica & Pein, 2016). Participants' responses varied in these findings regarding the use of formative assessment with technology and formative assessment without technology. In reference to using a formative assessment technology tool, one participant stated, "It gives us the opportunity to share the student's work anonymously." Other participants described how they utilize programs such as Study Island in group session mode, which allows the students to respond to a question and then permits the teacher to instantly see responses and provide a whole group feedback discussion. Therefore, this study identified a benefit perceived by teachers in relation to maximized participation, as well as how the method or tool chosen influenced the form of feedback that could be provided to all students.

Regarding feedback not involving technology for formative assessment, the National Research Council (2001) detailed that collective feedback without such technology often results in insufficient evidence of student mastery because responses come from a sampling of students. Another participant in the present study shared her methods for discussion:

> "I've learned a lot this year with when to pipe in and extend that to something even deeper than where they were. So I'm constantly assessing what they know…what they don't know based on their discussions."

Additional participants referenced the use of discussion methods to provide feedback. While these participants expressed perceived positive results from this instructional and assessment method, these findings do not align with those in previous studies.

Preference for formative assessment using paper and pencil also developed as a sub-theme. When discussing formative assessment in general during the interviews, participants described situations involving paper and pencil methods of formative assessment. Participants across all grade levels indicated that the results they receive from paper and pencil formative assessment methods are more accurate, and therefore, better inform instruction. Literature review for this study neither supported nor rebutted the use of paper and pencil for formative assessment. Hattie (2012) reported that sometimes paper-pencil and discussion methods for formative assessment only warranted responses from a sample of the student class population.

Finally, a fourth sub-theme involving the use of results emerged as a common occurrence across all three sets of data. All participants noted how their instruction methods are affected by formative assessment results. "Being able to use formative assessment results to inform my instruction is the main reason I use formative instruction. In my opinion, it's the most helpful and useful part of using formative assessment," said one participant. Other participants frequently explained how they rely on formative assessment data to determine next steps in instruction. These participants' perceptions support the work of Hattie and Timperley (2007), who noted that feedback is the data or information gained from formative evaluations which provides the educator with evidence of learning or a lack of learning. Sadler (1989) referred to feedback as a reduction force to eliminate gaps in mastery, and John, Ravi, and Ananthasayanam (2009) defined reinforcement as a way to readdress non-mastered skills, which also are supported by these comments. It should be noted that there was some variance in the frequency of use of formative assessment data to structure future instruction.

These four subthemes support and inform the overarching theme, which displays the existence of a relationship between data and instruction for the participants in this study. In

relation to the research question, this theme discloses that teachers recognize the presence of a relationship between results and instructional decisions. The value or importance of such relationship varies among the participants in this study, as evidenced in the variance of frequency of formative assessment implementation.

Theme 4

Islam and Gronlund (2016) noted positive influences on teaching, enhancing formative assessment, and improved feedback as impacts of one-to-one implementations in a recent international review of one-to-one implementation. The fourth theme to emerge from the common subthemes across data involved the efficiency that is allowed by formative assessment technology.

A majority of the participants in the study referred to using technology for formative assessment purposes as a preferred means of this practice, which was a subtheme related to the fourth overarching theme. This preference was due to a variety of reasons, but all related to efficiency. All participants explained that students love formative assessment technology. Some of these participants further described that technology and the design or structure of certain programs serve as a motivator without teachers needing to put forth effort to foster motivation. Findings related to students' perceptions regarding formative assessment did not surface in the research review for this study; therefore, this finding is unique to the present study.

Also, participants discussed that formative assessment technology provides the teacher with instant feedback, which made it a preferred assessment method. Earlier studies provided research describing the use of formative assessment technology for mass assessment purposes (Timmis, Broadfoot, Sutherland, & Oldfield, 2016), as well as use of clicker-systems, which were viewed as valuable for immediate feedback but variance in the type of questions depending

on the actual clicker device (Mayer et. al., 2009; Troy & Bulkakov-Cooke, 2013). Responsess of participants in the present study evidenced findings similar to those involving clicker systems, but it is important to mention that these participants were using Chromebooks as their one-to-one devices. Also, clicker studies evidenced in the search for related literature were based upon research conducted in a secondary and post-secondary educational settings, and the current study occurred in an elementary school. One participant explained:

> "It's just quick and … a lot of these will help you assess the data too in ways that I would never…I mean you know like pie charts …ways that I would never have looked at the data before."

Nine of the 10 participants expressed statements about the benefits of the instantaneous feedback available through formative assessment technology in at least two sets of data.

Having access to pre-planned or premade questions also emerged as a sub-theme. Participants described the benefits of having pre-planned questions readily available in online technology programs such as Kahoot, Study Island, Quizziz, and Nearpod. While participants acknowledged that it was sometimes necessary to create their own questions, they stated that having these banks of questions at their fingertips made it easier to prepare for and use formative assessment in their classrooms.

Prior research exploring the perceptions of teachers with formative assessment technology indicated that there were varied opinions regarding the questioning related to these programs. Similar to teachers in the present study, previous research showed that teachers noted the need to develop their own questions, but these teachers perceived the development of questions to be complex (Beatty et al., 2008). In other studies, the use of pre-made questions provided to teachers through technology products was still a point of contention as teachers'

perceptions indicated that some of these questions were not rigorous or complex enough to meet the expectations of the curriculum or standards (Feldman & Capobianco, 2007; Lee, Feldman, & Beatty, 2011). While some participants in this study noted that they cannot completely rely on formative assessment technology questions due to the necessity for standard alignment, some participants expressed a heavy reliance on these tools and explained they believed their questioning was better because of the access to formative assessment technology tools.

In relation to the research question, while participants' reasons for efficiency varied, the use of formative technology was viewed consistently as a beneficial tool that made aspects of teaching easier on participants.

Conclusions

Based upon the findings, conclusions can be drawn from this study that are relevant to the research school, as well as other schools and districts involved in one-to-one implementation initiatives aimed at preparing students with 21st Century skills In this study, participants conducted question selection or creation with attention to state standards. However, minimal evidence related to levels of questions or levels of thinking was present within this case study. Wilen (1991) suggested measures for effective development and application of questions for instruction including: plan key questions to provide lesson structure and direction, plan questions clearly and specifically, adapt questions to student ability level, ask questions logically and sequentially, and ask questions at a variety of levels. Keischnick (2017) outlined similar expectations that considered the learning targets and the various levels of thinking and questioning necessary to reach such targets. As the research school and other schools continue to engage in professional learning, focus upon consideration of the levels of questions and thinking associated with such questions would ensure that learning targets related to standards are fully

mastered and achievement is occurring beyond a lower level of rigor. It is important to note, however, that there was not enough evidence within the present study to determine if formative assessment technology was directly impacting the skill of question development and recognition.

In conjunction with promoting access to questions at varied levels of thinking, teachers in this study expressed a level of comfort in creating low level questions—those questions often associated with lower end of Bloom's taxonomy. However, they also shared questions are not always available in premade text or technology resources that align with the state standards for their particular grade level. Therefore, it is likely that some of these standards are in need of questions at a higher level, yet teachers from this study, as well as previous studies (Beatty et al., 2008), who need to create these questions also expressed that they do not feel adequately prepared to do so. While previous researchers have recommended to take steps to improve questioning in the classroom (Gonzalez, 2010; Smith & Lennon, 2011), practices of creating questions at all levels of the hierarchy continues to be a difficult task for educators. Because research participants view support received through the teacher-led one-to-one initiative in a positive manner, incorporating question development training into this model of professional learning would be beneficial in fostering educators who are more confident in this area. Subsequently, this addition should better prepare students with critical, complex thinking skills.

In addition to professional learning focused upon questioning, teachers should be increasingly engaged in the ongoing, job-embedded professional learning opportunities described in this study, as well as opportunities detailed in other research (U.S. Department of Education, 2017). As evidenced in this study's findings, most participants shared a desire to grow in technology practices, as well as other instructional practices such as questioning and formative assessment. Specifically, teachers expressed the impacts and benefits of the teacher-led,

continuous growth model being utilized by the research school and district as the foundation of professional growth for their one-to-one initiative.

Finally, recent research has provided evidence of the effectiveness of teachers participating in collaborative networks designed to build systems of expectations and systematic implementation of formative assessment (Lawrence & Sanders, 2012; Moore & Sanders, 2012). Teachers within these collaborative groups have reported increases in the value of, the application and frequency of, and the ability to utilize formative assessment. Study participants discussed using formative assessment results, and some teachers recognized the value of these results and the need to use them frequently. Additionally, participants noted the value of receiving immediate, high-quality data from formative assessment technology. However, the study did not evidence a systematic approach to use of formative assessment, with or without technology. Therefore, given the evidence of the effectiveness of collaboration within the research school and some occurrence of formative assessment, it would serve the research school to further investigate the systematic approaches, or lack thereof, across grade levels with attention to practices with and without technology.

Recommendations

Research in this study was based teachers in grades 3-5 in an elementary setting in East Tennessee involved in a one-to-one district initiative. Other studies focused upon formative assessment technology have emphasized secondary and post-secondary populations (Mayer et. al., 2009; Troy & Bulkakov-Cooke, 2013). Future research related to this study could expand to other elementary grade levels. In addition, this study was limited to one elementary school within a school district in East Tennessee. Expanding the research to other schools, districts, and states could provide a more in-depth picture of the perception of teachers regarding questioning

practices paired with formative assessment technology. Professional learning has historically occurred in short-term workshop models, yet many of these teacher development opportunities often yield negative returns on implementation (Darling-Hammond, Wei, Andree, Richardson, & Orpanos, 2009). Recent research supports the use of ongoing, job-embedded professional learning (U.S. Department of Education, 2017). The professional learning model used in the research school impacted the results of the study and supported this recent research. However, other studies could be conducted in school settings that use models other than a teacher-leader approach to expand research in the area of professional growth related to technology implementation. In addition, the present study, as well as previous studies (Beatty et al., 2008), highlighted the research that shows that teachers do not feel confident in creating their own questions. Future studies in examining this aspect more in-depth may provide better insights that would be useful in designing future professional learning around questioning. Finally, within the subtheme related to a preference for use of formative assessment technology, a common theme surfaced reflecting that teachers perceive that students love and enjoy formative assessment technology. Presently, minimal research exists regarding this idea and further research is necessary with attention to students' actual perceptions.

Summary

Students are leaving secondary school ill-equipped with 21st century skills necessary to enter college or the workforce. Therefore, this study sought to explore teachers' perceptions of instructional practice that may be utilized to address this deficiency by investigating the question:

How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms?

The data collection process involved interviews, a questionnaire, and observations all designed with attention to pre-planned questions, one-to-one implementation, and formative assessment. The data analysis produced four overarching themes: professional learning is valued, influences on formative assessment design, relationship between data and instruction, and formative assessment technology allows for efficiency. Pre-determined codes and value coding, along with triangulation of the three data sources, allowed for the overarching themes to emerge and reflect the participants' perceptions in the study.

These findings indicate that insights into teachers' perceptions regarding pre-planned questions paired with formative assessment technology can be utilized to guide future professional learning, as well as research in this area of education. Subsequently, this work should better prepare teachers to better prepare students for the 21st Century.

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APPENDIX

Appendix A

Demographics of Participants

Participant	Years of experience	Current Grade Level	Subject or Content Instructing
A	10	3rd	Math, Science, Social Studies
B	20	3rd	ELA, Science, Social Studies
C	12	3rd	ELA, Science, Social Studies
D	14	3rd	Math, Science, Social Studies
E	6	4th	ELA, Social Studies
F	13	4th	ELA, Social Studies
G	10	5th	ELA, Social Studies
H	16	5th	Math, Science
I	6	5th	Math, Science
J	3.5	5th	ELA, Social Studies

Appendix B

Interview Protocol (Version 1)

Time of interview:

Date:

Place:

Interviewer:

Interviewee:

Briefly describe the project and highlight elements of the consent to participate.

A. **Introduction and demographic information:**
   How long have you been an educator?

   What is your teaching background?

B. **Research question: How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms?**

1. **Tell me about how you use formative assessment in your classroom.**

2. **Describe a time when using formative assessment worked well for you.**

3. **Has becoming one-to-one changed or impacted your use of formative assessment? If yes, how has it changed it?**

4. **What differences do you see in formative assessment with technology tools and formative assessment without tech tools?**

5. **What types of technology tools for formative assessment have you used? Describe how you use them.**

6. **How do you plan or prepare for using formative assessment and/or formative assessment technology tools?**

7. **Tell how you determine the questions you will use for formative assessment. Are they program-based, teacher created, etc.?**

8. **What professional learning have you participated in regarding one-to-one implementation? Formative assessment?**

9. **What impacts did these professional learning opportunities have on your practice?**

Additional probing questions related to the following may be used to fill in gaps:

-elements of formative assessment: *cues, participation, feedback, and reinforcement*

-questioning: *levels of questioning, Bloom's taxonomy (original and revised)*

Appendix C

Interview Protocol (Version 2)

Time of interview:

Date:

Place:

Interviewer:

Interviewee:

Briefly describe the project and highlight elements of the consent to participate.

A. **Introduction and demographic information:**
   How long have you been an educator?

   What is your teaching background?

B. **Research question: How do teachers perceive the practice of using pre-planned questions paired with one-to-one technology devices for formative assessment in 3rd-5th grade classrooms?**

1. **Tell me about how you use formative assessment in your classroom.**
2. **Describe a time when using formative assessment worked well for you.**
3. **Has becoming one-to-one changed or impacted your use of formative assessment? If yes, how has it changed it?**
4. **What differences do you see in formative assessment with technology tools and formative assessment without tech tools?**
5. **What types of technology tools for formative assessment have you used? Describe how you use them.**

6. **How do you see technology affecting the aspects of feedback, participation, and reinforcement that go along with formative assessment?**

7. **How do you plan or prepare for using formative assessment and/or formative assessment technology tools?**

8. **Tell how you determine the questions you will use for formative assessment. Are they program-based, teacher created, etc.?**

9. **Do the levels of rigor of questions factor in to your choice of questions in any way? If so, how?**

10. **What professional learning have you participated in regarding one-to-one implementation? Formative assessment?**

11. **What impacts did these professional learning opportunities have on your practice?**

Additional probing questions related to the following may be used to fill in gaps:

-elements of formative assessment: *cues, participation, feedback, and reinforcement*

-questioning: *levels of questioning, Bloom's taxonomy (original and revised)*

Appendix D

Codebook

Awareness of student performance levels related to FA data	Participated in FA PD
Levels of thinking or cognition	Analysis of data with paper pencil perceived as less favorable
Analysis of assessment data with paper pencil preferred	Increased practice of FA because of tech
formative assessment technology impedes instruction	Preview/adjust tech resource questions
Formative assessment technology enhances instruction	Questions align to standard
feedback, participation, and reinforcement are affected by teacher instruction methods	Timing is a factor in some FA tech
Leveling of students	Desire to grow in FA practice
Levels of questions	Collaboration
pre-planned questioning has potential to enhance formative assessment	Higher order thinking/questions take time
Formative assessment is better with technology	Digital citizenship
Formative assessment is better with paper-pencil methods	Google Platform not as user friendly
Teacher instruction methods are effected by formative assessment results	Time factor
Questions from tech resources	Kahoot
Teacher created questions	Quizziz
Planning for formative assessment relies on prior experience with similar lessons	Google
Use of tech formative assessment is ideal for determining mastery of basic skills	Study Island
Discussion or oral formative assessment better	
Desire to grow in questioning practices	
Desire to grow in tech practices	
Tech formative assessment give immediate feedback	
Perceived love of tech FA by students	
Premade questions from text or source	
Teacher actions during FA	
Effort of students with tech is less	
Questions created in the moment	
Participated in tech PD	
Preplanned questions are difficult to create	

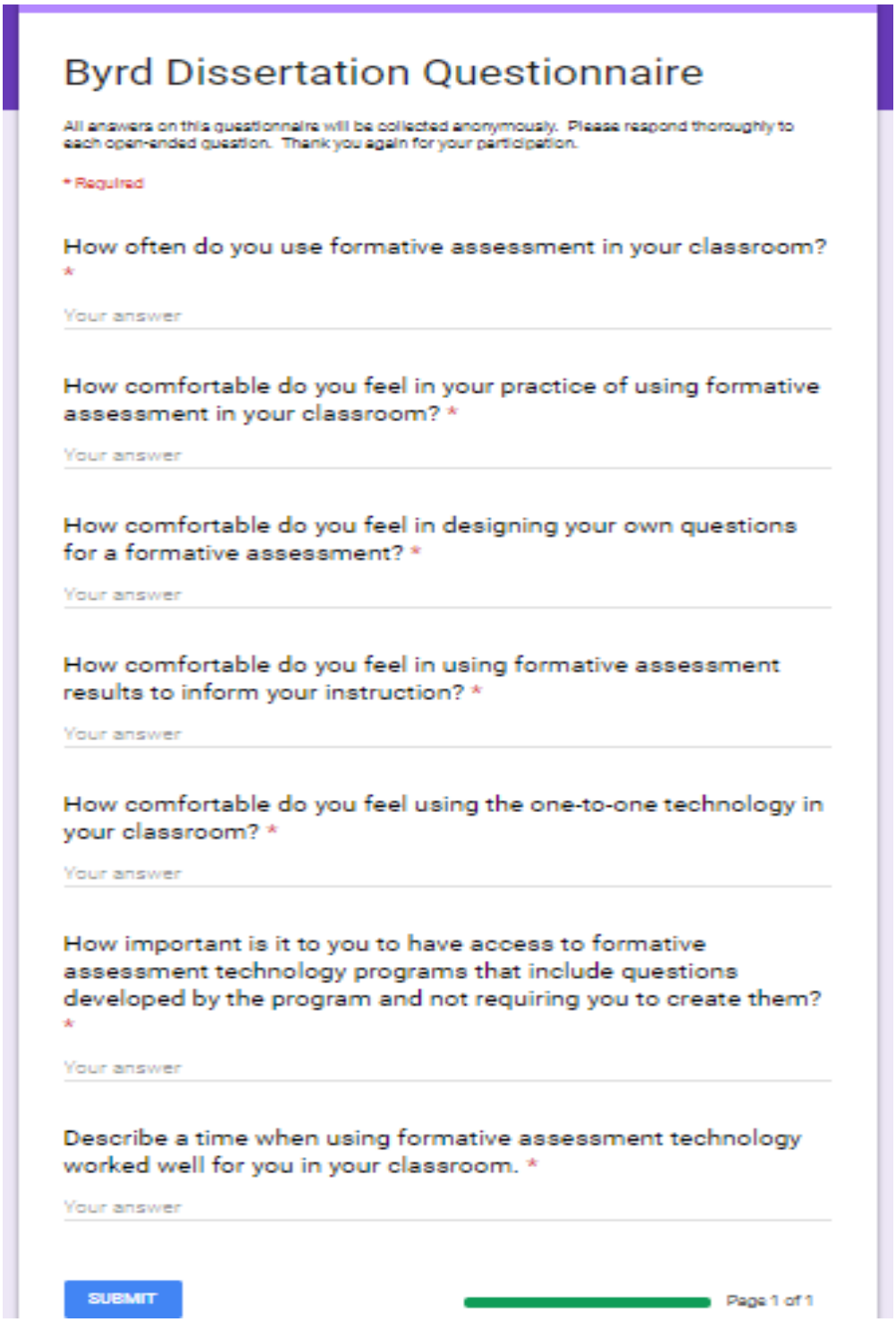
Appendix E

Excerpts from peer review sessions log

2/28/18 Met with, peer reviewer, and shared my current coded transcripts for her to review and pose questions concerning the current state of the coding and analysis process. The reviewer offered feedback concerning the amount of codes and wondered if some could be combined in some way as they were similar. I also shared how I was presently sorting the codes into categories and asked for her feedback regarding this present practice. She suggested an electronic spreadsheet so that with each revision to the sort a new copy could be saved and electronic sorting would possibly be more efficient.

3/4/18 A review of the coding sort revealed that sorting needed to be adjusted and perhaps stretched back out to an extent to get the complete picture and description of the case. The codes were sorted and category labels were redefined to more accurately reflect the categories and reflect more of the meaning and emerging themes/patterns within the data. Coding sort was shared with peer reviewer. Peer reviewer provided feedback noting that the category labels seemed to describe the codes within them. Also, suggested continuously revisiting this list to condense or adjust as needed.

Appendix F



Byrd Dissertation Questionnaire

All answers on this questionnaire will be collected anonymously. Please respond thoroughly to each open-ended question. Thank you again for your participation.

* Required

How often do you use formative assessment in your classroom? *

Your answer

How comfortable do you feel in your practice of using formative assessment in your classroom? *

Your answer

How comfortable do you feel in designing your own questions for a formative assessment? *

Your answer

How comfortable do you feel in using formative assessment results to inform your instruction? *

Your answer

How comfortable do you feel using the one-to-one technology in your classroom? *

Your answer

How important is it to you to have access to formative assessment technology programs that include questions developed by the program and not requiring you to create them? *

Your answer

Describe a time when using formative assessment technology worked well for you in your classroom. *

Your answer

SUBMIT

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Appendix G

Observation descriptive accounts

Participant E and F planning session. Participants E and F, two 4th grade ELA teachers, were observed first. They met for their planning session in Participant F's classroom at her desk area. Participant F sat at her desk where she could access the computer and see the shared Google Doc that she and participant E utilized to collaborate. Participant F sat beside her at the desk and used paper and pencil to make notes of things to do based upon the discussion. The researcher sat on the other side of the desk in a student chair. Participant F's student teacher was also present but did not interject in the discussion.

The planning discussion began with a focus on the social studies research projects that students were working to complete and present. Both said the projects were taking longer than anticipated so they needed to adjust and extend these projects into the week after spring break. The team then went deeper into specifics about the week of instruction to wrap up the American Revolution. They discussed using some Google Slides to outline the week of instruction. Participant F then talked through her notes in the Google Doc that broke down what elements of the end of the American Revolution that she would focus on each day in this week. She also said she would give the students five true or false questions at the end to turn in. Participant E then mentioned using Studies Weekly and a video during this instruction as well.

After outlining the end of the American Revolution unit, participant E asked if they would pause on social studies until the TNReady test begins so that they could devote all time to ELA instruction. They both decided to finish the American Revolution unit, and then use the remainder of the 2 weeks before the test to spend on ELA. This decision led into a discussion on mapping out the rest of the ELA standards that needed to be taught prior to testing. They looked at and discussed prepositional phrase standards and verb standards. In-depth discussion of specifics for these standards did not occur at this point.

Mapping out the ELA standards led to a decision to treat the last week before testing as a review week. Monday they would cover the structure of the test and the writing prompt as well as hit on some of the vocabulary or terminology that may be unfamiliar such as the "conventions of standard written English" often found in the writing prompt. Tuesday through Thursday would be reviewing the three types of writing—one per day. Friday the students would complete a practice assessment. Participant E mentioned that she recalled one of the 3rd grade teachers saying that they were going to create a booklet that mimics the structure of the test and the answer document. Participant F agreed with the idea because some of the students had struggled with the different pieces during the recent field test. She also stated that it would be a good time to discuss quantity vs. quality as some of them saw all the writing lines on the field test and felt that meant that they needed to fill those lines. The team also said that one of them would create a Google Slide presentation to guide/outline this week and its focuses.

Momentarily the conversation returned to the number of days needed to present the social studies projects as a factor to consider in mapping out the grammar instruction. Also, participant

F said she would continue to build the information in the shared Google Doc that was needed to complete the unit on the American Revolution.

Participant E then returned the conversation back to grammar by discussing a Kahoot formative assessment on prepositional phrases and said she would share it. She stated that she had edited it because she didn't like some of the wording, and she had noticed some errors. From this point, the conversation went back to a focus on the breakdown of the grammar lessons during the weeks leading up to testing. After using the Kahoot one day, they agreed to do a scoot on the following Friday and would collect it for a grade. They also said that they would do an airplane activity on prepositional phrases which was somewhat chaotic, but the kids enjoyed it.

Participant E talked through how they would look at what a compound sentence was and then address the components of it: comma, conjunction, and combining sentences. She stated that they could use the flipbook they had used last year that contained these elements. They also discussed using a Fan Boy activity, but participant E denoted that the folding of the fan was quite tricky as she had tried it herself. They proceeded to look for other options by doing a search on Google and talked through some of the images from the search. Participant F suggested doing what they did last year and then doing the fan with less on it to reinforce the concepts. Participant E then mentioned seeing an idea that related compound sentences to a compound word. In response, participant F mentioned noticing in students' writing that they were not joining compound words to which participant E agreed. They discussed connecting it to compound sentences and making a point to address it the week after spring break during writing and grammar instruction.

Participant A and D planning session. Participants A and D were meeting in participant D's classroom when the researcher entered. Participant D was sitting at her desk with a paper pencil, and some other documents in front of her while participant A was on the other side of the desk and had the same materials with her. The researcher sat in a student desk beside the teacher's desk to observe.

Participant A had a copy of the standards analysis report from TNReady in front of her as they were discussing what standards to address next. She explained that regardless of the test coming up, her results showed area and perimeter were lowest last year so she wanted to continue with it and not rush to something else. She explained that she quickly went through area and perimeter last year so the students obviously didn't get as a result. They both pointed out to the researcher that the lessons on area and perimeter are at the end of their text book so they just barely taught it last year, and they had move it up this year because of their lower scores on this skill last year.

At this point, participant D explained that she had started to introduce perimeter that day and shared some of the real world ways that she presented perimeter to her class to help them understand the concept. She also said she thought there was a Brainpop video available on it. Participant A had a file with materials related to area/perimeter open in front of her at this point and she was looking through it. They both discussed a poster they used previously, and

participant A said that she was using it right now but had all of the information about perimeter covered up because she hadn't introduced it yet.

Following discussion of the poster, participant A shared that she didn't like order of the subtopics within the lesson. She showed the researcher the lessons and talked through each pointing out the concepts involved in each lesson within the unit on perimeter and area. At that point, she voiced that she was skipping the parts that she didn't like in the lesson because she thought it didn't make sense to do it in that order. Participant D said she was just going in the order of the book.

The conversation then moved into talk about the Friday before spring break. They decided they would do a grid paper area activity to create a robot, which they had done in previous years. They agreed to do it because it connects perimeter and area. Some discussion at this point focused on the type of grid paper, coloring or not, and other logistical aspects of doing the robot activity. The team also discussed that they would go ahead and do a multiplication quiz on Friday then the students could get on Prodigy on their Chromebooks for fun. Participant A stated that she had also been letting her high group get on prodigy in during intervention time. Participant D said she had been doing the same thing.

After discussing the robot activity, the conversation came back to skipping some parts of the lessons on perimeter. This time participant A voiced that she was skipping it because kids usually struggle more with same area and different perimeter situations. Both participants then talked through how they would use Cheeze Its again to introduce perimeter like they did when they introduced area. Then, the discussion moved to how to scaffold to the following day away from the concrete elements (Cheeze Its) and towards using grid paper only. Participant A noted at this point how much faster their planning time was not after having used this textbook series during the previous year.

Next, the conversation took a focus on the workbook that is used during math. Participant A asked, "Are you doing a workbook page…" because she didn't want to get the books out. Participant D responded that the instruction book had a page that would be a good check for understanding because it aligned well with the Cheeze It activity. Participant A then made a point about the workbook being difficult sometimes and described when the workbook started talking about grass instead of carpet during the lessons on area. She said the kids acted like they didn't understand. After this point, they determined which pages of the workbook they would use as they taught the differences between area and perimeter.

Following the discussion on the use of the workbook, Participant A stated that her students still need to do 8s because they bombed these multiplication facts previously. This point led to a general discussion about kids struggling with fact mastery, and they both expressed that it is a battle every year. Participant D said they do fact practice two times a week in class, and it all came down to memorization. She said they do Reflex in the classroom, and they send home the logins and other things that the kids can do at home to practice.

Finally, the conversation ended with looking at how the textbook posed area and perimeter as different than adding all sides, and that this approach was a difficult way for students to understand area and perimeter. Both teachers stated that they do not expect students to get it

with that method, but instead use ways that they've seen work previously. They also agreed to use color coding to label area and perimeter to provide students with a visual scaffold.

Participant G and J planning session. The planning session was held in participant J's classroom where he was seated at his desk and had paper, pencil, and other materials in front of him. Participant G was seated across from him in a student chair but was using the other side of his desk for her materials which were the same. The researcher sat in a student chair beside the teacher's desk.

The planning began with a discussion of when they will begin the TNReady review. The two of them looked at calendars and determined how they would spend the weeks following spring break leading up to TNReady. Then, they reviewed practice test materials that had recently been made available to them. This was a brief review to denote what they had available as far as practice materials. They also discussed that during the weeks of ELA and Math TNReady they would do social studies instruction, and then reverse those content areas the following week because they felt like they can't just stop teaching when they haven't taught all of the standards.

Next, they pulled out materials in files that they had used in previous years. Participant J pointed out that last year the more difficult texts and questions had been broken down into 3 days. He also shared some skill based materials that they had used before. He pointed out that he felt like 3 weeks of review was too much. Participant G agreed and stated that she didn't want to overkill with the review and instead wanted to give it a good pace, beef it up, and make it fun. Participant J then pointed out that they still needed to teach past perfect tense, and that he was going to continue doing homework and spelling. Participant G agreed.

The conversation at this point began to focus on the daily review. Participant G said that she liked daily review and wished she had stuck with doing it, but time had become a factor. Participant J stated that the kids were getting lazy on it, and he didn't get that because it was simple. He pointed out that he needed to add complex sentence on it so that it was more aligned with standards. They discussed some of the elements included in the review and stated that they didn't do the analogies section, but that the students did complete the sentence corrections and multiple choice grammar skills. Participant J said he had scanned them all and put them in Google Classroom because it was easier for students to see on their Chromebooks than just projected on the board. They also mentioned that as they continue with spelling they will continue to go over the words on Monday and have students do Spelling City and type the words other days of the week.

From this point, the conversation shifted to focus on figurative language. They discussed the ones that they were expected to teach based upon the standards. Simile, metaphor adages, idioms, are expected, and they mentioned that they use to do proverbs. Participant G shared things she posts on her wall for idioms. Then, they both shared and discussed an idea from Pinterest where the students dress up like idioms. Participant J questioned whether or not they thought they would actually get participation. Then, they looked back at file from last year on figurative language. Participant J stated that they did songs, and participant G recalled how much the kids loved them. He also shared the wheel of figurative language they did and pointed out that it had some beyond standards. Then, they decided that after spring break they would use

4 days to hit figurative language, and they would assess where the students are in understanding the following Tuesday using Study Island. Participant J noted that the kids usually have the concept of simile and metaphor, but they will need to hit adages and idioms more.

Briefly following the discussion of figurative language, the team discussed social studies. Participant J mentioned the topics they would hit before the TNReady test, and that they would get through Nixon and Kennedy briefly. He then pulled out the reading standards and said "Oh we haven't done poetry yet." Then, he also stated while still looking at the standards that students are not reading captions so they're missing questions because of it.

The conversation shifted again to look at sources from the Tennessee Department of Education for ELA and how to use those effectively. They discussed how to use these and hit other standards with creating own questions. Also, they talked about how they could hit language with it also because it is tested in an integrated way. Participant G inserted that they had just discussed today that they don't see kids consistently apply grammar to which participant J agreed.

Once again the conversation shifted back to past perfect tense. They looked at a folder of participant J's that had materials used in previous years. He pointed out that they took notes and had a worksheet that they used last year. He also shared that there was a Nearpod that he used last year, and that they probably could find a Kahoot on past perfect. He wanted to use these this year for sure because the kids enjoy them. Then, the figurative language wheel was brought up again as well as a graphic or note journal to accompany it. Participant G pointed out that they needed to add adages to the materials.

The last segment of their planning session was used to look at the practice testing materials provided by the state again. The focus here was on the online resources and the type of questions in those sources. Participant G read, "How does paragraph 4 contribute to the main idea?" She then commented, "That's tough!" Number of paragraphs was in one question pointed out by participant J, and he stated that they have trouble with that skill as well. They finished discussing how they needed to integrate these elements into their plans for the next few weeks, and would focus on one text each day from these sources.