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The Alignment of Instructional Practices with Digital Learning Environments

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The Alignment of Instructional Practices with Digital Learning Environments

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Approval Page

This dissertation was submitted by Angela M. Szakasits under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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Dedication

To the teachers in District Z and everywhere, who go to work each day hopeful they are making the world a little brighter. In case no one else told you today, you are awesome!

To my parents who instilled in me the importance of education and encouraged me to never settle for less than my best

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Abstract

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The purpose of this study was to examine how teacher instructional practices aligned with digital learning environments. The following four research questions guided this investigation: How do teachers demonstrate leadership in digital learning? How do teachers model and teach digital citizenship? How do teachers use digital content and resources for instruction? How do teachers use technology for data and assessment? The North Carolina (NC) Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016) provided the theoretical framework for this study, and the research questions aligned with the four focus areas of these competencies. This mixed-methods study used data from a survey of 187 K-12 teachers in a district in southeastern NC as well as interview responses from two elementary, two middle, and two high school Teachers of the Year in this district. Additional data from the district's AdvancED (2015) ELEOT ratings were reported in the results and analyzed in the findings. Survey data were analyzed for responses by grade level taught, years of teaching experience, and participants' highest level of education.

The findings from this study indicate teachers believed they were most capable of demonstrating competencies in digital citizenship, although interview data did not support translation into instructional practices. Teachers also indicated highest self-confidence in their abilities to demonstrate leadership in digital learning, and interview data indicated these skills were shown with instructional practices. Data showed elementary teachers need additional support in several areas of digital learning environments including demonstrating leadership outside one's own classroom, immersing students in exploration of relevant issues and analysis of authentic problems through digital tools and resources, and evaluating and appropriately modifying the form and function of the physical learning environment to create a conductive digital learning environment. In these competencies, K-5 teachers rated lower means than those in Grades 6-8 and 9-12.

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Chapter 1: Introduction

Background of the Problem

When Isaac Asimov (1951) wrote "The Fun They Had," he described a future in which students attended school at home taught by robots. The year Asimov described was 2155. Instead of writing assignments in punch code and submitting them through a slot in the mechanical teacher, Margie, the 10-year-old main character, longed for the days of her great-great grandfather when students read books printed on paper together in schoolrooms (Asimov, 1951). Asimov had a vision for the future of education and technology that seemed impossible to readers; the story was published in 1951, which was the year the world's first large-scale commercial computer was developed and 4 years before either Steve Jobs or Bill Gates was born (Woodford, 2017).

Since the introduction of personal computers, the push has been for teachers to integrate them into instruction whether they had the knowledge to do so or not. After the launch of Sputnik by the Russians in October 1957, politicians felt schools did not do enough to prepare students to succeed in math and science fields, so they provided emphasis and financial support to improve education in these subjects (Marsh & Willis, 2007). This focus on emphasizing the use of technology in schools and providing financial support has continued since the late 1950s. In his 1970 explanation of the need to create a National Institute of Education, President Richard Nixon described a role of the organization as examining how to enhance education with technology (Peters & Woolley, n.d.). After the release of *A Nation at Risk*, President Ronald Reagan explained the need to become pioneers in technology to continue space exploration (Strauss, 2011). President Bill Clinton called for teachers to be ready to use technology in instruction and for all students to have access to computers and other technology for learning

(Christensen, Horn, & Johnson, 2011). President Barack Obama coordinated allocations of $3 billion from government agencies and businesses to provide Internet access to students and improve technology opportunities in schools (Bidwell, 2014).

The purpose of 21st century skills was to shift educational focus to ensuring students demonstrate innovative and collaborative skills necessary for succeeding in a global economy (Partnership for 21st Century Learning, n.d.). The need to prepare students for life after graduation drove the creation of the Common Core State Standards Initiative in 2009 (National Governors Association & the Council Chief State School Officers, 2015). These standards describe students using technology and digital media effectively to demonstrate college and career readiness through mastery of 21st century skills (National Governors Association & the Council Chief State School Officers, 2010). North Carolina (NC) legislators took support for digital learning even further by passing three key pieces of legislation in 2013. The first was House Bill 23, Digital Learning Competencies/School Employees (2013), which tasked the NC State Board of Education (NCSBOE) to develop and implement standards for digital teaching and learning. Clarify Education Reporting Requirements (2013) ensured teacher preparation and lateral entry programs provide training for teachers to use technology-based formative and summative assessments. The final piece of legislation was Transition to Digital Learning in Schools (2013), which transferred funding for textbooks to "digital materials, including textbooks and instructional resources, to provide educational resources that remain current, aligned with curriculum, and effective for all learners by 2017" (p. 1).

In digital learning environments, students are empowered and engaged in learning experiences to develop skills for success in 21st century environments (Kemker, 2005). The Framework for 21st Century Learning (Partnership for 21st Century Learning, 2016)

explained students should have learning and innovation skills; information, media, and technology skills; and life and career skills. The Alliance for Excellent Education's Center for Digital Learning and Policy (2016) defined digital learning as instructional practices that strengthen student learning experiences using technology. The purpose of this organization is to ensure all students graduate ready for success, and their definition supports a focus on how technology tools are used to support and empower learning in a digital-age classroom. In his 2016 article, Peter West, Director of eLearning at Saint Stephens College in Australia, urged educators not to view devices as the answer to improving instruction and stated, "Instead of counting the number of laptops in an organization, we would be better off walking around a school noting the number of classrooms in which teaching and learning has changed" ("Tools alone are not the answer," para. 3).

Statement of the Problem

Research has explained the importance of transitioning to digital learning environments to prepare students for their rapidly changing futures in which technology will be tied to every aspect of society (Friday Institute for Educational Innovation, 2015). As West (2016) advocated, *how* technology transforms instruction is more important than whether it is present in classrooms. In 2016, the NCSBOE approved the NC Digital Learning Competencies for Classroom Teachers (see Appendix A) to comply with the first part of S.L. 2013-11, Digital Learning Competencies/School Employees, and implementation of this framework began in July 2017 (North Carolina Department of Public Instruction [NCDPI] Digital Teaching and Learning Division, 2017). Determining how teacher instructional practices align with digital learning environments will help state and district leaders implement the competencies by prioritizing and focusing areas

for improvement.

The research problem. As the NC Digital Learning Plan stated, "Systemic changes in K-12 education are required in order to effectively prepare students for the rapidly changing, interconnected, technology-driven world" (Friday Institute for Educational Innovation, 2015, p. 1). The NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016) explained teachers should focus on leadership in digital learning, digital citizenship, digital content and instruction, and data and assessment using technology (see Appendix A). Existing observational and perceptual data from AdvancED and Teacher Working Conditions (TWC) survey do not provide enough information to determine how teacher instructional practices align with digital learning environments because they do not evaluate performance in all four focus areas.

In NC, the statewide results of the TWC survey show little improvement in access or training to use technology from 2010 to 2016. When asked if teachers have sufficient access to instructional technology, the percentage of teachers who agreed rose only slightly from 79.6% in 2010 to 79.7% in 2016 (New Teacher Center, 2016). The percentage of teachers who agreed they have access to reliable communication technology increased from 89.2% in 2010 to 91.6% in 2016, but the reliability and speed of Internet connections decreased from 81.4% in 2010 to 79.0% in 2016 (New Teacher Center, 2016). The results from AdvancED (n.d.) observations show digital learning environments are a national area of concern, and the TWC indicate teachers do not perceive much progress has been made from 2010-2016 in NC (New Teacher Center, 2016).

Purpose of the Study

This research study determined how teacher instructional practices aligned with digital learning environments. The data from this study determined how elementary, middle, and high school teachers were facilitating digital learning environments and what support was still needed. The investigation occurred within District Z, a district in southeastern NC, through surveys and interviews of the educators in 16 elementary, middle, and high schools. Survey and interview questions were aligned with the NC Digital Learning Competencies for Classroom Teachers, which provided the framework for this study. Additional data from observations of classroom teachers was obtained from the district.

The significance of this study. In the NC Digital Learning Plan (Friday Institute for Educational Innovation, 2015), the transition in classroom practices was described as shifting from standardized, mass instruction to responsive, personalized instruction to prepare students for success in the rapidly changing world. An investigation of teacher perceptions of their instructional practices aligned with digital learning environments would help NCDPI's Digital Teaching and Learning Division as well as local education agencies (LEAs) plan the implementation of the competencies by determining strengths and weaknesses in current practices because such research has not yet been published. Implementation of the NC Digital Learning Competencies for Classroom Teachers is required under the first part of S.L. 2013-11, Digital Learning Competencies/School Employees (2013). Therefore, the central research question for this study was, "How do teacher instructional practices align with digital learning environments?"

Definition of Terms

21st century skills. The Framework for 21st Century Learning (Partnership for

21st Century Learning, 2016) outlines the skills every student needs to be successful beyond graduation. These skills include learning and innovation skills, information, media, and technology skills, and life and career skills (Partnership for 21st Century Learning, 2016).

College and career ready. Achieve (n.d.) advocates for students to connect their education to postgraduate work and learning. Students should have work-based learning opportunities and explore their interests while participating in rigorous coursework. These graduates demonstrate mastery of knowledge and skills acquired across academic areas by communicating effectively, solving problems, thinking critically, and analyzing information (Achieve, n.d.).

Digital learning. Instructional practices effectively used to improve student learning experiences comprise digital learning and include tools and applications used for support by teachers as well as students. The content, resources, and courses used to provide students with personalized learning and teachers with professional learning opportunities are included as components of digital learning (Alliance for Excellent Education's Center for Digital Learning and Policy, 2016).

Digital learning environment. In digital learning environments, students are empowered and engaged in learning experiences to develop skills for success in 21st century environments. Teachers who are facilitating digital learning environments provide opportunities for students to develop 21st century skills in conjunction with academic knowledge (Kemker, 2005).

Educational technology. As defined by Aziz (2010), it is "the considered implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory, and cognition to enhance teaching practices and improve

learning outcomes" (para. 1).

Effective Learning Environments Observation Tool (ELEOT). This tool plays a key role in AdvancED Accreditation and Diagnostic reviews. Since 2012, this tool has been used in more than 45,272 classrooms to make observations of 30 items across seven learning environments: equitable learning, high expectations, supportive learning, active learning, progress monitoring and feedback, well-managed learning, and digital learning (AdvancED, n.d.).

Technology. This term has a much different meaning than people associate with it. Rather than referring to computers and other electronic devices, the National Assessment Governing Board (2013) described technology as anything used to change the natural world in order to meet humans' wants and needs.

Technology integration. The National Center for Education Statistics (NCES, 2002) defined technology integration as the "incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools" (p. 75).

Traditional classroom instruction. In a traditional classroom environment, educators present teacher-centered instruction in a one-size-fits-all approach during the school day with printed, static, texts, and assessments administered at the end of grade or course for accountability (Friday Institute for Educational Innovation, 2015).

Research Questions

1. How do teachers demonstrate leadership in digital learning?
2. How do teachers model and teach digital citizenship?
3. How do teachers use digital content and resources for instruction?
4. How do teachers use technology for data and assessment?

Overview of Methodology

This section provides an overview of the process the candidate followed when conducting the research for this study, and chapter 3 of this dissertation provides more specific information. This study was mixed methods with a survey in phase one, individual interviews in phase two, and collection of existing observation data in phase three. The researcher used a mixed methods approach in this research to blend quantitative and qualitative data and determine a stronger understanding of the problem (Creswell, 2014). A review by five members of the NC Digital Leaders Coaching Network (NCDLCN) using Simon and White's (2011) Survey/Interview Validation Rubric for Expert Panel validated the survey instrument (see Appendix B). Based on their feedback, no changes were made, and the survey was administered via an electronic link sent in an email to all classroom teachers within District Z. The survey was administered using Survey Monkey, an online tool. In the second phase, each school's Teacher of the Year for 2017-2018 was invited to participate in an individual interview (see Appendix C). Talking directly with teachers in their natural settings was a key component of the interview research because it allowed the candidate to observe how they behave within their context (Creswell, 2014). The first two teachers at each level of elementary, middle, and high schools to consent were interviewed. Interviews were digitally recorded and transcribed for coding. In the third phase, the researcher obtained existing data from a standard district observation tool for classroom teachers, the ELEOT. This tool was used as part of District Z's most recent review for accreditation through AdvancED. Data were triangulated from the three phases to answer the research questions and explain how teacher instructional practices aligned with digital learning environments.

Theoretical framework. The NCSBOE approved the NC Digital Learning Competencies for Classroom Teachers in 2016 as a framework for teachers, administrators, and institutions of higher education of the skills needed to "provide high-quality, integrated digital teaching and learning. These competencies demonstrate skills that teachers and leaders should integrate into their practice in order to create digital learning environments" (NCDPI Digital Teaching and Learning Division, 2016, para. 1). In digital learning environments, students are empowered and engaged in learning experiences to develop skills for success in 21st century environments. Teachers who are facilitating digital learning environments provide opportunities for students to develop 21st century skills in conjunction with academic knowledge (Kemker, 2005). The NC Digital Learning Competencies for Classroom Teachers are based on the other frameworks and standards for teaching from the International Society for Technology in Education (ISTE), International Association for K-12 Online Learning (iNACOL), and the NC Professional Teaching Standards (NCPTS), which are discussed further in Chapter 2.

The organization of the competencies (see Figure) is in the four focus areas of digital leadership, digital citizenship, content and instruction, and data and assessment (NCDPI Digital Teaching and Learning Division, 2016). Appendix A provides the framework along with the competencies in each focus area. To demonstrate leadership in digital learning, teachers should engage in online and face-to-face professional development to promote lifelong learning, solve problems collaboratively, and take initiative for growth in practices as well as student learning (NCDPI Digital Teaching and Learning Division, 2016).

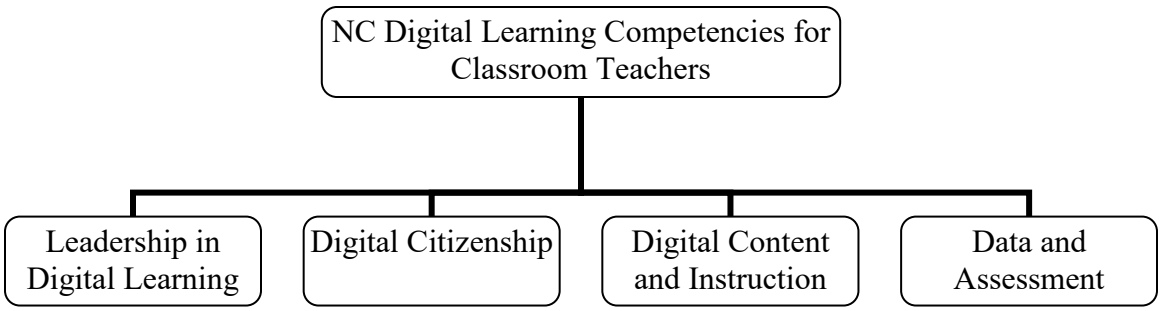

Figure. Four Focus Areas of the NC Digital Learning Competencies (NCDPI Digital Teaching and Learning Division, 2016).

Teachers should model and teach digital citizenship. To do so, teachers should adhere to copyright laws, intellectual property, and fair use guidelines in their own work as well as requiring students to do so (NCDPI Digital Teaching and Learning Division, 2016). It is also important for teachers to participate in responsible, professional digital social interactions as outlined in district Acceptable Use Policies (AUPs). The Partnership for 21st Century Learning (2015) defined global awareness as "learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts" (p. 2). Using tools for communication and collaboration to demonstrate global awareness is another component of digital citizenship, as is ensuring equitable access to high-quality technology tools and resources for all learners (NCDPI Digital Teaching and Learning Division, 2016).

Content and instruction are key parts of many frameworks for technology integration, and it is the third in the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). Teachers are responsible for creating a physical environment conducive to the elements of a digital learning environment (NCDPI Digital Teaching and Learning Division, 2016).

Additionally, they should use digital tools and resources to accomplish the following:

- Design personalized learning experiences for students;
- Empower students to set goals for, manage, and assess their learning;
- Encourage creativity, critical thinking, communication, collaboration, and problem-solving; and
- Explore relevant, real-world issues (NCDPI Digital Teaching and Learning Division, 2016).

The fourth focus area of the framework outlines how teachers should use technology to adjust learning based on data from technology-enhanced formative and summative assessments (NCDPI Digital Teaching and Learning Division, 2016). It is important to provide varied methods of assessing student progress including work samples. As the competencies explain, qualitative and quantitative data are used to determine student strengths and weaknesses as well as inform their learning experiences (NCDPI Digital Teaching and Learning Division, 2016).

Assumptions. One assumption of this research was teachers had access to technological devices in their classrooms as part of their instruction and with students. Another assumption of this research was teachers in elementary, middle, and high schools use technology as part of their instructional practices in some way even if it is minimal use. To use technology, teachers must have access to it, and this access should include professional development in how to use it (Cottle, 2010).

Limitations and delimitations. A limitation of this research study was the use of survey and interview responses to obtain information. Teachers self-reported their instructional practices; therefore, their assumptions could have impacted their responses.

They may believe they are demonstrating competencies not actually present in their instructional practices. The misperceptions may be a result of a lack of understanding regarding recommendations for digital learning environments.

A delimitation of this study was the researcher conducted this investigation within one district. Conducting the investigation in one district made the data easier and more convenient for the researcher to collect, and she ensured participation did not pose any risks. The researcher maintained confidentiality for survey and interview responses.

Organization of the Dissertation

Chapter 1 presented background information explaining the need for and significance of this research. Included in Chapter 1 were the research questions and an overview of the methodology. Chapter 2 discusses existing research related to technology integration in education, and Chapter 3 explains the methodology in greater detail. Chapter 4 presents findings from the quantitative and qualitative data collected. Chapter 5 discusses the results in connection with prior research as well as makes recommendations for future work.

Chapter 2: Literature Review

Overview

This chapter summarizes the related research to demonstrate the gaps in literature and establish the need for this study. An explanation of federal legislation and national initiatives to fund technology use in education will appear along with an historical review of the transition to digital learning practices and need for students to be globally competitive after graduation. Additionally, research explaining the importance of digital learning environments will support the need for technology integration as well as explain the basis of the research for the NC Digital Learning Competencies framework. Finally, existing research studies will describe investigations of teacher perceptions of technology integration. Synthesized literature will demonstrate the research gaps and justify the need for an investigation of teacher perceptions of changes in their instruction with increased access to and emphasis on the use of technology in digital learning environments.

Support for Technology Literacy in Education

Although, as Marsh and Willis (2007) noted, national attention regarding technology use in schools began after the launch of Sputnik in 1957, the establishment of a common vision and defined goals for educational technology began in the 1990s. On February 15, 1996, President Bill Clinton and Vice President Al Gore announced the Technology Literacy Challenge with the goal to make all students technologically literate by the 21st century (United States Department of Education [USDOE], 1996). They wanted students to demonstrate "computer skills and the ability to use computers and other technology to improve learning, productivity, and performance" (USDOE, 1996, p. 7). To meet this challenge, the USDOE (1996) advocated for federal, state, and local governments to work with other stakeholders to provide modern computers with Internet

connections for classroom use, engaging and effective software and online resources, and support for teachers in using devices and software with students. In *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge* (USDOE, 1996), it was noted that American students would fall further behind those in other nations if they did not become technologically literate and called for technology to be included as a new key focus in addition to reading, writing, and arithmetic. This report provided state and local governments the framework for planning to use technology as a tool to achieve exacting standards of teaching and learning (USDOE, 1996). While this document was the first National Education Technology Plan (NETP), subsequent versions published in 2000, 2004, 2010, and 2016 provided the amended vision, goals, and actions necessary for preparing students to succeed in the 21st century and be globally competitive (USDOE, Office of Educational Technology, 2016).

In addition to technology planning, committees of nongovernmental stakeholders provided expert opinions on how to advance the nation. In 1997, President Clinton formed President's Information Technology Advisory Committee (PITAC) with industry and academic experts in the Information Technology (IT) field (National Coordination Office [NCO], n.d.). Their purpose was to advise the Clinton administration in efforts to determine and adopt information technologies that would be most beneficial in ensuring American achievement moving into the next century (NCO, n,d.). Restructuring PITAC in 2001 as the President's Council of Advisors in Science and Technology (PCAST), the group, comprised of science and technology experts, advised on policies in these fields (Executive Office of the President, 2001). Re-established in 2010, PCAST advised not only the President but also the National Science and Technology Council (NSTC) on matters related to science, technology, and innovation (Obama, 2010).

In addition to forming committees of advisors, U.S. presidents have signed legislation supporting the use of technology in education. With the turn of the century came President George W. Bush's No Child Left Behind (NCLB) legislation, part of which was the Enhancing Education Through Technology (EETT) Act of 2001. The goal of this act, also known as Title II Part D, was to use technology to improve academic achievement in elementary and secondary schools (USDOE, 2004). From 2002-2008, the federal government targeted approximately $3.4 billion to provide professional and curriculum development to ensure students were technologically literate by eighth grade (USDOE, 2009). By this time, the definition of technological literacy shifted to "an understanding of technology at a level that enables effective functioning in a modern technological society" (National Research Council, 2006, p. 2) like the skills outlined in the Framework for 21st Century Learning (Partnership for 21st Century Learning, 2016; USDOE, 2009).

Funding for EETT halted after 2010, and advocates encouraged re-establishing funding to achieve the goals of the Elementary and Secondary Education Act (ESEA) by making students college and career ready or having the skills necessary to succeed in the workforce and/or postsecondary learning environments (Achieve, n.d.; Consortium for School Networking [CoSN], ISTE, & State Educational Technology Directors Association [SETDA], 2013; The School Superintendents Association et al., 2015). When the CoSN, ISTE, and SETDA urged Congress to support HR 521, the Transforming Education Through Technology Act (TETA), and S. 1087, the EETT Act of 2013, they explained the need for funding (CoSN, ISTE, & SETDA, 2013) beyond President Obama's ConnectED Initiative, which prioritized closing the technology gap through access to Internet connections in student homes (Bidwell, 2014). These

organizations believed new legislation was necessary because of the ways in which instructional practices were changing.

> K-12 education is in the midst of a historic transition from print to digital resources and tools, which will result in more robust and engaging learning environments that empower all students to be self-directed, think critically and collaborate while mastering core academic content. Teachers are focusing on personalizing the learning experience for students through technology tools and services and are increasingly capitalizing on online professional learning to develop and refine high-impact lessons in online, blended and traditional classrooms. The vast majority of states will also be administering online assessments for the first time this coming school year, which will require districts to spend more on bandwidth, hardware, software and professional development (CoSN, ISTE, & SETDA, 2013, para. 3).

As Lemke and Coughlin (1998) noted in their policymaker guide for measuring progress in schools, preparing students to succeed in the 21st century is not about the technological devices but is instead about how to use the technology as a tool to improve student performance; however, between 2010 and 2015, the only dedicated funding for technology in schools came through E-rate funds, which provided discounts on Internet and telecommunications services (Pierce, 2015). While infrastructure is important, having reliable and fast Internet connections does not quickly translate into increases in productivity (Lemke & Coughlin, 1998). With that in mind, CoSN, ISTE, and SETDA (2013) advocated not only for funding for connection and access but also to offer in-depth professional development for effectively using technology as an essential component of instruction in digital learning environments. They also supported the

development of a grant program to fund technology use for personalizing instruction, promoting leadership opportunities for school staff, and helping at-risk populations further their educations (CoSN, ISTE, & SETDA, 2013).

The passing of Every Student Succeeds Act (ESSA) in 2015, which replaced NCLB, re-established federal funding for technology to enhance education (Team ISTE, 2015) by providing grant funding similar to what CoSN, ISTE, and SETDA (2013) advocated. ESSA established the Student Support and Academic Enrichment Grants (SSAEG) program to provide funding to support effective use of technology through professional development for teachers, blended learning programs, and the purchase of devices (Association for Supervision and Curriculum Development [ASCD], 2016; Team ISTE, 2015). Allocation of SSAEG funds are based on Title I funding, and then districts distribute money for technology in education as well as providing a well-rounded education for students and safe and healthy school activities (ASCD, 2016). Distribution of grants up to $1.6 billion occurs annually for various purposes including effective use of technology, but districts may not spend more than 15% of their funds on technology infrastructure (Alliance for Excellent Education's Center for Digital Learning and Policy, 2016).

Team ISTE (2015) reported schools would have greater access to resources to personalize student learning, safely manage student data, use data to inform instruction, and ensure technology use is instructionally meaningful through these grants. This resurgence of funding is necessary because of the benefits technology can provide when used in schools, but "simply making the technology available is not sufficient; the primary goal is employing the technology to increase students' engagement and learning" (Friday Institute for Educational Innovation, 2015, p. 12). Therefore, the limit on

infrastructure expenditures is important because providing funding for devices and connections alone is not likely to improve student achievement and success. "Introducing laptops while not changing the teaching and learning paradigm is of little use, and may even produce negative academic outcomes" (West, 2016, para. 3).

Transition to Digital Learning

NCES (2002) defined technology integration as the "incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools" (p. 75). Aziz (2010), Director of the School of Technology and Design at Rasmussen College, expanded on this idea and defined educational technology as the "implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory, and cognition to enhance teaching practices and improve learning outcomes" (para. 1), which demonstrated a shift in thinking from how to use the tools to how the resources can alter student learning experiences.

In 2002, the Partnership for 21st Century Skills (note: Skills later changed to Learning) formed to advocate for educational practices encouraging 21st century readiness (Partnership for 21st Century Learning, 2015). Stakeholders from educational, business, and legislative groups developed the Framework for 21st Century Learning (Partnership for 21st Century Learning, 2015, 2016). The framework outlines the skills students should be able to demonstrate to be globally competitive after graduation such as those for learning and innovation, information, technology, and media, and life and careers. Learning and innovation skills include demonstrating creativity, critical thinking, communication, and collaboration; analyzing the credibility of information from digital sources indicates information and media literacy (Partnership for 21st Century Learning, 2016). The skills the framework (Partnership for 21st Century

Learning, 2016) describe as necessary for life and careers include flexibility, taking initiative, and acting as a leader. The framework acknowledges instructional practices need to incorporate more than core content areas to provide students with the skills they will need in their future careers (Partnership for 21st Century Learning, 2016). Teachers who are facilitating digital learning environments provide opportunities for students to develop 21st century skills in conjunction with academic knowledge (Kemker, 2005).

The Alliance for Excellent Education's Center for Digital Learning and Policy (2016) defined digital learning as instructional practices that strengthen student learning experiences using technology. Rather than the teacher delivering content and the student receiving it, digital learning environments allow students to take responsibility for their learning as the teacher becomes the facilitator of information (Peters, 2000). In classrooms set up in this way, the use of technology is to enhance instruction because student empowerment is to develop skills for 21st century learning (Alliance for Excellent Education's Center for Digital Learning and Policy, 2016). When using technology in the classroom, the type of activities and depth of learning used is more important (West, 2016). Digital learning allows students to learn more efficiently anytime, anywhere to achieve mastery (Friday Institute for Educational Innovation, 2015; Massachusetts Institute of Technology [MIT] Office of Digital Learning, 2015).

In developing the NC Digital Learning Plan (Friday Institute for Educational Innovation, 2015), stakeholders noted digital-age teaching and learning should be student centered, personalized, and project based with instruction delivered anywhere and anytime rather than the traditional standardized, one-size-fits-all approach to instruction (Friday Institute for Educational Innovation, 2015). Traditionally, computers have been tutors; but when they are a tool for learning, research indicates teachers can create

student-centered environments (Kemker, 2005). As Peters (2000) found in his study of digital learning environments, they "will probably be the most efficacious 'enabler' of independent and self-determined learning" (Summary section, para. 4).

Using technology to administer formative and summative assessments is a component of digital learning environments (NCDPI Digital Teaching and Learning Division, 2016). Online testing is even part of the National Assessment of Educational Progress (NAEP), or the Nation's Report Card, since the addition in 2014 of the Technology and Engineering Literacy (TEL) Assessment (NCES, 2014). For this entirely computer-based assessment, the first for NAEP, eighth-grade students completed scenario-based tasks requiring them to solve problems using technology (NCES, 2014).

Need for Digital Learning Environments

As the Friday Institute for Educational Innovation (2015) explained, schools must prepare students for the rapidly changing world in which technology is key to every aspect of society. Being college and career ready means high school graduates have the skills and knowledge in English and math necessary to succeed in entry-level jobs and/or postsecondary coursework (Achieve, n.d.); however, Friedman and Mandelbaum (2012) argued the technology revolution has placed a need for better educated Americans to meet the demands of modern workplaces because a high school diploma is no longer enough education. Wagner (2012) advocated for changes in the educational methods used rather than having students spend more time in schools. He viewed 21st century students as needing different educational experiences rather than more if they are going to become innovators (Wagner, 2012).

Friedman and Mandelbaum (2012) believed globalization "poses an educational challenge – to expand the analytical and innovative skills of Americans – that is no less

profound than those created by the transition from plow horses to tractors or from sailing ships to steamships" (p. 20). Thus, innovation in education has become a focus as educators prepare students for careers not yet invented (Couros, 2015). Innovation consultant Couros (2015) defined innovation as "a way of considering concepts, processes, and potential outcomes" (p. 19) that "creates something *new* and *better*" (p. 19). Academic knowledge is not enough for schools to teach, because knowing how to think critically and solve problems is what will be most beneficial to students in their futures (Friedman & Mandelbaum, 2012; Wagner, 2012). Digital learning environments allow students to learn academic content while developing their 21st century skills which include flexibility, taking initiative, and acting as a leader (Kemker, 2005; Partnership for 21st Century Learning, 2016). Couros (2015) believed the way to improve the world is to encourage students to become creators and leaders; therefore, it is necessary to examine what teachers do to support skill development beyond their subject areas, such as through critical thinking and problem-solving activities, to determine if they are facilitating digital learning environments.

NC Digital Learning Competencies for Classroom Teachers

"The different demands on 21st century education dictate new roles for teachers in their classrooms and schools" (NCDPI Educator Effectiveness Division, 2013, p. 2). Influencing the development of the NC Digital Learning Competencies for Classroom Teachers, listed in Appendix A, was existing research on effective teaching from the NCPTS as well as desired technology integration as described by ISTE and iNACOL (NCDPI Digital Teaching and Learning Division, 2017). NCPTS, developed initially in 1998 and revised in 2013, reflect modern practices for effective teaching in the 21st century (NCDPI Educator Effectiveness Division, 2013). ISTE (2008), a consortium of

stakeholders from around the world working together to support educators and leaders in transforming instructional practices, developed the Standards for Teachers upon which these standards are based. iNACOL, a non-profit organization of educators and business members who focus on research and development to ensure students have high-quality blended and online learning opportunities, released their vision for technology in education as the New Learning Models in 2013 (iNACOL, 2013).

NCPTS. NCPTS was the first influential work in the development of the digital learning competencies. The NCPTS Commission developed their standards, which provide the framework for teacher preparation, evaluation, and professional development, to demonstrate what teachers should know and be able to do to provide effective instruction in the 21st century (NCDPI Educator Effectiveness Division, 2013). The commission developed the following six standards to align with their vision of instruction to prepare students for life beyond graduation in the 21st century:

- Demonstrate leadership,
- Establish a respectful environment for diverse students,
- Know the content one teaches,
- Facilitate learning for students,
- Reflect on one's practice, and
- Contribute to the academic success of students (NCDPI Educator Effectiveness Division, 2013).

The first standard includes leading in and out of the classroom in addition to advocating for students and upholding the Code of Ethics for NC Educators (NCDPI Educator Effectiveness Division, 2013). To meet the second standard, teachers in NC

should build relationships with students, treat them as individuals, embrace their diversity, differentiate their learning experiences, and work with their parents/guardians while providing them a safe place to learn (NCDPI Educator Effectiveness Division, 2013). The third of the NCPTS states teachers should know the content they teach and provide interdisciplinary, relevant instruction to students (NCDPI Educator Effectiveness Division, 2013). When teachers facilitate learning for students, which is the fourth standard, they plan a variety of instructional activities appropriate for their students' intellectual, physical, social, and emotional development (NCDPI Educator Effectiveness Division, 2013). These lessons should promote communication, critical thinking, and problem-solving as students work collaboratively to develop leadership skills with and without technology (NCDPI Educator Effectiveness Division, 2013). To conduct formative and summative assessments, teachers should also "use 21st century assessment systems to inform instruction and demonstrate evidence of students' 21st century knowledge, skills, performance, and dispositions" (NCDPI Educator Effectiveness Division, 2013, p. 7). When teachers reflect on their practice to demonstrate the fifth standard, they should analyze student learning, attend high quality professional development aligned with their personalized growth plan, and act as a lifelong learner (NCDPI Educator Effectiveness Division, 2013). The amount of growth a teacher's students demonstrate on their end-of-grade or end-of-course assessments determines the level of academic success to which he/she contributes (NCDPI Educator Effectiveness Division, 2013). Observations of these standards as well as student assessment data at the end of the semester or year measure teacher effectiveness (NCDPI Educator Effectiveness Division, 2013).

ISTE standards for teachers. ISTE has developed standards for students,

teachers, and administrators to provide a framework for instruction enhanced by technology, and these standards were influential in the development of the digital learning competencies. Rather than serving as a set of technology standards, the ISTE framework "bridges the gap between overall curriculum goals and the use of technology for learning and teaching" (ISTE, 2017, "Why is it important?"). The purpose of the framework is to ensure technology meets specific learning objectives and teaches authentic skills for 21st century success (ISTE, 2017). "Effective teachers model and apply the ISTE Standards for Students as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community" (ISTE, 2008, p. 1). There are five components in the ISTE Standards for Teachers, and each has four performance indicators. The first standard explains teachers should facilitate classroom experiences with technology that promote student learning and creativity in face-to-face and virtual environments (ISTE, 2008). The use of technology to assess student learning is also included in these standards as it is in Standard 4 of NCPTS. ISTE explains teachers should use technology to design, implement, and analyze data from multiple, varied formative and summative assessments (ISTE, 2008). Also included in this standard is the idea that technology should be used to personalize learning experiences, so students can take ownership over their own goals and outcomes (ISTE, 2008). Standard 3 states teachers should model the behaviors of collaboration and communication when locating, using, analyzing, and evaluating the use of current and emerging technology tools and resources (ISTE, 2008). Standard 1 of NCPTS explains the importance of adhering to a code of ethics, which is also included in the ISTE Standards for Teachers. The fourth standard in this set describes the need to exhibit legal

and ethical behaviors regarding digital information and technology by teaching respect for copyright, intellectual property, citations of resources, digital etiquette, and responsible social interactions with others (ISTE, 2008). Demonstrating cultural and global awareness by modeling respect for students and colleagues from various backgrounds is also included in this standard (ISTE, 2008). The fifth standard states teachers should engage in professional growth experiences and exhibit leadership characteristics by contributing to their school and community (ISTE, 2008). These competencies are also evident in Standards 1 and 5 of NCPTS.

iNACOL's New Learning Models. iNACOL's work was also influential in the creation of the digital learning competencies. The intent of their New Learning Models (iNACOL, 2013) is to "assist educators in transforming each child's educational journey into a more personalized, engaging learning experience in order to improve student outcomes" (p. 2). In the center of their model is the student, and around him/her are components of technology, pedagogy, assessment, and content which comprise their TPAC framework. iNACOL has identified eight design principles which are intended to transition classroom instruction to one that meets the vision of their model (iNACOL, 2013). Providing personalized instruction means students receive differentiated, standards-based instruction they can complete anytime, anywhere, and have their learning measured through performance-based assessments (iNACOL, 2013). Designing personalized learning and administering multiple methods of assessment are included in NCPTS Standard 4 and ISTE Standard 2. The second principle of this model is student centered; and as this principle explains, student needs and interests should guide the instruction (iNACOL, 2013). Only after mastering content are new objectives added. Again, this principle is similar to what NCPTS Standard 4 and ISTE Standard 2 explain

teachers should do when facilitating instruction. Within the third principle of equitable and accessible instruction are the ideas of providing varied instructional opportunities for all students including those with disabilities and from diverse cultural backgrounds (iNACOL, 2013). Both NCPTS and ISTE Standards 2 include the need for teachers to establish respectful learning environments in which diversity is recognized and promoted in classrooms. Gathering competency-based data from multiple sources over time and using them to drive instructional practices to attain higher student achievement results is the fourth principle for this model (iNACOL, 2013). Utilizing a variety of assessment methods to measure student success is included in NCPTS Standards 1 and 4 as well as ISTE Standards 2 and 3. The fifth design principle is providing technology-enhanced opportunities for students to collaborate with others and engage with digital content in and out of the classroom (iNACOL, 2013). ISTE Standards 1 and 3 as well as NCPTS Standards 1 and 4 pertain to students using digital content anytime, anywhere to collaborate and communicate with others. iNACOL believes educational experiences should be affordable and sustainable, which is the sixth principle. Initiatives should be cost effective and evaluated to ensure the results justify the expenditures (iNACOL, 2013). Public and private partnerships should work together to provide funding, and performance-based funding could be dependent upon student growth (iNACOL, 2013). Utilizing flexible staffing models, which is another principle, places teachers in the role of coordinator of online and face-to-face instruction from a team of experts within the school or from the community (iNACOL, 2013). Standard 4 of NCPTS outlines the role of teachers as facilitators as does ISTE Standard 3. Included in this principle is the recognition teachers need support and training in how to manage student information and learning in online, face-to-face, and blended classrooms (iNACOL, 2013). Both ISTE

and NCPTS Standards 5 advocate for teachers to engage in professional growth opportunities. The final principle of New Learning Models is ensuring rigorous content and standards for all students (iNACOL, 2013). Learning objectives should be concise and measurable and standards should promote college and career readiness (iNACOL, 2013). Part of Standard 3 for the NCPTS states teachers should make curriculum rigorous and relevant for learners, which is also included in ISTE Standard 1 regarding facilitating student learning.

Teacher Perceptions of Technology Integration

Rather than advocating for one technological device or program for education, Koehler and Mishra (2009) explained there is "no single technological solution that applies for every teacher, every course, or every view of teaching" (p. 66). In general, teaching is a complex practice because it requires practitioners to utilize various types of knowledge; teaching with technology further complicates their work because instructors may lack the experience and/or skills in using the digital resources (Koehler & Mishra, 2009). In her blog, Microsoft's Vice President of Education Margo Day (2014) stated, "Technology has the power to enhance the work of our educators and create a more immersive and engaging learning experience for students" (para. 7), and research indicates teachers recognize these benefits (Capo & Orellana, 2011; Ertmer, Ottenbreit-Leftwich, & York, 2006-2007).

Capo and Orellana (2011) surveyed high school teachers in Florida to determine the factors impacting intentions to use Web 2.0 technology, such as wikis, blogs, and social networking, for instruction. Survey questions measured the extent to which teachers used Web 2.0 technologies, their opinions of using these technologies with classroom instruction, and the factors impacting adoption of these technologies for use in

their classrooms (Capo & Orellana, 2011). The results of the study showed perceived usefulness and instructional compatibility were the highest ranked factors impacting whether teachers would use Web 2.0 technologies in their classroom (Capo & Orellana, 2011). Teacher attitude was the strongest predictor indicating they would be likely to use these technologies during instruction, and more than half of all respondents believed Web 2.0 tools could improve learning and opportunities for interaction (Capo & Orellana, 2011). Of the teachers surveyed, 53% believed these technologies could improve student learning (Capo & Orellana, 2011). In terms of improving teacher-student interactions, 62% of participants believed Web 2.0 technologies would be useful, and 52.6% of respondents believed these tools could help student interactions with their peers (Capo & Orellana, 2011). What is missing from this research is an analysis of the tasks students completed with the resources in order to connect this research to teacher facilitation of digital learning environments. Also, because this research was conducted with high school teachers, further research in elementary and middle school classrooms was noted (Capo & Orellana, 2011).

While teachers understand the benefits of using technology, Cunningham and Bradley (n.d.) found they believe this use should be supplemental rather than replace core instructional content delivery. The researchers in this study investigated a small judgment sample using survey and open-ended respond questions scored using a rubric (Cunningham & Bradley, n.d.). The participants surveyed had between 1 and 24 years of full-time teaching experience at their school along with a master's degree in mathematics education and indicated they received professional development on technology integration through college coursework as well as other workshop experiences (Cunningham & Bradley, n.d.). In their investigation of high school math teachers in

Kentucky using online tools, this study found teachers were willing to implement online learning tools if these resources were supplemental rather than replacements for instructional delivery by the teacher (Cunningham & Bradley, n.d.). By questioning the participants further, the researchers could have determined if teachers reject the idea of making instruction student centered rather than teacher centered, and if their view of computers as supplemental resources includes providing personalized learning experiences, which would indicate a connection to digital learning environments.

Thompson (2015) studied K-5 teachers within a school district in Georgia to determine their perceptions of integrating technology into instruction. Through interviews, classroom observations, and a review of lesson plans, this research found teachers who have a positive attitude regarding integration use technology tools to engage students and increase learning daily (Thompson, 2015). Participants in this study stated instructional videos as well as teacher- and student-created PowerPoints were their top tools for technology integration, and additionally noted the use of technology to monitor student progress throughout the year (Thompson, 2015). What these findings do not indicate is whether students were creating presentations of the same information, collaborating to share in the design process, and/or communicating their findings to classmates, which would indicate the teachers in this study are facilitating digital-age instruction.

In their study of exemplary technology-using teachers, Ertmer et al. (2006-2007) found comparable results regarding teacher perceptions of the benefits to using technology. They surveyed statewide winners of technology awards in the Midwest to determine their perceptions of the intrinsic and extrinsic factors impacting exemplary use of technology as well as the characteristics of teachers identified as exemplary users of

technology. The results of this study found preservice education to be the least influential enabler of success, whereas inner drive and personal beliefs were most influential (Ertmer et al., 2006-2007). Based on their findings, Ertmer et al. (2006-2007) believed exemplary integrators will overcome obstacles such as limited time and resources because of their beliefs, visions, and commitment to technology use. The research also indicated increased confidence and successful use of technology made exemplary teachers more likely to integrate technology because intrinsic factors were significantly more influential than extrinsic factors (Ertmer et al., 2006-2007). Because this research focused on exemplary users of technology, an investigation with a random sampling of teachers could provide additional information as to how less intrinsically motivated teachers are using technology, especially for an innovation implemented across a district or state, and stakeholders need to understand how to support adult learners at all levels of readiness.

In addition to an innovative approach to instructional technology, having a high perception of knowledge is also helpful for teachers. Almekhlafi and Almeqdadi (2010) found similar results related to self-perceptions in their study of teacher perceptions of technology integration conducted in classrooms of Grades 6-9 in two United Arab Emirate Model Schools. The researchers' findings indicated teachers at these schools have a high self-perception of their knowledge and skills when integrating technology regardless of gender, which helped them overcome barriers to use (Almekhlafi & Almeqdadi, 2010). The barriers identified in this research study of 100 teachers using a mixed-method approach consisting of a questionnaire and focus group interviews, include technical problems, lack of training, and lack of buy-in from colleagues (Almekhlafi & Almeqdadi, 2010). This study also revealed teachers want regular

professional development as well as opportunities for collaboration with colleagues across the country (Almekhlafi & Almeqdadi, 2010). The researchers recommended further investigation of the relationship between the integration of technology with curriculum goals and outcomes (Almekhlafi & Almeqdadi, 2010). Because content and instruction are included in digital learning frameworks, research in this area would fill the gap in Almekhlafi and Almeqdadi's research.

Synthesis of the Literature

Digital learning environments provide opportunities for empowering students to learn relevant content and engage in their work (Kemker, 2005). The Framework for 21st Century Learning (Partnership for 21st Century Learning, 2016) includes the skills students need to be successful in their futures, which extend beyond core content subjects. In digital-age classrooms, students can demonstrate these skills through personalized learning opportunities that happen anytime and anywhere (Friday Institute for Educational Innovation, 2015). These classrooms differ from traditional settings in many ways, which include learning opportunities that are student centered and project based (Friday Institute for Educational Innovation, 2015). The NCSBOE approved the NC Digital Learning Competencies for Classroom Teachers in 2016 to provide a framework of the skills educators should integrate into their instructional practices to facilitate digital learning environments (NCDPI Digital Teaching and Learning Division, 2017). The basis of this framework is the existing research from NCPTS, ISTE, and iNACOL.

Various researchers have conducted studies of teacher perceptions regarding technology integration (Capo & Orellana, 2011; Cunningham & Bradley, n.d.; Ertmer et al., 2006-2007; Thompson, 2015). Existing research indicates teachers believe it is

beneficial to integrate technology, and having a positive attitude increases the likelihood a teacher will use technology devices, software, and/or tools even if doing so requires overcoming barriers. While this research has contributed to understanding teacher perceptions of technology integration, further investigation of the impending implementation of the Digital Learning Competencies for Classroom Teachers and current digital learning practices of teachers should occur in NC to help stakeholders promote the transition to digital learning environments.

Chapter 3: Methodology

Overview

The central research question for this study was, "How do teacher instructional practices align with digital learning environments?" Given the legislative and financial support dating back to the late 1950s, it was important to examine instructional practices to determine if progress has been made in moving to a digital-age learning model as the implementation of the NC Digital Learning Competencies for Classroom Teachers requires. As West (2016) advocated, the time has come to investigate how teaching and learning have changed with the inclusion of technology. Butin (2010) suggested using exploratory research to investigate a gap in existing research or study an issue needing clarification. "An exploratory design is best suited to qualitative research methods that allow for in-depth analysis of complex and layered issues and flexible enough to account for highly open-ended research questions, data collection protocols, and analyses" (Butin, 2010, Location No. 1795). Creswell (2014) explained a mixed-methods approach can make the research stronger because it uses both approaches to data analysis. This study used quantitative and qualitative data to answer the following research questions.

1. How do teachers demonstrate leadership in digital learning?
2. How do teachers model and teach digital citizenship?
3. How do teachers use digital content and resources for instruction?
4. How do teachers use technology for data and assessment?

Overview of Data Collection

This research study was a mixed-methods investigation to have the benefits of both qualitative and quantitative analysis. Collected data determined patterns of technology integration across grade levels within a school district in southeastern NC;

and using a convergent parallel mixed-methods design, the researcher was able to analyze the survey data and interview responses separately before comparing the results to support findings (Creswell, 2014). Collection of data from a standard observation tool used throughout the district occurred in the third phase. Triangulation of data from the three phases answered the research questions and explained how teacher instructional practices aligned with digital learning environments.

Quantitative data from a cross-sectional survey of teachers determined how often they believed they demonstrated components of digital learning environments. It was cross-sectional because it provided information about teacher current practices (Creswell, 2014). The researcher used Survey Monkey to administer the survey, which appears in Appendix B. Survey Monkey is an online service for administering anonymous surveys to participants via an electronic link. It began with an explanation of the purpose, definition of digital learning, and explanation of the NC Digital Learning Competencies for Classroom Teachers. The first section of the survey collected demographic data, and then each competency within the four focus areas of the framework appeared as separate survey items. Respondents indicated the extent to which they agreed they demonstrated each competency using a Likert scale of strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree.

In the second phase, interviews with Teachers of the Year yielded qualitative data. "The key idea behind qualitative research is to learn about the problem or issue from participants and to address the research to obtain that information" (Creswell, 2014, p. 186). Having a small, purposefully selected group of participants is important in conducting a qualitative study (Creswell, 2014). When gathering data for this investigation, the researcher collected high-quality information from a select number of

subjects; therefore, the researcher interviewed recognized leaders, or Teachers of the Year, in the district. By interviewing model teachers within the district, the researcher collected in-depth explanations as to how teacher instructional practices align with digital learning environments by expanding on the survey results collected in the first phase. Thompson (2015) found teachers demonstrating a positive attitude toward technology integration are morning like to use digital tools for student engagement and learning. Ertmer et al. (2006-2007) determined inner drive and personal beliefs were the most influential factors of exemplary technology use. Teachers of the Year were selected as interview subjects, because they were most likely be intrinsically motivated to improve learning; and those who would respond to an interview request for a research study of digital learning environments were viewed as most likely to have a positive attitude toward technology integration.

Gaining an accurate understanding of digital learning environments across all grade levels in the district required gathering information from multiple perspectives within the elementary, middle, and high schools, so interviews were conducted with two teachers at each level. The interview protocol, which began with the purpose of the study, appears in Appendix C. The first three interview questions provided background information about the subject; and the subsequent five questions pertained to how the teacher demonstrated leadership in digital learning, digital citizenship, digital content and instruction, and data and assessment. Dedoose, an online platform for data analysis, was used to code transcribed responses according to the areas of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016).

The research site. NC's recognition as a leader in digital learning made it a

logical location for this study (Friday Institute for Educational Innovation, 2015). Also, NCDPI's Digital Teaching and Learning Division (2017) began planning the implementation of the NC Digital Learning Competencies for Classroom Teachers in July 2017; therefore, examining teacher current practices as well as their beliefs regarding how their instruction has changed over time helps stakeholders determine areas of strength and weakness. The researcher conducted this research in a district in southeastern NC, in which over 1,200 employees served approximately 9,200 students in 16 schools (District Z, 2016). The district was comprised of 16 schools: one K-8 school, eight elementary schools, five middle schools, three traditional high schools, and one early college high school (District Z, 2016). With the exception of the early college high school, the remaining 15 schools have media coordinators, and there is one instructional technology leader for the district (District Z, 2016). Between 51-95% of schools in this district have 1:1 programs which provide one device per student in the school (Friday Institute for Educational Innovation, 2015).

In May 2015, the NCSBOE requested all public and charter schools within the state complete the Digital Learning Progress Rubric Self-Assessment (Friday Institute for Educational Innovation, 2015). Each charter school or LEA rated their district on a scale of 1 (early) to 4 (advanced) for 25 items within the categories of leadership, professional learning, content and instruction, technology infrastructure and devices, and data and assessment to determine their current progress and guide future planning (Friday Institute for Educational Innovation, 2015). District Z was one of 34 local education agencies (LEAs) to rate their overall digital learning initiatives as being in developing advanced on this self-assessment (Friday Institute for Educational Innovation, 2015). Table 1 includes the number of LEAs at each stage of development as reported on the Digital Learning

Progress Self-Assessment. The results showed scores for each of the five components the Friday Institute for Educational Innovation (2015) designated as being necessary for success in the transition to digital-age teaching which include leadership, professional learning, content and instruction, technology infrastructure and devices, and data and assessment. Included in the results was an overall development score. District Z reported being in the developing early stage for leadership, developing early for professional learning, developing advanced for content and instruction, advanced for infrastructure and access, and developing advanced for data and assessment, which places it with or ahead of other districts in every area except data and assessment (Friday Institute for Educational Innovation, 2015).

Table 1

LEA Ratings on the Digital Learning Progress Rubric Self-Assessment (Friday Institute for Educational Innovation, 2015)

	Early (N)	Developing Early (N)	Developing Advanced (N)	Advanced (N)
Overall	22	52	34	7
Leadership	25	55	22	13
Professional learning	30	44	28	13
Content and instruction	26	58	20	11
Technology infrastructure and devices	23	45	35	12
Data and assessment	12	39	32	32

Table 2 shows a comparison of the state and district averages for technology-related questions on the NCTWC survey (New Teacher Center, 2016). The results of this survey show District Z meets or exceeds the state average for many items. The district average of 85.0% surpassed the 2016 state average of 79.7% in providing access to instructional technology for teachers (New Teacher Center, 2016). While the state average for teachers having access to reliable communication technology was 91.6% in

2016, District Z's average was below it with 85.6%, which was a decline from 90.5% in 2014 (New Teacher Center, 2016). The reliability and speed of Internet connections increased in the district from 65.2% in 2014 to 91.9% in 2016 placing it well above the state average of 79.0% (New Teacher Center, 2016). The candidate observed a noticeable difference when comparing the results of teacher access to training. The 2016 state average was 75.9%; however, the district average was 72.0%, and that indicated a decline from 73.6% in 2014 (New Teacher Center, 2016). Given the other technology-related items, this item indicates a weakness in the district. In the 2016 NCTWC survey's (New Teacher Center, 2016) newly added items pertaining to instructional technology, District Z was above the state average for both. Of the teachers surveyed, 87.2% within the district agree teachers have sufficient access to digital content and resources, placing it above the state average of 84.9%; and 97.2% agree teachers use digital content and resources in their instruction, which exceeded the state average of 95.5% (New Teacher Center, 2016).

Table 2

Results of Technology-Related Questions on the NCTWC Survey (New Teacher Center, 2016)

Please rate how strongly you agree or disagree with statements about your school.	2014 State Average	2014 District Z Average	2016 State Average	2016 District Z Average
Teachers have sufficient access to instructional technology, including computers, devices, printers, software and internet access.	78.7%	81.1%	79.7%	85.0%
Teachers have access to reliable communication technology, including phones, faxes and email.	90.6%	90.5%	91.6%	85.6%
The reliability and speed of Internet connections in this school are sufficient to support instructional practices.	87.8%	65.2%	79.0%	91.9%
Teachers have sufficient training to fully utilize instructional technology.	73.3%	73.6%	75.9%	72.0%
Teachers have sufficient access to digital content and resources.	N/A	N/A	84.9%	87.2%
Teachers use digital content and resources in their instruction.	N/A	N/A	95.5%	97.2%

The data for District Z indicated it made efforts to transition from traditional classroom instruction to digital learning environments, and further investigation could determine how teachers perceive this shift was evident in their instructional practices. An investigation into the alignment of instructional practices with digital learning environments would be beneficial to other districts within the state and nation who are implementing digital learning practices, because such insight could explain how teachers in this district exceeded state averages on the NCTWC survey. Also, determining how teachers perceive their roles in creating positive digital learning environments could guide the support and training needed to make the transition to these environments.

The role of the researcher. The researcher has had significant experiences integrating technology into classroom instruction as a teacher and Instructional Technology Facilitator (ITF) in schools within NC. Her personal background included using computers since the first grade and teaching children to be consumers of technology prior to becoming a classroom teacher. Also, she studied Instructional Technology in graduate school and was a member of NCDLCN, the collaborative network of educators advocating for digital learning opportunities. Her prior experiences with technology shaped the focus of this study (Creswell, 2014) because she had background knowledge related to using technology during instruction. The researcher was a former employee of District Z and has children in two of its 16 schools.

The subjects. Administration of the survey occurred electronically within a district of approximately 584 K-12 teachers. All teachers received an email invitation to complete the survey through their district email addresses. There were 285 elementary, 123 middle, and 176 high school teachers invited to respond to the survey. In the interview phase of the research, the candidate emailed each school's Teacher of the Year to determine which subjects would participate. Interviews of two Teachers of the Year from each level (elementary, middle, and high) occurred at a mutually agreed-upon date and time.

The instrument. This study was mixed methods with a survey in phase one, individual interviews in phase two, and analysis of existing observation data in phase three. Five members of NCDLCN used Simon and White's (2011) Survey/Interview Validation Rubric for Expert Panel (see Appendix D) to review the survey instrument (see Appendix B). The NC Digital Learning Plan (Friday Institute for Educational Innovation, 2015) advocates for the creation of a network of educators across the state to

support digital-age learning for public school students; and NCDLCN serves as cohort of ITFs, instructional coaches, media coordinators, and teacher leaders across the state who work together to build capacity in digital learning experiences (Friday Institute for Educational Innovation, n.d.). Based on their feedback, no changes were made to the instrument, and the survey was administered via an electronic link sent in an email to all classroom teachers within District Z. Administration of the survey occurred using Survey Monkey, an online tool, to ensure anonymity; and the researcher's account password adhered to the highest standards for security.

Interviewing teachers in their natural settings is a key component of qualitative research because it allows the candidate to listen to what people say and do in the context of their work (Creswell, 2014). In the second phase, each school's Teacher of the Year for 2017-2018 had the option to participate in an individual interview (see Appendix C for the interview protocol). Interviews occurred with the first two Teachers of the Year at each level of elementary, middle, and high schools to consent. Interviews were digitally recorded and transcribed for coding. In the third phase, the researcher obtained existing data from a standard district observation tool for classroom teachers. Triangulation of data from the three phases answered the research questions and explained how teacher instructional practices align with digital learning environments.

The interview questions. The interview protocol, found in Appendix C, included the context (interviewer, interviewee, date, and time) and instructions the researcher followed. Interviews of participants occurred individually at a time of their convenience, and the researcher used the responses to provide additional information regarding how teachers facilitated digital learning environments as well as what support is missing. The questions included warm-up questions designed to put the subject at ease, probes used for

follow-up when asking the questions, space to record interviewee answers, and a statement of appreciation for interviewee time (Creswell, 2014). The interview questions for this study were

1. How long have you been a teacher?
2. What subjects and/or grade levels do you teach?
3. What is your highest level of education?
4. How do you demonstrate leadership in digital learning?
5. How do you model and teach digital citizenship?
6. How do you use technology tools and resources for instruction, such as to personalize learning and engage students?
7. How do you encourage creativity, critical thinking, communication, collaboration, and authentic problem-solving using digital tools and resources?
8. How do you use technology for data and assessment?

Procedures for Data Collection

The researcher completed several steps to collect data for this study. The actions taken as outlined in Table 3 began with validation of the survey instrument. After obtaining permission to conduct research in District Z, the researcher administered a survey via Survey Monkey through an emailed link sent to classroom teachers. Interviews with six of District Z's Teachers of the Year were conducted, transcribed, and coded. Finally, the researcher requested and received ELEOT results for District Z.

Table 3

Data Collection Process

Step	Action Taken
1.	Validated the survey a review of five members of NCDLCN using Simon and White's (2011) Survey/Interview Validation Rubric for Expert Panel.
2.	Obtained permission to conduct research in District Z.
3.	Obtained a list of each school's principal and their email addresses from District Z's school webpages.
4.	Sent an email describing the researcher and purpose of the study to each of District Z's 16 principals.
5.	Obtained a list of K-12 teachers and their email addresses from District Z's school webpages.
6.	Sent an email describing the researcher and purpose of the study requesting their voluntary participation in the anonymous survey. Included the link from Survey Monkey.
7.	Sent an email reminder with one week remaining in the survey period.
8.	Obtained a list of the 2017-2018 Teachers of the Year for each of the district's schools.
9.	Emailed each Teacher of the Year requesting their voluntary participation in an individual interview at a time of their convenience. Six Teachers of the Year, two from each level of elementary, middle, and high schools, were interviewed. The first two Teachers of the Year at each level to reply agreeing to an interview were contacted to establish a date and time.
10.	Conducted interviews in each teacher's classroom. Interviews were digitally recorded.
11.	Transcribed the responses. Interview subjects were referred to as Elementary Teacher 1 (ET1), Middle Teacher 1 (MT1), etc. when their responses were transcribed, and files were password protected Microsoft Office documents.
12.	Coded the data for common themes using Dedoose
13.	Submitted a request to the district to receive data for digital learning environments from a tool, Effective Learning Environments Observation Tool (ELEOT), used by administrators in classroom observations of teachers. The data provided included average scores across the district and did not include specific teachers' names or any other identifying information

Data Analysis

Analysis of the survey results determined correlations with the interview data. The researcher calculated a Cronbach's alpha of .95 for the survey results to determine the internal consistency of the survey results. An alpha level of .70 or higher is accepted as reliable (Urdan, 2010). One-way ANOVA tests were run on the responses to compare years of teaching experience, grade levels taught, and highest levels of education for each survey question. A one-way ANOVA was used because the researcher compared three or more groups to determine if group means were significantly different (Urdan, 2010). Further, *t* tests were run comparing each group of respondents for any questions in which ANOVA results indicated a p value of .05 or less. *T* tests were used to determine if the results differed significantly (Urdan, 2010). The results of these tests appear in Chapter 4.

Following each interview, the candidate transcribed the digital recordings and handwritten notes to create a document of each subject's responses. The researcher coded the files with each subject's name using a confidential format of ES 1, ES 2, MS 1, MS 2, HS 1, and HS 2. Once transcription of all six interviews occurred, the candidate read each transcript twice to increase familiarity with the responses and began to identify themes among the respondents. She then imported the six transcript documents into Dedoose, an online platform for data analysis, and coded them to correspond to each area of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). Analysis of the frequencies within coded responses occurred, and these data appear in Chapter 4. Also, included in Chapter 4 are the digital learning findings from District Z's most recent AdvancED observations using ELEOT. Chapter 5 contains these conclusions presented along with recommendations

for future research.

Limitations and Delimitations

A limitation of this research study is teachers self-reported their instructional practices, which limits the validity of responses. They may believe they are demonstrating competencies not actually observed in their instructional practices. The misperceptions may be a result of a lack of understanding regarding recommendations for digital learning environments, but an analysis of these misperceptions was not part of this research study. Rather than conducting this research throughout various districts across the state, the findings were based in one location, which is a delimitation of the study. Conducting the research study in this district made the data easier and more convenient to collect, but the researcher took responsibility for showing it was not compromised and did not place the participants at risk, as Creswell (2014) recommended.

Summary

The researcher conducted this study in District Z based on its location convenience as well as the results of the Digital Learning Progress Rubric Self-Assessment for the LEA, which indicated it met or exceeded other districts in NC in the implementation of digital initiatives in every area except data and assessment (Friday Institute for Educational Innovation, 2015). Also, NCTWC survey (New Teacher Center, 2016) indicated the district was above state averages in providing access to reliable technology and resources in almost every area assessed. To conduct this exploratory investigation, the candidate administered a survey of items aligned with the NC Digital Learning Competencies for Classroom Teachers. In the second phase, interviews with two Teachers of the Year at each level of elementary, middle, and high school provided additional information regarding how teachers have facilitated digital learning

environments. In the third phase, the researcher obtained data from ELEOT observations made throughout the district. Data from the survey, interviews, and ELEOT observations are presented and analyzed in Chapters 4 and 5.

Chapter 4: Results

Introduction

The purpose of this mixed-methods research study was to determine how teacher instructional practices align with digital learning environments. The researcher collected quantitative data through a survey of classroom teachers within a district in southeastern NC and qualitative data in the form of interviews with six of the district's Teachers of the Year to provide further information. Finally, the scores from the district's AdvancED accreditation provided additional information regarding teacher instruction as it relates to digital learning environments. The data presented in this chapter were collected and analyzed to answer the following questions.

1. How do teachers demonstrate leadership in digital learning?
2. How do teachers model and teach digital citizenship?
3. How do teachers use digital content and resources for instruction?
4. How do teachers use technology for data and assessment?

Overview of the Participants

Respondents in this study included the 187 teachers in District Z who participated in the Survey of Digital Learning Practices for Classroom Teachers available in Appendix B. With 584 teachers in the district, the survey had a return rate of 32%. Appendix E presents the descriptive statistics for each item of the survey. The largest group of respondents were teachers with 6-10 years of experience, who comprised 24.6% of the respondents (n=46). Teachers with 31 or more years of experience comprised the smallest group of respondents totaling 1.6% (n=3). Table 4 depicts the number of years of teaching experience for the participants.

Table 4

Survey Participant Years of Teaching Experience (n=187)

Years of Experience	%	N
1-5	14.44%	27
6-10	24.60%	46
11-15	19.25%	36
16-20	19.79%	37
21-25	18.18%	34
26-30	2.14%	4
31+	1.60%	3

Other demographic data collected from the survey included grade levels taught and highest level of education. Of the 187 survey respondents, 39.04% (n=73) identified as teachers of Grades K-5, 30.48% (n=57) identified as teachers of Grades 6-8, 28.88% (n=54) identified as teachers of Grades 9-12, and 1.60% (n=3) identified as others, which included music K-12, instructional support, and K-5 exceptional children. Teachers with bachelor's degrees constituted the largest percentage of respondents at 56.68% (n=106). Teachers with master's degrees accounted for 41.18% (n=77) of the respondents, and 2.14% (n=4) of respondents identified as having doctoral degrees.

In the second phase of the research, 15 Teachers of the Year from 16 of the district's schools were invited via email to participate in individual interviews to describe how their instruction demonstrates the components of digital learning as outlined in the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). The researcher interviewed the first two teachers to respond at each school level of elementary, middle, and high. Their responses were transcribed and coded for analysis. Table 5 contains the background information for each of the interview subjects. Additionally, the researcher obtained ELEOT data from District Z's most recent AdvancED accreditation review. They are presented in this

chapter in the applicable research questions.

Table 5

Background Information for Interview Subjects

Subject	Years of Teaching Experience	Grade level(s)/ Subject(s) Taught	Highest Level of Education
ES 1	21	K-5/ Music	Master's
ES 2	12	2/ All	Master's
MS 1	10	8/ English Language Arts	Bachelor's
MS 2	14	6/ Science	Bachelor's
HS 1	16	9-12/ Social Studies	Bachelor's
HS 2	18	9-12/ Career and Technical Education	AA with additional certifications

Research Question 1

How do teachers demonstrate leadership in digital learning? To determine how instructional practices align with this component of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016), survey questions 4, 5, 6, 7, and 8 asked teachers to rank the extent to which they agreed they were able to complete each task on a Likert scale of 1 (strongly disagree) to 5 (strongly agree) with an option of 3 for neither agree nor disagree. Interview question 4 asked teachers to explain how they demonstrated leadership in digital learning.

The sample mean for the survey questions in this section was 4.0. To measure the internal reliability of these questions, the researchers calculated a Cronbach's alpha score. An alpha of .77 found these items acceptably reliable. One hundred sixty participants answered these questions, and Table 6 presents the results. Taking initiative with own professional growth to inform practice was the highest ranked competency in this area as

well as being the second highest of all the survey items with a mean of 4.29. Of the 160 respondents, 56.88% (n=91) agreed and 37.5% (n=60) strongly agreed, while only 5.63% (n=9) rated it 3 or less. The second highest mean in this area was 4.28 for promoting open, lifelong learning as an iterative process of success, failure, grit, and perseverance. Fifty percent (n=80) of teachers responded with agreement, and 40% (n=64) strongly agreed. This competency had the third highest mean overall among the survey items.

Table 6

Leadership in Digital Learning Survey Responses (n=160)

Survey Item	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Mean
	%	n	%	n	%	n	%	n	%	n	
4. Engage in virtual and face-to-face learning communities to expand mastery of technological applications for professional growth and student learning.	1.88	3	6.88	11	11.25	18	58.75	94	21.25	34	3.91
5. Take initiative with own professional growth to inform practice.	0.63	1	1.25	2	3.75	6	56.88	91	37.50	60	4.29
6. Demonstrate leadership for technology innovation beyond my own classroom.	3.13	5	12.50	20	28.75	46	38.75	62	16.88	27	3.54
7. Engage in peer collaborative problem-solving through continuous planning, designing, testing, evaluation, and recalibration of teaching methods using appropriate digital technology.	1.88	3	3.75	6	10.63	17	61.25	98	22.50	36	3.99
8. Promote open, lifelong learning as an iterative process of success, failure, grit, and perseverance.	0.63	1	1.25	2	8.13	13	50.00	80	40.00	64	4.28

The lowest rated competency in this area as well as for all the survey items was demonstrating leadership in technology innovation beyond one's own classroom with a

mean of 3.54. More than 15% (n=25) disagreed or strongly disagreed and 28.75% (n=46) marked neither agree nor disagree, while 55.63% (n=89) agreed or strongly agreed. A one-way ANOVA test yielded a p value of .03 for this item indicating a statistically significant difference in the responses based on grade levels taught (K-5, 6-8, and 9-12). To determine the specific groups in which significant differences were present, the researcher performed *t* tests to compare the grade levels taught. The analysis produced a significant p value of .03 for K-5 and 6-8 as well as a p value of .02 for K-5 and 9-12. An examination of the means revealed K-5 had a lower mean (3.27) than both 6-8 (3.69) and 9-12 (3.71). No other groups exhibited a significant difference in their means based on the years of teaching experience or the educational level of the respondents.

Interview question 4 asked teachers to explain how they demonstrated leadership in digital learning. The researcher coded the responses to correspond with the competencies in this focus area. An analysis of the interview data disclosed the greatest number of tagged excerpts coded for engaging in virtual and face-to-face learning communities and taking initiative with one's own professional growth to inform practice. These competencies had eight tagged excerpts, and each of the interview subjects explained at least one way in which he/she addressed the items in his/her professional practice. ES 1 explained how she was able to complete an online training course based in Australia to learn occupational therapy techniques for breath support in her music classroom. She was also preparing to begin online classes with the National Association of Music Educators because the professional development offerings within District Z did not meet her professional needs. Two other interviewees mentioned the necessity of engaging in online learning communities for professional development because of the decrease in options provided by District Z over the years. HS 1 described the difficulties

of being the only teacher of a course within a school and not having colleagues with whom to plan classes. MS 1 explained that he is often an early user of innovative technology tools; so by the time the district provides training, it is outdated for him. He stated, "I was using Google Classroom before PD happened on Google Classroom, and I can't remember, really, any 'here's resources that are available on the Internet.' Sadly, most of our digital PD is about how to use Schoolnet or EVAAS" (personal communication, October 18, 2017).

The competencies demonstrating leadership for technology innovation beyond one's classroom and promoting open, lifelong learning as an iterative process of success, failure, grit, and perseverance each had seven excerpts coded. Five of six subjects were able to describe at least one aspect of their professional practices that aligned with each of these competencies. MS 2 explained how she models technology use through HyperDocs and the sharing of technology tools as both a grade-level chair and a member of the science department. ES 2 will train as a leader as part of the NCDLCN, the collaborative network of educators across NC. MS 1 explained, "As somebody who is really into technology myself, I tend to kind of try to find the things that are going to be most useful for my students and then share those things with teachers outside my classroom" (personal communication, October 18, 2017).

Fifty percent of the interview respondents explained how they engaged in peer collaborative problem-solving using appropriate digital technology. HS 1 stated she provided technical support and training for colleagues at her school; and ES 1 explained how she and the other music teachers used Google Docs to plan district-wide events without having face-to-face meetings. HS 2 described how she and other members of a statewide committee were able to use various technology tools to plan, design, and

evaluate competitive events. She described the benefits of learning from one another in following observation:

> Whenever I don't know something, you know, my colleague may and, you know, we can have a conversation about, “hey, I use that in my classroom in that way.” So, you know, the professional development is coming just by sometimes being in a meeting with somebody and just learning from them, and then, you know, because you're a teacher, and you're a reflective practitioner, you know, you're sitting in the meeting doing what you're supposed to be doing, but you're also thinking, and your gears are just grinding about, OK, how can I use this in my classroom? How can I have kids who are working on this project with Chromebooks and there's four of them working on this document at one time where they are, you know, putting together this Google Form survey? There's just so much that we learn from each other just by, you know, being in meetings together just by working collaboratively together. (personal communication, October 18, 2017)

Given this area of the NC Digital Learning Competencies for Classroom Teachers focuses on teachers demonstrating leadership in digital learning, the items from the AdvancED’s (2015) ELEOT, which is student focused, do not apply; and the researcher did not analyze observation scores for this question. A comparison of the means for each survey item with the number of excerpts coded to match the competency appears in Table 7. Taking initiative with one’s own professional growth to inform practice had the greatest mean (4.29) in this area and tied for the highest number of coded interview excerpts with a score of eight. All six interviewees addressed this practice with at least one excerpt coded from their responses. ES 1, MS 1, and HS 1 specifically spoke about

how they have used technology to accomplish this task, and the eight coded excerpts included at least one from each participant. Although the number of coded excerpts was high, the mean for this item was 3.91, placing it below the sample mean of 4.0 for this focus area of the competencies.

Table 7

Comparison of Item Means and Coded Excerpts for Leadership

Competency	Item Mean	Coded Excerpts
Engage in virtual and face-to-face learning communities to expand mastery of technological applications for professional growth and student learning.	3.91	8
Take initiative with own professional growth to inform practice.	4.29	8
Demonstrate leadership for technology innovation beyond my own classroom.	3.54	7
Engage in peer collaborative problem-solving through continuous planning, designing, testing, evaluation, and recalibration of teaching methods using appropriate digital technology.	3.99	5
Promote open, lifelong learning as an iterative process of success, failure, grit, and perseverance.	4.28	7

Demonstrating leadership for technology innovation beyond one's own classroom had the lowest mean of all the survey items at 3.54. Five of the six interview subjects addressed this task in their responses; but as the *t* test results indicated a significant difference, the elementary school teachers did not have as many examples as the middle and high school teachers. ES 1 was unable to identify any technology leadership outside of her classroom. ES 2's only example was participating in NCDLCN, which is comprised of educators across the state who work together to build capacity in digital learning experiences (Friday Institute for Educational Innovation, n.d.); and she had yet

to attend the first meeting. MS 1 and MS 2 had two coded excerpts in this area and stated they modeled technology use for their grade level and department colleagues. HS 1 explained how she modeled technology for colleagues in similar ways, and HS 2 described working collaboratively with teachers across the district and state to share practices in technology.

Teachers stated they demonstrate leadership in digital learning by taking initiative with their own professional growth to inform their practices. Also, they promote open, lifelong learning as an iterative process of success, failure, grit, and perseverance. Interview respondents explained working with colleagues across the state and world to collaborate using technology and engage in personalized professional development. They described needing to find their own online learning opportunities because of limited offerings with the district as well as to research innovative practices.

Research Question 2

How do teachers model and teach digital citizenship? Survey questions 9, 10, 11, 12, 13, and 14 asked teachers in District Z to rate themselves again on a scale of 1 (strongly disagree) to 5 (strongly agree) in this area of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). Interview question 5 asked teachers to describe how they model and teach digital citizenship. The researcher calculated a Cronbach's alpha of .82 to gauge the reliability of survey results for this section; and because it was greater than .70, the results were considered acceptably reliable. This area of the survey had the greatest sample mean (4.03), while question 11 was the only item to have a mode of 5 rather than 4.

Three of the six questions in this section had a mean greater than 4, and question 11 had the greatest mean (4.44) of any item in the survey. The results for these questions

appear in Table 8. Engaging in responsible and professional digital social interaction yielded the greatest mean in this focus area as well as within the whole survey with 47.71% (n=73) agreeing and 49.02% (n=75) strongly agreeing, which supplied an average score of 4.44. Demonstrating understanding of intellectual property rights through abiding by copyright law, intellectual property, and fair use guidelines had the second largest mean at 4.2 with 54.25% (n=83) agreeing and 34.64% (n=53) strongly agreeing.

Table 8

Digital Citizenship Survey Responses (n=153)

Survey Item	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Mean
	%	n	%	n	%	n	%	n	%	n	
9. Demonstrate understanding of intellectual property rights by abiding by copyright law, intellectual property, and fair use guidelines.	0.65	1	2.61	4	7.84	12	54.25	83	34.64	53	4.2
10. Teach and require the use of copyright law and fair use in student work and creation.	0.65	1	3.92	6	10.46	16	56.21	86	28.76	44	4.08
11. Engage in responsible and professional digital social interaction.	0.65	1	0.00	0	2.61	4	47.71	73	49.02	75	4.44
12. Integrate digital citizenship curriculum into student learning.	1.96	3	5.23	8	15.03	23	58.17	89	19.61	30	3.88
13. Demonstrate global awareness through engaging with other cultures via advanced communication and collaboration tools.	2.61	4	11.11	17	18.95	29	52.94	81	14.38	22	3.65
14. Ensure full, equitable access and participation of all learners through high-quality technology tools and resources.	3.27	5	3.92	6	10.46	16	58.82	90	23.53	36	3.95

Survey question 13 scored the lowest mean (3.65) in digital citizenship, that is demonstrating global awareness through engaging with other cultures via advanced communication and collaboration tools. Of the 153 responses, 103 agreed or strongly agreed, 18.95% (n=29) neither agreed nor disagreed, 11.11% (n=17) disagreed, and 2.61% (n=4) strongly disagreed. A single factor ANOVA test for this question resulted in a p value of .004, and *t* test results demonstrated statistically significant differences for the groups based on the number of years of teaching experience. Teachers with 1-5 and 6-10 years of experience had higher means than teachers with 11-15, 16-20, and 21-25 years of experience. Further analysis indicated that teachers with 1-5 years of experience had a mean of 4.26 for this question. This presented a significant difference when compared to teachers with 11-15 years of experience who had a mean of 3.30, while 16-20 years of experience had a mean of 3.38, and 21-25 years of experience had a mean of 3.56. Teachers with 6-10 years of experience had a mean of 3.89, which was a significant difference when compared to the averages for those with 11-15 and 16-20 years of experience. ANOVA results indicated no significant differences among grade levels taught or teacher educational levels for this question.

One-way ANOVA test results did show a significant difference (p=.006) for teach and require the use of copyright law and fair use in student work and creation based on respondent highest educational level. The researcher analyzed the subsequent *t* test results, and the means for teachers with bachelor's (M=4.04) and master's (M=4.19) degrees were significantly higher than those with doctoral degrees (M=2.50). It was noted only two participants had doctorate degrees compared with 89 bachelor's and 62 master's degrees.

Interview question 5 asked Teacher of the Year respondents to explain how they

teach and model digital citizenship. The coding of their responses revealed demonstrating understanding of intellectual property rights through abiding by copyright law, intellectual property, and fair use guidelines had eight tagged excerpts including one from each subject. Both high school teachers said they modeled citations in their instructional presentations, and ES 1 stated the issue is particularly relevant to her as a music teacher when explaining to students why she cannot upload songs to her website for their use when practicing. Five of the six interview subjects explained how they teach and require the use of copyright law and fair use in student work and creation with eight excerpts coded in this area. ES 2 summarized the process of teaching this to her second-grade students as, "Find it, and read it, and put it in your own words, and then give the person credit" (personal communication, October 18, 2017).

Engaging in responsible and professional digital social interaction yielded responses from 50% of the subjects. ES 2 explained how she used Seesaw, an iPad application, with her second graders to teach appropriate commenting to students: "to make people feel good and how to validate their work and how to comment, you know, in a kind way, and not say things that would hurt somebody's work they put out to publish" (personal communication, October 18, 2017). HS 1 stated she used texting with seniors who take off-campus classes as a means of communicating deadlines for senior projects; and MS 2 described disabling the commenting feature in Google Classroom to avoid inappropriate conversations. To explain how they integrated digital citizenship curriculum into student learning, HS 1 and HS 2 explained how changes to their content standards impacted their instructional focus in this area. HS 1 stated she had designed and taught a freshman seminar class on digital citizenship, which later became part of the community college's program for juniors and seniors. HS 2 described a research project

students had previously conducted that allowed her to incorporate digital citizenship instruction, but a change in the course objectives meant she no longer had an instructional link to that task. MS 2 believed maintaining elevated expectations for student work was a way to integrate digital citizenship into her instructional practices. She also advocated for teachers to monitor students closely when using technological devices in class to ensure they are emailing and commenting appropriately as well as using reliable and credible websites to ensure full, equitable access and the participation of all learners through high-quality technology tools and resources. MS 2 was the only subject to explain how she addressed that competency. None of the respondents indicated they demonstrated global awareness through engaging with other cultures via advanced communication and collaboration tools.

Results from the AdvancED (2015) ELEOT were not included in this section because digital citizenship is not specifically referenced in the observation matrix. The inclusion of digital tools/technology for research did not mention intellectual property, copyright law, or fair use guidelines. A comparison of the quantitative and qualitative data indicated demonstrating understanding of intellectual property rights through abiding by copyright law, intellectual property, and fair use guidelines had a high item mean (4.2) and number of coded excerpts (n=8). Table 9 presents a comparison of item means and coded excerpts for the digital citizenship competencies. Each of the six interview subjects specifically addressed this competency in their responses. Five of the six respondents stated that they teach and require the use of copyright law and fair use in student work and creation among eight coded excerpts. This task had an item mean of 4.08, which also placed it above the sample mean of 4.03 for this focus area.

Table 9

Comparison of Item Means and Coded Excerpts for Digital Citizenship

Competency	Item Mean	Coded Excerpts
Demonstrate understanding of intellectual property rights by abiding by copyright law, intellectual property, and fair use guidelines.	4.2	8
Teach and require the use of copyright law and fair use in student work and creation.	4.08	8
Engage in responsible and professional digital social interaction.	4.44	4
Integrate digital citizenship curriculum into student learning.	3.88	3
Demonstrate global awareness through engaging with other cultures via advanced communication and collaboration tools.	3.65	0
Ensure full, equitable access and participation of all learners through high-quality technology tools and resources.	3.95	2

Although engaging in responsible and professional digital social interaction had the highest mean at 4.44 for this section and the entire survey, there were a small number of excerpts coded in this area (n=4) given by three of the six respondents. A one-way ANOVA test did not indicate any significant differences among grade levels taught, years of experience, or highest levels of education. The four coded excerpts were declared by three of the interview subjects (ES 2, MS 2, and HS 1), so the researcher found no differences among grade levels in qualitative results either.

Demonstrating global awareness through engaging with other cultures via advanced communication and collaboration tools had the lowest average for items in this section (M=3.65) and had zero excerpts coded from the interview data. It was one of only three competencies to have no coded excerpts and the only item in this section. Results from *t* tests did show differences for respondents based on their years of teaching

experience; those with 1-5 and 6-10 years of experience having higher means than 11-15, 16-20, and 21-25 years of experience. Except for MS 1, who had 10 years of experience, the other interview subjects fell within the range of 12-21 years in the classroom.

Teachers model and teach digital citizenship by engaging in responsible and professional digital social interaction, which had the highest item mean on the survey. Respondents described extending their traditional classroom behavior management practices into an online format by teaching appropriate ways to comment on student work, adhering to copyright guidelines, and modeling fair use of information. Overall, this area of the digital learning competencies had the highest sample mean. There was a lack of evidence from interview respondents for demonstrating global awareness through engaging with other cultures via advanced communication and collaboration tools, which also had the lowest mean in this area.

Research Question 3

How do teachers use digital content and resources for instruction? Survey respondents were asked to rate the extent to which they could meet the competencies within the focus area of digital content and instruction using a scale of 1 (strongly disagree) to 5 (strongly agree) for questions 15, 16, 17, 18, and 19. Interview question 6 asked the subjects to explain how they used technology tools and resources for instruction, such as to personalize learning and engage students. Question 7 asked them to describe ways they encouraged creativity, critical thinking, communication, collaboration, and authentic problem-solving using digital tools and resources. These questions align with the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016).

Table 10 displays the survey results. To measure the internal consistency of the

items, the researcher calculated a Cronbach's alpha and determined them to be reliable with an alpha of .92. This section was the only one in which all survey questions had a mean below 4.0 and, as a result, also, had the lowest sample mean at 3.73. The mean for question 17 was the highest for this section of the survey with an average of 3.81. Of the 145 responses to this question, 60% (n=87) agreed and 15.87% (n=23) strongly agreed they could identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively. Question 15 had the lowest average with a mean of 3.68 for designing technology-enriched learning experiences that encourage all students to pursue their individual interests, preferences, and differences. Thirty-four participants, or 23.45%, stated they neither agreed nor disagreed; and over 66% agreed to some extent.

Table 10

Digital Content and Instruction Survey Responses (n=145)

Survey Item	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Mean
	%	n	%	n	%	n	%	n	%	n	
15. Design technology-enriched learning experiences that encourage all students to pursue their individual interests, preferences, and differences.	2.76	4	7.59	11	23.45	34	51.03	74	15.17	22	3.68
16. Lead all students in becoming active participants in setting educational goals, managing learning, and assessing their progress through digital tools.	2.07	3	8.97	13	18.62	27	53.10	77	17.24	25	3.74
17. Identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively.	2.07	3	6.21	9	15.86	23	60.00	87	15.86	23	3.81
18. Immerse students in exploring relevant issues and analyze authentic problems through digital tools and resources.	2.76	4	8.97	13	22.76	33	44.14	64	21.38	31	3.72
19. Evaluate and appropriately modify the form and function of the physical learning environment to create a conducive digital learning environment.	2.76	4	8.97	13	17.24	25	55.17	80	15.86	23	3.72

One-way ANOVA analyses of these questions yielded no significant differences between years of teaching experience, grade levels taught, or respondent highest level of education; however, the p value from a one-way ANOVA for question 18 was .002 based on the grade levels taught. When asked about immersing students in the exploration of relevant issues and analyzing authentic problems through digital tools and resources, K-5

teachers (M=3.35) had a significantly lower mean rating than 6-8 (M=3.96) and 9-12 teachers (M=3.90). These differences were determined to be significant based on an analysis of the responses through *t* tests comparing each group with the other. The number of years of experience and the educational level of the respondents revealed no significant differences among the groups.

Question 19 asked participants about their ability to evaluate and appropriately modify the form and function of the physical learning environment to create a conducive digital learning environment. Single factor ANOVA analysis also disclosed a significant difference for elementary teachers when compared with those in middle and high schools with a p value of .04; therefore, the researcher ran *t* tests and analyzed the results. The findings indicated a significant difference between K-5 and 6-8 teachers for this question. The difference between K-5 and 9-12 teachers was just at the threshold for statistical significance of P(T<=t) two-tail value of 0.51. The mean of this item for K-5 teachers was 3.52 while it was 3.98 for 6-8 and 3.65 for 9-12 educators. There were no statistical differences based on respondent highest educational level or years of experience.

Interview subjects were asked to explain how they used technology tools and resources for instruction, such as to personalize learning and engage students in question 6. Question 7 asked the respondents to explain how they encouraged creativity, critical thinking, communication, collaboration, and authentic problem-solving using digital tools and resources. The researcher coded and analyzed their responses to determine how teachers use digital content and resources for instruction. The results of this analysis showed 100% of the subjects design technology-rich learning experiences that encourage all students to pursue their individual interests, preferences, and differences with 11 excerpts coded for this competency. MS 1 used monthly independent reading

assignments to introduce students to various technology tools, such as presentation tools like PowerPoint and Prezi, whereby students choose one of these tools for their interests and needs. ES 2 and HS 1 described similar ways of encouraging freedom in learning experiences. HS 1 stated, "You know, here's the goal, here's the topic I want you to cover, but how you present it to the class and how you compile it is up to you" (personal communication, October 18, 2017), and she added that she enjoys learning about new tools from the students during these assignments. She disclosed the desire to provide students with choices for demonstrating learning came through a book study on teaching digital natives, which cautioned teachers not to limit students. ES 2 described a bulletin board in her classroom with various technology tools and their uses for students to employ as a reference when selecting how to share their learning. MS 2 explained how she used English and Spanish resources within Discovery Education for a learner in one of her middle school classes who has limited English proficiency. She also stated she used leveled assignments to meet student diverse needs. HS 2 explained how she used technology to deliver content to visual, auditory, and kinesthetic learners. ES 1 used learning stations to expose students to encourage students to work at their own levels on topics of interest.

In addition, the 16 coded excerpts of respondents indicated how they identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively. This competency had the greatest number of coded excerpts with comments that represented all six respondents. ES 1 stated she uses interactive tools, such as one requiring students to analyze changes in pitch, to encourage critical thinking and collaboration. ES 2 described her instructional use of Seesaw to require students to

create responses, such as BookSnaps, regarding their thoughts about the books they are reading. MS 2 used technology to supplement limited resources impacting upon the number of science labs students can complete. "They can run a lab, like a PhET lab, and we don't have a calorimeter to burn up food and get the calories from, but that simulator does it, so they get the idea" (MS 2, personal communication, October 18, 2017). She further explained the highly personalized pace of her classroom can limit peer-to-peer collaboration and communication because students are working on such diverse tasks. Hence, while she knew she was better in some areas of this competency, there were some aspects in which she struggled. The four middle and high school teachers spoke of their use of Google Docs for collaboration and communication. HS 2 explained how she used a Google Doc to conduct a Strengths, Weaknesses, Opportunities, and Threats analysis with students. MS 1 described teaching his students to create collaborative note documents to demonstrate the power in multiple perspectives and listeners. MS 2 gathered resources from multiple sources and presented this information in a collaborative document to students. HS 1 elaborated on her use of Google Classroom and asserted,

> I know I keep talking about, like Google, but that's a game changer for me. The fact that the kids can all work on the same document at the same time, that's really been awesome for collaboration, and then you can see as a teacher who worked on what. (personal communication, October 18, 2017)

ES 1 and MS 2 were the only subjects with responses coded for leading all students to become active participants in setting educational goals, managing learning, and assessing their progress through digital tools. ES 1 described how she has students watch videos of their musical performances, critique their work, and establish areas of

improvement. MS 2 explained how she used leveled assignments with students to help them find and conduct appropriately challenging activities but added managing this could be a concern for some teachers. She stated,

> You get a little overwhelmed sometimes trying to make that, keep all those pie plates spinning in the classroom, but they do a good job because I make a big point in the beginning to teach them how to manage themselves, the expectations of the room, and how to find what they need. (MS 2, personal communication, October 18, 2017)

Table 11 presents a comparison of the item means for digital content and instruction with the number of excerpts coded from the interview responses. One area of digital content and instruction had no responses coded from the six interview respondents. This competency was immersing students in exploring relevant issues and analyzing authentic problems through digital tools and resources, and it had an average response of 3.72. K-5 teachers had a lower mean than those in Grades 6-8 and 9-12 when the researcher analyzed subgroup responses, but she was unable to attain a deeper understanding of this discrepancy due of a lack of coded interview responses.

Table 11

Comparison of Item Means and Coded Excerpts for Content and Instruction

Competency	Item Mean	Coded Excerpts
Design technology-enriched learning experiences that encourage all students to pursue their individual interests, preferences, and differences.	3.68	11
Lead all students in becoming active participants in setting educational goals, managing learning, and assessing their progress through digital tools.	3.74	4
Identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively.	3.81	16
Immerse students in exploring relevant issues and analyze authentic problems through digital tools and resources.	3.72	0
Evaluate and appropriately modify the form and function of the physical learning environment to create a conducive digital learning environment.	3.72	2

Analysis of the survey results indicated a difference in the means of responses based on grade levels taught with K-5 teachers being lower than 6-8 and 9-12 teachers in evaluating and appropriately modifying the form and function of the physical learning environment to create a conducive digital learning environment. This competency only had two coded excerpts, and MS 2 stated both. She described arranging her classroom tables such that student backs are to her when they are working on their Chromebooks, which means the screens face her. "You cannot just have your Chromebooks facing away from you. So it needs to be set up so that the room is something that you can quickly, at a glance, look up and look from whatever angle you're at" (MS 2, personal communication, October 18, 2017).

Question 17 had the greatest mean for the survey items in this focus area (M=3.81) as well as the most coded excerpts. This competency was the only one aligned with the items from the Digital Learning Environment on the AdvancED ELEOT. Table 12 presents the findings from District Z's AdvancED (2015) observations. The ELEOT scores were based on student-focused observations made throughout the district's 16 schools during their most recent review. The overall score for this area was 1.57 of 4. A rating of 4 indicates the item is very evident, 3 is evident, 2 is somewhat evident, and 1 is not observed. The item with the lowest rating was uses digital tools/technology to communicate and work collaboratively for learning (M=1.34). The highest average observed score was 1.75 for uses digital tools/technology to gather, evaluate, and/or use information for learning. Student use in this area was evident to some degree in 38.23% of the classrooms. Student use of digital tools/technology to conduct research, solve problems, and/or create original works for learning had an average of 1.62.

Table 12

District Z's ELEOT Scores for Digital Learning Environment (AdvancED, 2015)

Behavior Observed	Not observed 1	Somewhat Evident 2	Evident 3	Very Evident 4	Average Rating
Uses digital tools/technology to gather, evaluate, and/or use information for learning	61.76%	11.76%	16.18%	10.29%	1.75
Uses of digital tools/ technology to conduct research, solve problems, and/or create original works for learning	70.59%	7.35%	11.76%	10.29%	1.62
Uses digital tools/technology to communicate and work collaboratively for learning	83.82%	4.41%	5.88%	5.88%	1.34

Teachers reported they use digital content and resources for instruction to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively. Interview respondents explained how they provided students with choices of technology tools to demonstrate content knowledge. Cited as used frequently by teachers and students were Google Suite tools, such as Classroom and Docs. Despite teachers self-reporting use of these and other tools by students, ELEOT results did not support prevalent student-centered use of technology. Item analysis in this focus area indicated disparities between grade levels as K-5 teachers were less likely than those of Grades 6-12 to immerse students in exploring relevant issues and analyze authentic problems as well as evaluating and appropriately modifying the form and function of the physical learning environment to create conducive digital learning environments.

Research Question 4

How do teachers use technology for data and assessment? Survey questions 20, 21, 22, 23, 24, 25, and 26 asked study participants to indicate the degree to which they agreed they were able to use technology for data and assessment. Interview question 8 invited teachers to describe ways they used technology for data and assessment. Questions for both measurement tools aligned with the NC Digital Learning Competencies (NCDPI Digital Teaching and Learning Division, 2016). Respondents rated their opinions on a Likert scale of 1 (strongly disagree) to 5 (strongly agree). Based on the calculated Cronbach's alpha of .93, the results for this section were reliable. The sample mean for questions 20-26 was 3.81, and Table 13 presents the individual results for these questions.

The one-way ANOVA analyses for the survey questions in this section yielded no

significant differences when comparing responses for years of teaching experience, grade levels taught, or participant highest level of education. Of the seven questions in this section, two had a mean greater than 4.0. Question 22 had the greatest mean with 63.77% (n=88) agreeing and 28.26% (n=39) strongly agreeing for an average of 4.17. This question asked respondents about their abilities to utilize multiple and varied forms of assessment including examples of student work products, and only three participants indicated disagreement to some degree. Question 20, that is, integrate digitally enhanced formative and summative assessments as part of the teaching and learning process, had a mean of 4.05 with 60.87% (n=84) agreeing and 26.09% strongly agreeing (n=36).

Table 13

Data and Assessment Survey Responses (n=138)

Survey Items	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Mean
	%	n	%	n	%	n	%	n	%	n	
20. Integrate digitally enhanced formative and summative assessments as a part of the teaching and learning process.	1.45	2	5.07	7	6.52	9	60.87	84	26.09	36	4.05
21. Use performance data and digital tools to empower student metacognition for self-assessment & self-monitoring their own learning progress.	4.35	6	5.07	7	18.84	26	55.80	77	15.94	22	3.74
22. Utilize multiple and varied forms of assessment including examples of student work products.	1.45	2	0.72	1	5.80	8	63.77	88	28.26	39	4.17
23. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to create individual learner profiles of strengths, weaknesses, interests, skills, gaps, and preferences.	2.17	3	10.87	15	18.84	26	54.35	75	13.77	19	3.67
24. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to inform, personalize, and calibrate individual learning experiences.	2.90	4	7.25	10	21.74	30	57.25	79	10.87	15	3.66
25. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile.	2.90	4	8.70	12	20.29	28	57.97	80	10.14	14	3.64

(continued)

Survey Items	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Mean
	%	n	%	n	%	n	%	n	%	n	
26. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to reflect and improve upon instructional practice.	2.17	3	9.42	13	16.67	23	57.25	79	14.49	20	3.72

The competency with the lowest mean response rating in this section and second lowest of all the survey questions was question 25, which asked about teacher capabilities in utilizing technology and digital tools to synthesize and apply qualitative and quantitative data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile. Of the 138 responses, 57.97% (n=80) agreed and 10.14% (n=14) strongly agreed for a mean of 3.64. Question 24 had a mean of 3.66, making it the second lowest score in data and assessment. More than 21% (n=30) neither agreed nor disagreed and 68% (n=94) agreed, to some extent, that they could utilize technology and digital tools to synthesize and apply qualitative and quantitative data to inform, personalize, and calibrate individual learning experiences.

Interview question 8 asked Teacher of the Year respondents to explain how they used technology for data and assessment, and 100% of respondents indicated they integrated digitally enhanced formative and summative assessments as part of the teaching and learning process. This competency was the only one in this focus area with at least one excerpt coded for each of the six subjects. ES 1 spoke about videotaping student performances and having them view, critique, and reflect on their work. ES 2 explained how the rubrics in Seesaw allowed her to formatively assess student learning and view the color-coded data within the program to make instructional decisions for the following day or week. MS 1 said he used Schoolnet and Google Forms to assess

students and chose the assessment tool based on the skills he assessed as well as the style of assessment he performed. MS 2 stated she liked the instantaneous feedback that online assessments give students and described Sown to Grown, a new assessment tool she had used. HS 1 explained her use of benchmark assessments in Schoolnet along with data from Read Works to target reading comprehension in social studies texts. HS 2 described how an assistant principal encouraged her and colleagues to use data to make instructional decisions, so she has used assessments from Schoolnet and Quia, an online quiz-style review program.

Four of the six participants had at least one excerpt coded for the competency utilizing technology and digital tools to synthesize and apply data to create learner profiles. ES 2 explained she preferred the use of Seesaw for quick assessments rather than waiting for district-wide benchmark assessments. She stated, "Let's see how they did, and look at it, and make groups for next week or tomorrow and not have to wait for those benchmarks" (personal communication, October 18, 2017). MS 1 described his use of Google Forms to collect the academic and behavioral data of students, which had extended beyond his classroom as teachers throughout the school began utilizing this tool. For MS 2, formative assessment was appealing because it was not high stakes testing, so students could monitor their progress and retake assessments as necessary. The need to examine multiple sources of data was something HS 1 advocated teachers do; and she explained using EVAAS data with benchmark data, grades, and observational notes from class to determine student strengths, weaknesses, and skill gaps.

The remaining competencies in this focus area had a code applied to 33% or less of subject responses. The only two teachers to have responses aligned with using performance data and digital tools to empower student metacognition for self-assessment

and self-monitoring of their own learning progress were ES 1 and MS 2. For this competency, ES 1 explained how students develop an evaluation system and critique a recorded performance to determine their success. As previously stated, MS 2 (personal communication, October 18, 2017) began using a program called Sown to Grow to track student progress, which empowered students to input data such as self-reflections and grades on quizzes.

ES 2 and HS 1 described utilizing multiple and varied forms of assessment including examples of student work products. For HS 1 (personal communication, October 18, 2017), the use of rubrics added into Google Docs helped her assessment of student work. As Seesaw recorded pictures, videos, and text, this enabled ES 2 (personal communication, October 18, 2017) to analyze multiple sources of data for each of her students and make instructional decisions based on the results. They were the only two participants with responses coded for this competency.

Two interviewees also had responses coded for utilizing technology and digital tools to synthesize and apply data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile. ES 2 explained how she used data from Seesaw to guide her next steps with students:

> So, this Seesaw program that we use, when I give them a task and they show me their work, however, they want to show it to me, when it comes back to me, I can grade it on a one, two, three, four, and then it shows me all the kids' work and it looks like yellow, green, or red. And then I can just quickly look at it and say, OK, all of them can do a number talk with two-digit numbers. Here are my two that couldn't think of a second strategy. Let me pull them tomorrow and we'll work on second strategy for them. (personal communication, October 18, 2017)

HS 1 described how her data analysis from online benchmark assessments guided her remediation instruction for struggling students and her plans to use an online reading comprehension tool to help students:

> They should have all grown even if they're not above the 60% threshold that Schoolnet says is passing. So, are there students who didn't grow or are there students that regressed instead of grew? Are there students that are still way far off the target, and those are ones that I have started kind of focusing remediation on for the rest of the semester? And, so I did that yesterday actually, kind of make a spreadsheet and look at their scores and highlight the ones that I think I need to work on and put asterisks next to the ones that have gone down. And so now I'm going to start- we have something that's new this year called [Mascot] Lunch, which we've extended lunch to 45 minutes and we have targeted tutoring time that happens during that. We have clubs that happen during that. The students can choose where to go on some days, but we also have the right to say you need to come on these days. And so, I'm going to start assigning students to come during that time. (personal communication, October 18, 2017)

Only HS 2 had a response excerpt coded for the competency utilizing technology and digital tools to synthesize and apply qualitative and quantitative data to reflect and improve upon instructional practices. She spoke about the influence of an assistant principal at her school who encouraged teachers to analyze data and use it to guide their instruction and how, despite her initial resistance to doing so, she had grown professionally from the experience (HS 2, personal communication, October 18, 2017). She stated,

> We tend to be very resistant to providing data because we feel like it is, you

> know, one more step and one more thing to look at. And if I'm teaching, if I'm producing, why not just let me continue to do that? And even I was that way in the beginning, but whenever our current assistant principal said, you know, I would like for you to embrace this, and as a department chair, you know, that's important that I model good behavior. So, I do what I'm supposed to do, but what I found out is it really does tell me something. It really does show me where my deficiencies are as a teacher and some things that I need to review before a midterm and things that I need to review before final exams so that we can hope that- we can be more strategic in what we do. It's work smarter, not harder. (personal communication, October 18, 2017)

None of the interview participant responses were coded to describe how teachers utilized technology and digital tools to synthesize and apply data to inform, personalize, and calibrate individual learning experiences. While it was the only competency in this focus area without any coded excerpts, it did not have the lowest item mean. Table 14 presents a comparison of the item means and the number of excerpts coded for each competency. A review of this table illustrated that other than integrating digitally enhanced formative and summative assessments as part of the teaching and learning process, which had the highest number of excerpts coded (n=12) and an item mean of 4.05, which placed it above the sample mean of 3.81 for this area, there were no other strong indicators of support with coded excerpts reinforcing the average for the competency.

Table 14

Comparison of Item Means and Coded Excerpts for Data and Assessment

Competency	Item Mean	Coded Excerpts
Integrate digitally enhanced formative and summative assessments as a part of the teaching and learning process.	4.05	12
Use performance data and digital tools to empower student metacognition for self-assessment & self-monitoring their own learning progress.	3.74	4
Utilize multiple and varied forms of assessment including examples of student work products.	4.17	2
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to create individual learner profiles of strengths, weaknesses, interests, skills, gaps, and preferences.	3.67	6
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to inform, personalize, and calibrate individual learning experiences.	3.66	0
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile.	3.64	4
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to reflect and improve upon instructional practice.	3.72	1

Data showed teachers used technology for digitally enhanced formative and summative assessments as part of the teaching and learning process. When assessing learning, teachers indicated they utilize multiple and varied forms of assessment including examples of student work products. Interview data showed the use of Schoolnet and many other formative assessment tools such as Google Forms, Quia, and Sown to Grow. Teachers stated they like the quick feedback provided to students when

assessed electronically. They were less specific in stating how they synthesize and apply data to make instructional decisions as three of four surveys pertaining to these competencies had averages below the sample mean for this focus area.

Summary

This chapter incorporated the data from surveys, interviews, and classroom observations to explain how the instructional practices of teachers in District Z align with digital learning environments. A total of 187 K-12 teachers with varying years of instructional experience ranging from one to more than 31 participated in the survey. These participants had undergraduate, graduate, and advanced degrees. The researcher interviewed six Teachers of the Year and asked five questions related to their instructional practices. The interview subjects included two teachers at each level of elementary, middle, and high school. Their years of experience ranged from 10-21, and they had associate's, bachelor's, or master's degrees. The researcher obtained ELEOT data from District Z's most recent AdvancED accreditation review to provide additional information regarding how teachers and students were observed using technology during instruction.

This chapter presented the results for each of the four research questions, which aligned with the focus areas of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016) that serves as the theoretical framework for this study. The researcher calculated Cronbach's alpha scores to determine the internal consistency of each section of the survey and found the results to be acceptably reliable for all four areas. While the digital citizenship competencies had the greatest sample mean of 4.03 for survey responses, they also had the lowest total number of excerpts coded from interview responses (n=25). Leadership in digital

learning had the most excerpts coded from interview data (n=35) and the second highest sample mean at 4.0. Digital content and instruction had a sample mean of 3.73, ranking it the lowest of the four areas.

The item with the largest mean (M=4.44) was engaging in responsible and professional digital social interaction. The lowest average for a survey item was 3.54 for demonstrating leadership for technology innovation beyond one's own classroom. The competency with the most excerpts tagged when interview responses were coded was identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively, with a total of 16. Digital citizenship, digital content and instruction, and data and assessment each had one competency with zero excerpts coded for alignment.

The researcher also described District Z's ratings for digital learning from AdvancED's classroom observation tool. The findings reported an overall rating of 1.57 of 4 for student-use of digital tools/technology for various tasks including using information for learning, conducting research, and working collaboratively. Chapter 5 presents a discussion of the findings identifying implications for practice and recommendations for further research.

Chapter 5: Discussion

This chapter presents a summary of the findings, recommendations based on the findings, implications for practice, and recommendations for future research. The purpose of this study was to determine how teacher instructional practices align with digital learning environments; therefore, this mixed-methods study included survey and interview data aligned with the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016) as well as data from AdvancED (2015) classroom observations. The NCSBOE approved these competencies in 2016 for implementation beginning in 2017-2018. Consequently, it was necessary to investigate how teacher current practices align with the competencies to prioritize and target areas for improvement.

The research questions for this study were

1. How do teachers demonstrate leadership in digital learning?
2. How do teachers model and teach digital citizenship?
3. How do teachers use digital content and resources for instruction?
4. How do teachers use technology for data and assessment?

To answer these questions, the researchers collected quantitative data through a survey of 187 K-12 teachers in a district within southeastern NC. Survey questions were aligned with the theoretical framework for this study, that is, the NC Digital Learning Competencies for Classroom Teachers. Six interviews with Teachers of the Year from the district's schools provided qualitative data with questions asking participants to explain how they demonstrate each of the four focus areas from the competencies. District Z officials provided additional observation data in the form of AdvancEd's ELEOT. Chapter 4 contained the data analysis, and the findings are presented in this

chapter. The purpose of these findings and recommendations is to inform practices for the support of teachers in the transition to digital learning as well as the implementation of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016).

Findings

The findings from this research were divided into the four areas of the NC Digital Learning Competencies for Classroom Teachers and are presented in that manner. These four areas are leadership in digital learning, digital citizenship, digital content and instruction, and data and assessment. The findings were also presented in this way to match the organization of the survey questions and interview questions.

Leadership in digital learning. Taking initiative with one's own professional growth to inform practice was an overall strength among the competencies and the highest rated task in this focus area based on the survey and interview data. As existing research (Almekhlafi & Almeqdadi, 2010; Ertmer et al., 2006-2007) found and survey results and interview responses from this study indicated, intrinsically motivated teachers overcome barriers to technology use to advance their own practices. In this study, the greatest obstacle teachers described was the lack of opportunities for professional growth offered by District Z. NCTWC survey results from 2014 and 2016 supported professional development opportunities as a barrier. During this time, District Z's teachers felt they had less training to utilize technology for instruction, as the rating decreased from 73.6% to 72.0%, placing it below the state average of 75.9% (New Teacher Center, 2016). They used technology as one way to meet this challenge by engaging in virtual learning communities as well as modeling and sharing tools with colleagues. These findings indicated teachers are intrinsically motivated to grow as

professionals and improve student learning. Teachers used virtual and face-to-face learning communities as resources for sharing and learning from colleagues, especially when a teacher was the only person in his/her building in that subject area.

K-5 teachers demonstrated weakness in leadership beyond their own classrooms. This competency was the lowest on the survey, and the elementary school teachers interviewed admitted they had not found many opportunities to be instructional leaders with technology. While these teachers seemed confident in their use of technology and intrinsically motivated to improve their practices, these beliefs did not necessarily translate into increased opportunities to be leaders. Data analysis did not find that this discrepancy was based on the years of teaching experience, so there was no evidence to indicate veteran teacher status equated to leadership opportunities for elementary school teachers. The data indicated teachers take initiative with their own professional growth to inform practice, but the resources they find may not allow them to be leaders nor do they necessarily have opportunities to share what they have learned with colleagues. Pairing elementary teachers with digital learning mentors from middle and high schools could provide support for growth in practices. The K-5 teachers could then serve as mentors for teachers within their own professional learning communities or grade-level teams, which would provide them the opportunity to become a leader.

Digital citizenship. This focus area of the competencies had the greatest sample mean (4.03) but the least number of coded excerpts (n=25). This disparity revealed that teachers believed they could demonstrate competencies in digital citizenship but could not elaborate on how they put those abilities into practice. Teachers identified several barriers in this focus area. HS 2 referenced a change in the curriculum, which meant she no longer had time for a research project she used to integrate copyright law and fair use

guidelines. HS 1 explained she previously used Remind, an online communication tool and application, with students and parents/guardians, but the district no longer allowed the medium. MS 2 spoke of concerns with cyberbullying causing her to limit student abilities to comment on each other's work. Ertmer et al. (2006-2007) found that teachers will overcome obstacles based on their beliefs, vision, and commitment to technology use, but these findings did not support that conclusion.

The highest item mean of the survey was 4.44 for engaging in responsible and professional digital social interaction. As one-way ANOVA tests did not indicate a statistical difference among grade levels, years of experience, or highest level of education, the results indicated all teachers could demonstrate this competency. Although the item mean was well above the sample mean, the number of items coded from interview responses was only four. While it was not the lowest coded item in this section, it did reveal a difference in potential compared with practice. ES 2 stated she engages in commenting through Seesaw, MS 2 described using Google Classroom for commenting, and HS 1 described texting senior students who take classes off campus.

Results from *t* tests demonstrated a significant difference about respondent highest level of education when teaching and requiring the use of copyright law and fair use in student work and creation. While there were only two survey respondents with doctoral degrees for this item, the significantly lower mean of 2.5 compared with 4.04 for bachelor's and 4.19 for master's may require further investigation. None of the interview subjects had doctoral degrees, so this phenomenon could not be investigated further during the interview data analysis to determine why there would be a difference in this area based on highest level of education.

P21 defines global awareness as "learning from and working collaboratively with

individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts" (Partnership for 21st Century Learning, 2015, p. 2). It has been included as a 21st century theme since the publication of the Framework for 21st Century Learning in 2007 (Partnership for 21st Century Learning, 2016). Given the development of this term over the past decade, the significant difference found in survey responses for question 13 pertaining to the demonstration of global awareness through engaging with other cultures via advanced communication and collaboration tools for years of experience may be a result of increased emphasis in undergraduate teacher preparation coursework. Teachers with 1-5 years of experience had the highest mean (4.26) and 6-10 years of experience had the second highest (M=3.89). None of the interview subjects described demonstrating this competency, but their years of experience ranged from 10-21. Teachers with 11-25 years of experience may not have had professional development targeted at this 21st century theme or discussed it during teacher preparation coursework because it was not taught then. Teachers with at least 26 years of experience did not show a significant difference in their mean, which could be the result of their veteran teacher status providing them with opportunities to learn from student interns trained in demonstrating global awareness or their general experiences in all areas of education based on overall professional development opportunities.

Digital content and instruction. The results from this study showed that although digital content and instruction had the lowest sample mean (M=3.73), teachers were able to explain many ways they identify, evaluate, and utilize appropriate digital tools and resources to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively. Of the tools referenced in interview

excerpts, Google Suite, including Classroom and Docs, displayed the greatest evidence of use and impact on instruction. HS 1 specifically identified it as a game changer in her instruction. All interview respondents indicated they used Google Suite tools professionally; and five of the six stated specific examples of how they have used at least one of these tools with students for creation, communication, and collaboration. Thompson (2015) found K-5 teachers who have a positive attitude toward technology integration regularly used tools to engage students and increase learning. This research extends Thompson's findings to K-12 classrooms.

AdvancED (n.d.) has used ELEOT since 2012 in more than 45,000 classroom observations internationally. The averages from these observations indicated the lowest of the seven environments measured was digital learning with a score of 1.88, and the behaviors observed aligned with the digital content and instruction area of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). District Z's digital learning score of 1.57 placed it below the organization's average. This focus area also had the lowest sample mean at 3.73. Although all interview participants stated they used tools for creation, communication, collaboration, and research as teachers, five of the six described using technology in these ways with students. This difference could be related to low observational ratings on the ELEOT if students are not the main users of technology. ES 1 did not mention specific tools and resources for student use, which could be significant given two other survey items in this focus area exhibited significantly lower means for elementary teachers when compared with those in middle and high schools. Immersion of students in the exploration of relevant issues and analysis of authentic problems through digital tools and resources was an area of weakness for K-5 teachers; and in addition, none of the K-12

teachers referenced this competency in their interview responses. Only one middle school teacher addressed evaluating and appropriately modifying the form and function of the physical learning environment to create a conducive digital learning environment, which was another area in which K-5 rated significantly lower than those in Grades 6-12.

Data and assessment. As Koehler and Mishra (2009) found, there is no one-size-fits-all technology tool or solution for all teachers. The results from survey and interview data in this research study support that statement. When the researcher analyzed the survey results for grade levels taught, years of experience, or highest level of education, there were no differences among the subgroups. The review of the excerpts coded for this focus area indicated all teachers used digitally enhanced formative and summative assessments as part of the teaching and learning process, but the tools used vary depending on the need.

Aside from this competency, the other six competencies in the data and assessment focus area showed a higher mean response rating and fewer interview excerpts coded or vice versa. The conclusion from this review was that teachers are using digital tools for assessment, but the specific tools and their use vary. While participants cited Schoolnet for benchmark assessments, it was teachers taking initiative to improve their own practices in support of student growth who found many of the other assessment tools and programs; such tools included Google Forms, Seesaw, Study Island, Read Works, Sown to Grow, Quizlet, and Quizizz. What was also missing from interview responses were specific plans of action based on assessment results and teacher reflection in order to improve upon instructional practices. ES 2 and HS 1 were the only participants to describe taking specific actions after identifying student weaknesses. Only HS 2 explained how she reviews assessment data to target areas for growth, and she did

so after being encouraged by an assistant principal to act on the information. Teachers should not only assess students but also use that data to make changes to instruction.

Recommendations from Findings

While data does not answer questions, it does provide the lenses through which educators and administrators can reflect upon and better understand their situations (Earl & Katz, 2010). Successful school reform comes from the inside out with support of adult growth and learning (Drago-Severson, 2009). As Learning Forward (n.d.) advocates, professional learning for educators improves their practices, which in turn increases student learning. Drago-Severson (2009) identified four pillar practices for leading adult learners: teaming, providing leadership roles, collegial inquiry, and mentoring. By creating mentoring communities, or places in which educators not only support one another but also challenge each other to grow, schools become places that nurture learning opportunities for both students and adults (Drago-Severson, 2009). The following recommendations were based on the existing research regarding professional learning (Learning Forward, n.d.) and adult learners (Drago-Severson, 2009) as well as findings from the preceding data analysis divided into the areas suggested by the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016).

Leadership in digital learning. Providing leadership roles is one of the four pillar principles for leading adult learners (Drago-Severson, 2009). Based on the research findings, K-5 teachers may need additional opportunities to serve as leaders in technology innovation outside of their classrooms. Given that middle and high school teachers had a significantly higher mean rating for this competency, they could provide support for elementary teachers. Additionally, given three of the six interview subjects

cited limited professional development provided by their district, District Z may want to specifically encourage K-5 teachers to lead online or face-to-face learning communities. Professional development opportunities in which elementary teachers share their best practices for technology use with each other would build leadership capacity within or outside of the district. It would also be beneficial to encourage more classroom teachers to participate in NCDLCN, the cohort of educators from across NC working together to build capacity with digital learning practices, under the leadership of the Friday Institute for Educational Innovation.

Digital citizenship. While the survey results show digital citizenship was a strength among teachers, the interview results did not support that idea with specific examples as to how they apply this knowledge with instruction. Further investigation of the ways in which teachers demonstrate digital citizenship competencies in the classroom is necessary. Additional investigation could determine whether this focus area is, in fact, a strength among teachers in this district, especially for engaging in responsible and professional digital social interaction, or if the interview subjects did not substantially describe their efforts in this area. Media coordinators have traditionally served as leaders in digital citizenship. Enlisting their help with classroom teachers and ensuring they have opportunities to mentor teachers in this area would also be beneficial. In addition, District Z should target professional development focused on using communication and collaboration tools to demonstrate global awareness by engaging with other cultures for teachers with 11-25 years of experience. Establishing mentoring communities (Drago-Severson, 2009) led by teachers with 1-10 years of experience could help support growth in this area and would have the added benefit of providing another way in which teachers in District Z could serve as leaders outside of their own classrooms.

Digital content and instruction. To improve its ELEOT score in digital learning, District Z should investigate technology use to ensure students, and not just teachers, use digital content and instruction. Specific, targeted professional learning in this area would help teachers improve their practices, which would in turn impact student use of technology as well as their achievement (Learning Forward, n.d.). Elementary school teachers should have priority in this investigation because of their lower means in two of the five competencies in this area. Also, continuing use of Google Suite should occur in the district because of the high reported use of its tools and the many ways teachers have found to encourage creation, communication, collaboration, and problem-solving. Given the frequent citing of the use of Google Suite, it would be beneficial to determine ways students could use these tools to explore relevant issues and analyze authentic problems. Doing so would also help teachers identify the thinking students should undertake to complete such tasks, which will have a long-term impact in making them college and career ready.

Data and assessment. Because the list of tools teachers stated they use for formative assessment included a wide array of items, it would be beneficial for District Z instructional technology leaders to compile a resource bank with vetted tools for student progress monitoring. By reviewing the assessment resources, leaders could also ensure qualitative and quantitative data are collected as the digital learning competencies require. Interview responses from this study showed teachers used primarily quantitative tools to assess learning. Teachers demonstrated their capabilities in locating digital assessment tools, but they did not describe a process of vetting the resource to determine whether assessment data obtained would be valid, reliable, and/or confidential if stored within the online program. Having administrators advocate for not just the collection of

data but also its use when making instructional decisions would also be helpful in encouraging teachers to do more than merely collect information. Teachers should use data from assessments when they engage in collegial conversations focused on student learning. Doing so will show they are recognizing how the technology is used is more important than being able to show their students have the capability to test on a computer. As West (2016) explained, changes in teaching and learning are more important than the presence of devices.

Implications for Practice

The researcher conducted this study in a district in southeastern NC and believes the results are useful to other schools and agencies tasked with implementing the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). Review of the Digital Learning Progress Rubric Self-Assessment (Friday Institute for Educational Innovation, 2015) and NCTWC survey from 2014 and 2016 (New Teacher Center, 2016) indicated District Z has made an effort to move from traditional classroom instruction to digital learning environments. With the implementation of the competencies in 2017, LEAs throughout the state need to understand how districts who have met and/or exceeded state averages on recognized measures of progress compare with their status. Doing so will help them target their own implementation steps.

Important to remember is the focus should not just be on the tools used in schools but how those resources impact student learning. The focus of digital learning environments is empowering and engaging of students in personalized, relevant instruction, which is different from traditional teacher-centered instruction (Friday Institute for Educational Innovation, 2015; Kemker, 2005). The results of this study

indicate teachers recognize the benefits of technology, which existing research supports (Capo & Orellana, 2011; Ertmer et al., 2006-2007). As Day (2014) advocated, technology can enhance education and create engaging learning opportunities for students. The results of this study indicate teachers in District Z are using digital tools and resources; now the district must ensure professional learning provides support to make progress toward engaging and empowering instruction for students. Teachers expressed a willingness to overcome barriers such as a lack of technological resources and relevant professional development to improve their professional practices. Almekhlafi and Almeqdadi's (2010) research relating to high self-perception and reported willingness to surpass barriers supports this finding; however, it is not only the teacher's job in surpassing these challenges. Administrators, media coordinators, and the district's instructional technology leader must also work with teachers to provide opportunities to serve in leadership roles, teams for collegial inquiry, and as mentors (Drago-Severson, 2009).

Reviewing the survey results and interview responses, the researcher believes teachers in this district desire professional development to grow and improve student learning. While the evidence supports they will take the initiative in informing their own practices, several teachers stated they lacked opportunities to communicate and collaborate with their counterparts across the district. An added benefit of this professional development could be providing opportunities for K-5 teachers to demonstrate leadership outside of their classrooms. Since teachers stated they are successfully conducting formative and summative assessments digitally, professional development could target tools some teachers are already using with success by having them serve as mentors or establishing communities within the district for sharing ideas.

Teachers of the Year could lead this professional learning because they demonstrated intrinsic motivation to take initiative and locate assessment tools. They could also serve as digital learning mentors who would support and challenge colleagues to grow in their instructional practices, as working in mentoring communities is one of the four pillar practices of leading adult learners (Drago-Severson, 2009).

If District Z seeks to improve their ELEOT rating for digital learning, it will be necessary to focus on the area of digital content and instruction prior to their next AdvancED review. The observation instrument focuses on the student use of technology rather than teacher use, so it will be necessary to provide support for students as consumers and creators of knowledge. The overall low average for items in this section of the survey may indicate teachers do not feel comfortable demonstrating these competencies. For that reason, professional learning modeling the implementation of these practices would be beneficial to improving student achievement (Learning Forward, n.d.), especially for K-5 teachers who had significantly lower survey ratings for 40% of the competencies in this area.

Future Research

An investigation into the ways elementary school teachers could demonstrate leadership in digital learning would be helpful in providing support in this area. An examination of how middle and high school teachers provide leadership in digital learning could support the development of growth opportunities for K-5 teachers. It would also be beneficial to determine the obstacles preventing teachers from demonstrating the tasks related to the digital citizenship competencies. This study found they can do it, but particular obstacles have hindered their application in the classrooms. This research did not determine the cause of the obstacles or the reasoning as to why

teachers were unable to overcome them.

Further research could also examine teacher preparation programs since 2007 to understand how global awareness has been incorporated into content. As the findings from ELEOT observations are lower on average for digital learning across educational agencies using AdvancED for accreditation, it would be helpful to identify districts with above average ratings for digital learning and investigate the support systems in place leading to high student use of digital tools and resources for gathering information, working collaboratively, and communicating findings.

Conclusion

Stakeholders should move beyond focusing on financial support for devices and Internet connections to also providing support for changes to instructional practices using technology. NCDPI provided the framework for the ways in which teachers and students should use technology in education with the development and implementation of the NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016). This study investigated how teacher instructional practices align with the four areas of digital learning outlined in these competencies. The results of this study indicate teachers are strongest in demonstrating leadership in digital learning. While they have the self-confidence to demonstrate digital citizenship, they lack the implementation of these skills into their instructional practices. For example, they believe they can engage in responsible and professional digital social interaction, but they are not doing so regularly. They are taking initiative regarding developing professionally; but they, not the students, are the users of these digital tools and resources. Teachers use many digital tools and resources for formative and summative assessments; however, they are not consistently reflecting on the results or making

instructional changes based on the results of the assessments.

The findings of this study also indicate that elementary teachers need more support demonstrating these competencies because middle and high school teachers have higher self-confidence in their abilities and application in professional practice. Elementary teachers need support in becoming leaders in technology innovation outside their classrooms. Additionally, K-5 teachers need assistance using digital tools and resources to explore relevant issues and analyze authentic problems as well as support for developing physical layouts conducive to collaborative learning.

Asimov's (1951) vision for technology was innovative for its time, especially considering the invention of personal computers had not yet occurred (Woodford, 2017), though it was quite different compared with today's definition of digital learning environments. Asimov described a mechanical teacher who only gave and scored tests; Kemker (2005), conversely, has advocated for teachers to empower and engage students in learning experiences while developing 21st century skills with content knowledge. Important in the shift to digital learning practices is the intention to improve learner experiences by personalizing learning (CoSN, ISTE, & SETDA, 2013). It is not necessary to fill digital learning environments with digital tools and resources, but these classrooms do need teachers who utilize what is available to improve instructional practices and student learning.

References

Achieve. (n.d.). *College and career readiness.* Retrieved from http://www.achieve.org/college-and-career-readiness

AdvancED. (n.d.). *Examining learning environments: Results from AdvancED's classroom observation tool.* Retrieved from http://www.advanc-ed.org/sites/default/files/mobile_apps/ELEOT/ELEOT_wp.pdf

AdvancED. (2015). *Report of the external review team for District Z.* District Z: Author.

Alliance for Excellent Education's Center for Digital Learning and Policy. (2016). *Digital learning day 2016.* Retrieved April 17, 2016, from http://center.all4ed.org//site/Default.aspx?PageID=71

Almekhlafi, A. G., & Almeqdadi, F. A. (2010). Teachers' perceptions of technology integration in the United Arab Emirates school classrooms. *Educational Technology & Society, 13*(1), 165-175. Retrieved from http://www.ifets.info/journals/13_1/16.pdf

Asimov, I. (1951). *The fun they had.* Retrieved from http://www.sffaudio.com/podcasts/TheFunTheyHadByIsaacAsimov.pdf

Association for Supervision and Curriculum Development. (2016). *ESSA title IV and school health frequently asked questions.* Retrieved from http://www.ascd.org/ASCD/pdf/siteASCD/policy/ESSA-Title-IV-FAQ_Mar32016.pdf

Aziz, H. (2010, September). The 5 keys to educational technology. *THE Journal*. Retrieved from https://thejournal.com/articles/2010/09/16/the-5-keys-to-educational-technology.aspx

Bidwell, A. (2014, February 4). Obama announces nearly $3 billion in educational technology commitments. *U.S. News.* Retrieved from http://www.usnews.com/news/articles/2014/02/04/obama-to-announce-nearly-3-billion-in-education-technology-commitments

Butin, D. (2010). *The education dissertation: A guide for practitioner scholars* [Kindle DX version]. Thousand Oaks, CA: Corwin.

Capo, B. H., & Orellana, A. (2011). Web 2.0 technologies for classroom instruction: High school teachers' perceptions and adoption factors. *Quarterly Review of Distance Education*, *12*(4). Retrieved from http://nsuworks.nova.edu/fse_facarticles/8

Christensen, C. M., Horn, M. B., & Johnson, C. W. (2011). *Disrupting class: How disruptive innovation will change the way the world learns* (Updated and expanded new ed.). New York: McGraw-Hill.

Clarify Education Reporting Requirements, Senate Bill 168, S.L. 2013-226 (2013).

Consortium for School Networking, International Society for Technology in Education, & State Educational Technology Directors Association. (2013). *Support a modernized ed tech program in ESEA reauthorization*. Retrieved from http://www.cosn.org/sites/default/files/ESEA%20one%20pager.pdf

Cottle, A. E. (2010). *Infusing technology: A study of the influence of professional development on how teachers use technology* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3413157)

Couros, G. (2015). *The innovator's mindset*. San Diego, CA: Dave Burgess Consulting, Inc.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Cunningham, J. D., & Bradley, K. D. (n.d.). *Teacher perceptions as an integral component in the development of online learning.* Retrieved from the University of Kentucky website: http://www.uky.edu/~kdbrad2/OnlineLearningTools.pdf

Day, M. (2014, February 4). We heard the president's connectED call-to-action, and here is our billion-dollar response to put affordable technology in the hands of U.S. students nationwide [Web log post]. Retrieved from The Official Microsoft Blog: https://blogs.technet.microsoft.com/microsoft_blog/2014/02/04/we-heard-the-presidents-connected-call-to-action-and-here-is-our-billion-dollar-response-to-put-affordable-technology-in-the-hands-of-u-s-students-nationwide/

Digital Learning Competencies/School Employees, House Bill 23/ S.L. 2013-11 (2013).

District Z. (2016). *Community info.* Retrieved from https://sites.google.com/a/XXXXX.k12.nc.us/pcs-community/about-XXXXXX-county

Drago-Severson, E. (2009). *Leading adult learning: Supporting adult development in our schools*. Thousand Oaks, CA: Corwin.

Earl, L. M., & Katz, S. (2010). Creating a culture of inquiry: Harnessing data for professional learning. In A. M. Blankenstein, P. D. Houston, & R. W. Cole (Eds.), *Data enhanced leadership: The soul of educational leadership series (vol. 7*, pp. 408-777). Thousand Oaks, CA: Corwin. Retrieved from Amazon.

Ertmer, P. A., Ottenbreit-Leftwich, A., & York, C. S. (2006-2007). Exemplary technology-using teachers: Perceptions of factors influencing success. *Journal of Computing in Teacher Education*, *23*(2), 55-61. Retrieved from ERIC Database: http://files.eric.ed.gov/fulltext/EJ876918.pdf

Executive Office of the President. (2001). *President's council of advisors of science and technology* (Executive Order 13226). Retrieved from Office of the Federal Register website: https://www.federalregister.gov/documents/2001/10/03/01-24983/presidents-council-of-advisors-on-science-and-technology

Friday Institute for Educational Innovation. (n.d.). *About NC-DLCN.* Retrieved from http://pllc.fi.ncsu.edu/ncdlcn/about/

Friday Institute for Educational Innovation. (2015, September). *North Carolina digital learning plan: Detailed Plan* [Adobe Reader version]. Retrieved from http://dlplan.fincsu.wpengine.com/wp-content/uploads/sites/11/2015/09/NC-Digital-Learning-Detailed-Plan-9-14-15.pdf

Friedman, T. L., & Mandelbaum, M. (2012). *That used to be us.* New York, NY: Picador.

International Association for K-12 Online Learning. (2013, October). *iNACOL's new learning models vision.* Retrieved from http://www.inacol.org/wp-content/uploads/2015/02/new-learning-models-vision.pdf

International Society for Technology in Education. (2008). *Standards for teachers.* Retrieved from https://www.iste.org/standards/standards/standards-for-teachers

International Society for Technology in Education. (2017). *Essential conditions*. Retrieved from https://www.iste.org/standards/tools-resources/essential-conditions

Kemker, K. (2005). *The digital learning environment: What the research tells us* [Adobe Reader version]. Retrieved from https://fairliemcmahon.files.wordpress.com/2008/10/research-about-digital-learning.pdf

Koehler, M. J., & Mishra, P. (2009). What is technical pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education* [Adobe Reader version]*, 9*(1), 60-70. Retrieved from https://citejournal.s3.amazonaws.com/wp-content/uploads/2016/04/v9i1general1.pdf

Learning Forward. (n.d.). *Standards for professional learning: Overview*. Retrieved from https://learningforward.org/standards

Lemke, C., & Coughlin, E. C. (1998.) *Technology in American schools: Seven dimensions for gauging progress: A policymaker's guide.* Retrieved from http://www.mff.org/assets/Uploads/newsroom_archive/publications/ME158.pdf

Marsh, C. J., & Willis, G. (2007). *Curriculum: Alternative approaches, ongoing issues* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Massachusetts Institute of Technology Office of Digital Learning. (2015). *Value of digital learning*. Retrieved from https://odl.mit.edu/value-digital-learning

National Assessment Governing Board. (2013). *Technology and engineering literacy framework for the 2014 national assessment of educational progress* (Contract number ED08CO0134). Retrieved from https://www.nagb.org/assets/documents/publications/frameworks/technology/2014-technology-framework.pdf

National Center for Education Statistics. (2002). *Technology in schools: Suggestions, tools and guidelines for assessing technology in elementary and secondary education*. Retrieved from https://nces.ed.gov/pubs2003/tech_schools/chapter7.asp

National Center for Education Statistics. (2014). *A new generation of NAEP assessments* [Adobe Reader version]. Retrieved from https://www.nationsreportcard.gov/tel_2014/files/TEL_101_infographic.pdf

National Coordination Office. (n.d.). *President's information technology advisory committee (PITAC)- Archive.* Retrieved from The Networking and Information Technology Research and Development (NITRD) Program website: https://www.nitrd.gov/pitac/

National Governors Association & the Council Chief State School Officers. (2010). *Common core state standards for English language arts and literacy in history/social studies, science, and technical subjects* [Adobe Reader version]. Retrieved from http://www.corestandards.org/wp-content/uploads/ELA_Standards1.pdf

National Governors Association & the Council Chief State School Officers. (2015). *Development process*. Retrieved from http://www.corestandards.org/about-the-standards/development-process/

National Research Council. (2006). Executive summary. In E. Garmire & G. Pearson (Eds.), *Tech tally: Approaches to assessing technology literacy* (pp. 1-18). Retrieved from https://www.nap.edu/read/11691/chapter/2

New Teacher Center. (2016). *NC teacher working conditions*. Retrieved from https://ncteachingconditions.org/results/166

North Carolina Department of Public Instruction Digital Teaching and Learning Division. (2016). *NC digital learning competencies for educators*. Retrieved from http://www.dpi.state.nc.us/dtl/digitallearningnc/competencies/

North Carolina Department of Public Instruction Digital Teaching and Learning Division. (2017). *About the NC digital learning competencies for classroom teachers*. Retrieved from http://www.dpi.state.nc.us/docs/dtl/digitallearningnc/competencies/teacher-dlcompetencies.pdf

North Carolina Department of Public Instruction Educator Effectiveness Division. (2013). *NC professional teaching standards.* Retrieved from http://www.ncpublicschools.org/docs/effectiveness-model/ncees/standards/prof-teach-standards.pdf

Obama, B. (2010). *President's council of advisors on science and technology* (Executive Order: 13539). Retrieved from https://obamawhitehouse.archives.gov/the-press-office/executive-order-presidents-council-advisors-science-and-technology

Partnership for 21st Century Learning. (n.d.). *Our history*. Retrieved from http://www.p21.org/about-us/our-history

Partnership for 21st Century Learning. (2015). *P21 framework definitions* [Adobe Reader version]. Retrieved from http://www.p21.org/storage/documents/docs/P21_Framework_Definitions_New_Logo_2015.pdf

Partnership for 21st Century Learning. (2016). *Framework for 21st century learning* [Adobe Reader version]. Retrieved from http://www.p21.org/storage/documents/docs/P21_framework_0816.pdf

Peters, G., & Woolley, J. T. (Eds.). (n.d.). *The American presidency.* Retrieved from http://www.presidency.ucsb.edu/ws/?pid=2895

Peters, O. (2000, June). Digital learning environments: New possibilities and opportunities. *The International Review of Research in Open and Distributed Learning 1*(1). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/3/336

Pierce, D. (2015, December 10). How ESSA will boost ed-tech funding. *eSchool News.* Retrieved from http://www.eschoolnews.com/2015/12/10/essa-ed-tech-561/

The School Superintendents Association, Association of Educational Service Agencies, Consortium for School Networking, International Society for Technology in Education, National Association of Elementary School Principals, National Association of Secondary School Principals, National Association of State Boards of Education, National Education Association, National PTA, National Rural Education Association, National Rural Education Advocacy Coalition, Partnership for 21st Century Learning, & State Education Technology Directors Association. (2015). *Support ESEA Baldwin/Hatch amendment- Innovative technology expands children's horizons (I-TECH).* Retrieved from International Society for Technology Education Website: http://www.iste.org/docs/advocacy-resources/support-itech-ed-tech-amendment-in-esea-community-letter.pdf?sfvrsn=2

Simon, M. K., & White, J. (2011). *Survey/interview validation rubric for expert panel-VREP* [Adobe Reader version]. Retrieved from http://dissertationrecipes.com/wp-content/uploads/2011/04/Expert-Validation-v3.pdf

Strauss, V. (2011, February 6). Ronald Reagan's impact on education today. *The Washington Post.* Retrieved from http://voices.washingtonpost.com/answer-sheet/school-turnaroundsreform/how-ronald-reagan-affected-tod.html

Team International Society for Technology in Education. (2015, December 10). ESSA is a win for ed tech [Web log post]. Retrieved from https://www.iste.org/explore/articleDetail?articleid=620

Thompson, D. J. (2015). *Elementary school teachers' perceptions of the process of integration technology* (Doctoral dissertation). Retrieved from http://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=2369&context=dissertations

Transition to Digital Learning in Schools, House Bill 44/ S.L. 2013-12 (2013).

United States Department of Education. (1996). *Getting America's students ready for the 21st century: Meeting the technology literacy challenge* (ED 398899). Retrieved from ERIC Database: http://files.eric.ed.gov/fulltext/ED398899.pdf

United States Department of Education. (2004). *Part D- Enhancing education through technology.* Retrieved from http://www2.ed.gov/policy/elsec/leg/esea02/pg34.html

United States Department of Education. (2009). *Evaluation of the enhancing education through technology program: Final report*. Retrieved from https://www2.ed.gov/rschstat/eval/tech/netts/finalreport.pdf

United States Department of Education, Office of Educational Technology. (2016). *Future ready learning: Reimagining the roles of technology in education.* Retrieved from http://tech.ed.gov/files/2015/12/NETP16.pdf

Urdan, T. (2010). *Statistics in plain English* (3rd ed.). New York: Routledge.

Wagner, T. (2012). *Creating innovators: The making of young people who will change the world* [Kindle version]. Retrieved from Amazon.com

West, P. (2016, July 11). Stop asking whether laptops improve learning outcomes. *eSchool News: Daily Tech News and Innovation.* Retrieved July 14, 2016, from http://www.eschoolnews.com/2016/07/11/stop-asking-whether-laptops-improve-learning-outcomes/

Woodford, C. (2017). *A brief history of computers.* Retrieved from http://www.explainthatstuff.com/historyofcomputers.html

Appendix A

NC Digital Learning Competencies for Classroom Teachers

The NC Digital Learning Competencies for Classroom Teachers (NCDPI Digital Teaching and Learning Division, 2016) were developed based on the work of ISTE, iNACOL, and NCPTS.

Leadership in Digital Learning Teachers will demonstrate leadership in accelerating their integration of digital teaching and learning pedagogies.
Engage in virtual and face-to-face learning communities to expand mastery of technological applications for professional growth and student learning.
Take initiative with own professional growth to inform practice
Demonstrate leadership for technology innovation beyond my own classroom.
Engage in peer collaborative problem-solving through continuous planning, designing, testing, evaluation, and recalibration of teaching methods using appropriate digital technology.
Promote open, lifelong learning as an iterative process of success, failure, grit, and perseverance.
Digital Citizenship Teachers will model and teach digital citizenship by the ethical, respectful, and safe use of digital tools and resources that support the creation of a positive digital school culture.
Demonstrate understanding of intellectual property rights by abiding by copyright law, intellectual property, and fair use guidelines.
Teach and require the use of copyright law and fair use in student work and creation.
Engage in responsible and professional digital social interaction.
Integrate digital citizenship curriculum into student learning.
Demonstrate global awareness through engaging with other cultures via advanced communication and collaboration tools.
Ensure full, equitable access and participation of all learners through high-quality technology tools and resources.
Digital Content and Instruction Teachers will know and use appropriate digital tools and resources for instruction.
Design technology-enriched learning experiences that encourage all students to pursue their individual interests, preferences, and differences.
Lead all students in becoming active participants in setting educational goals, managing learning, and assessing their progress through digital tools.
Identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively.
Immerse students in exploring relevant issues and analyze authentic problems through digital tools and resources.
Evaluate and appropriately modify the form and function of the physical learning environment to create a conducive digital learning environment.
Data and Assessment Teachers will use technology to make data more accessible, adjust instruction to better meet the needs of a diverse learner population, and reflect upon their practice through the consistent, effective use assessment.
Integrate digitally enhanced formative and summative assessments as a part of the teaching and learning process.

Use performance data and digital tools to empower student metacognition for self-assessment & self-monitoring their own learning progress.
Utilize multiple and varied forms of assessment including examples of student work products
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to create individual learner profiles of strengths, weaknesses, interests, skills, gaps, preferences.
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to inform, personalize, and calibrate individual learning experiences.
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile.
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to reflect and improve upon instructional practice.

Appendix B

Survey of Digital Learning Practices for Classroom Teachers

Directions:

This survey is part of a research study investigating how teacher instructional practices align with digital learning environments. The purpose of this survey is to determine your comfort in implementing digital learning practices. The Alliance for Excellent Education defines digital learning as the instructional practices used to improve student learning experiences including content, resources, and courses used to provide students with personalized learning and teachers with professional learning opportunities. In digital learning environments, students are engaged and empowered by teachers who provide opportunities to develop academic knowledge.

The NC Digital Learning Competencies for Classroom Teachers, which are designed to promote student learning and improve instructional practices, include the following four focus areas: leadership in digital learning, digital citizenship, digital content and instruction, and data and assessment. Reflecting on your instructional practices, mark one response for each statement to indicate how successfully you believe you can implement the digital learning competency. You may skip any questions that cause discomfort and/or exit the survey at any time. Submission of responses at the end of this survey is considered consent to participate in this research study, and the results of this survey will be reported anonymously in the research.

Background information

How many years of teaching experience do you have?

1-5 6-10 11-15 16-20 21-25 26-30 31+

Which area best describes the grade level of students you teach?

K-5 6-8 9-12 other

What is your highest level of education?

Bachelor's degree Master's degree Doctoral degree

Efficacy in implementation of digital learning competencies

For each item below, indicate the strength of your agreement or disagreement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Leadership in Digital Learning To what extent do you agree you can complete the following competencies?					
Engage in virtual and face-to-face learning communities to expand mastery of technological applications for professional growth and student learning.					
Take initiative with own professional growth to inform practice.					

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Demonstrate leadership for technology innovation beyond my own classroom.					
Engage in peer collaborative problem-solving through continuous planning, designing, testing, evaluation, and recalibration of teaching methods using appropriate digital technology.					
Promote open, lifelong learning as an iterative process of success, failure, grit, and perseverance.					
Digital Citizenship To what extent do you agree you can complete the following competencies?					
Demonstrate understanding of intellectual property rights by abiding by copyright law, intellectual property, and fair use guidelines.					
Teach and require the use of copyright law and fair use in student work and creation.					
Engage in responsible and professional digital social interaction.					
Integrate digital citizenship curriculum into student learning.					
Demonstrate global awareness through engaging with other cultures via advanced communication and collaboration tools.					
Ensure full, equitable access and participation of all learners through high-quality technology tools and resources.					
Digital Content and Instruction To what extent do you agree you can complete the following competencies?					
Design technology-enriched learning experiences that encourage all students to pursue their individual interests, preferences, and differences.					
Lead all students in becoming active participants in setting educational goals, managing learning, and assessing their progress through digital tools.					
Identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively.					
Immerse students in exploring relevant issues and analyze authentic problems through digital tools and resources.					
Evaluate and appropriately modify the form and function of the physical learning environment to create a conducive digital learning environment.					
Data and Assessment					

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
To what extent do you agree you can complete the following competencies?					
Integrate digitally enhanced formative and summative assessments as a part of the teaching and learning process.					
Use performance data and digital tools to empower student metacognition for self-assessment & self-monitoring their own learning progress.					
Utilize multiple and varied forms of assessment including examples of student work products.					
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to create individual learner profiles of strengths, weaknesses, interests, skills, gaps, preferences.					
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to inform, personalize, and calibrate individual learning experiences.					
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile.					
Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to reflect and improve upon instructional practice.					

By submitting your responses on this survey, you are agreeing to participate in the anonymous reporting of the results in the researcher's study. If you do not wish to continue, please close the browser without submitting your responses. There is no penalty for withdrawing from the study.

If you have questions about the study, contact the following individuals:
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If you have concerns about your rights or how you are being treated, or if you have questions, want more information, or have suggestions, please contact the IRB Institutional Administrator listed below.

Dr. Jeffrey S. Rogers
IRB Institutional Administrator
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Appendix C

Interview Protocol for Research Study

Interview Protocol for Research Study

Date: Location:

Interviewer: Interviewee:

Thank you for agreeing to be interviewed today. This interview is the second phase in a research study investigating how teacher instructional practices align with digital learning environments. The first phase involved a survey of teachers in your district regarding their efficacy in implementing NC Digital Learning Competencies for Classroom Teachers. Your responses today will be used to provide additional information regarding how teachers are facilitating digital learning environments and what support is still needed. Please review the information on the Informed Consent form, and sign if you agree to participate. Remember you may stop the interview at any time by telling me to stop recording, and you may skip any questions you do not feel comfortable answering.

1. How long have you been a teacher?

2. What subjects and/or grade levels do you teach?

3. What is your highest level of education?

The NC Digital Learning Competencies for Classroom Teachers are organized in four areas: leadership in digital learning, digital citizenship, digital content and instruction, and data and assessment.

4. The competencies state teachers should engage in online and face-to-face professional development to promote life-long learning, solve problems collaboratively, and take initiative for growth in practices as well as student learning. How do you demonstrate leadership in digital learning?

5. The second focus area is digital citizenship, which includes adhering to copyright laws, intellectual property, and fair use guidelines. How do you model and teach digital citizenship?

6. The next focus area is digital content and instruction, which states teachers will know and use appropriate digital tools and resources for instruction. How do you use technology tools and resources for instruction, such as to personalize learning and engage students?

7. How do you encourage creativity, critical thinking, communication, collaboration, and authentic problem-solving using digital tools and resources?

8. The fourth area of the competencies is data and assessment. The competencies explain teachers should use technology to assess learning to make data accessible, adjust instruction, and reflect on practices. How do you use technology for data and assessment?

Thank you for your participation in this interview. I appreciate your time and quality of information you provided, which will be helpful for my research study.

Appendix D

Survey/Interview Validation Rubric for Expert Panel

Survey/Interview Validation Rubric for Expert Panel - VREP©

By Marilyn K. Simon with input from Jacquelyn White

http://dissertationrecipes.com/

Criteria	Operational Definitions	Score **1=Not Acceptable** (major modifications needed) **2=Below Expectations** (some modifications needed) **3=Meets Expectations** (no modifications needed but could be improved with minor changes) **4=Exceeds Expectations** (no modifications needed)				**Questions NOT meeting standard (List page <u>and</u> question number) and need to be revised. *Please use the comments and suggestions section to recommend revisions.***
		1	2	3	4	
Clarity	• The questions are direct and specific. • Only one question is asked at a time. • The participants can understand what is being asked. • There are no *double-barreled* questions (two questions in one).					
Wordiness	• Questions are concise. • There are no unnecessary words					
Negative Wording	• Questions are asked using the affirmative (e.g., Instead of asking, "Which methods are not used?", the researcher asks, "Which methods *are* used?")					
Overlapping Responses	• No response covers more than one choice. • All possibilities are considered. • There are no ambiguous questions.					
Balance	• The questions are unbiased and do not lead the participants to a response. The questions are asked using a neutral tone.					

Criteria	Operational Definitions	Score **1=Not Acceptable** (major modifications needed) **2=Below Expectations** (some modifications needed) **3=Meets Expectations** (no modifications needed but could be improved with minor changes) **4=Exceeds Expectations** (no modifications needed)				**Questions NOT meeting standard (List page <u>and</u> question number) and need to be revised.** ***Please use the comments and suggestions section to recommend revisions.***
		1	2	3	4	
Use of Jargon	• The terms used are understandable by the target population. • There are no clichés or hyperbole in the wording of the questions.					
Appropriateness of Responses Listed	• The choices listed allow participants to respond appropriately. • The responses apply to all situations or offer a way for those to respond with unique situations.					
Use of Technical Language	• The use of technical language is minimal and appropriate. • All acronyms are defined.					
Application to Praxis	• The questions asked relate to the daily practices or expertise of the potential participants.					
Relationship to Problem	• The questions are sufficient to resolve the problem in the study. • The questions are sufficient to answer the research questions. • The questions are sufficient to obtain the purpose of the study.					
Measure of Construct: (Leadership in Digital Learning)	• The survey adequately measures this construct.					

Criteria	Operational Definitions	Score **1=Not Acceptable** (major modifications needed) **2=Below Expectations** (some modifications needed) **3=Meets Expectations** (no modifications needed but could be improved with minor changes) **4=Exceeds Expectations** (no modifications needed)				**Questions NOT meeting standard (List page <u>and</u> question number) and need to be revised.** ***Please use the comments and suggestions section to recommend revisions.***
		1	2	3	4	
Measure of Construct: B: (Digital Citizenship)	• The survey adequately measures this construct.					
Measure of Construct: C: (Digital Content and Instruction)	• The survey adequately measures this construct.					
Measure of Construct: D: (Data and Assessment)	• The survey adequately measures this construct.					

* The operational definition should include the domains and constructs that are being investigated. You need to assign meaning to a variable by specifying the activities and operations necessary to measure, categorize, or manipulate the variable. For example, to measure the construct *successful aging* the following domains could be included: degree of physical disability (low number); prevalence of physical performance (high number), and degree of cognitive impairment (low number). If you were to measure creativity, this construct is generally recognized to consist of flexibility, originality, elaboration, and other concepts. Prior studies can be helpful in establishing the domains of a construct.

Comments and Suggestions

Types of Validity

VREP is designed to measure face validity, construct validity, and content validity. To establish criterion validity would require further research.

Face validity is concerned with how a measure or procedure appears. Does it seem like a reasonable way to gain the information the researchers are attempting to obtain? Does it seem well designed? Does it seem as though it will work reliably? Face validity is independent of established theories for support (Fink, 1995).

Construct validity seeks agreement between a theoretical concept and a specific measuring device or procedure. This requires operational definitions of all constructs being measured.

Content Validity is based on the extent to which a measurement reflects the specific intended domain of content (Carmines & Zeller, 1991, p.20). Experts in the field can determine if an instrument satisfies this requirement. Content validity requires the researcher to define the domains they are attempting to study. Construct and content validity should be demonstrated from a variety of perspectives.

Criterion related validity, also referred to as instrumental validity, is used to demonstrate the accuracy of a measure or procedure by comparing it with another measure or procedure which has been demonstrated to be valid. If after an extensive search of the literature, such an instrument is *not* found, then the instrument that meets the other measures of validity are used to provide criterion related validity for future instruments.

Operationalization is the process of defining a concept or construct that could have a variety of meanings to make the term measurable and distinguishable from similar concepts. Operationalizing enables the concept or construct to be expressed in terms of empirical observations. Operationalizing includes describing what is, and what is not, part of that concept or construct.

References

Carmines, E. G., & Zeller, R.A. (1991). *Reliability and validity assessment*. Newbury Park: Sage Publications.

Fink, A., ed. (1995). *How to measure survey reliability and validity v. 7*. Thousand Oaks, CA: Sage.

Appendix E

Descriptive Statistics for Survey Items

Survey Item	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Count
4. Engage in virtual and face-to-face learning communities to expand mastery of technological applications for professional growth and student learning.	3.91	0.07	4	4	0.87	0.76	1.63	-1.13	4	160
5. Take initiative with own professional growth to inform practice.	4.29	0.05	4	4	0.66	0.44	4.03	-1.20	4	160
6. Demonstrate leadership for technology innovation beyond my own classroom.	3.54	0.08	4	4	1.01	1.03	-0.29	-0.43	4	160
7. Engage in peer collaborative problem-solving through continuous planning, designing, testing, evaluation, and recalibration of teaching methods using appropriate digital technology.	3.99	0.06	4	4	0.81	0.65	2.85	-1.28	4	160
8. Promote open, lifelong learning as an iterative process of success, failure, grit, and perseverance.	4.28	0.06	4	4	0.72	0.52	2.39	-1.08	4	160
9. Demonstrate understanding of intellectual property rights by abiding by copyright law, intellectual property, and fair use guidelines.	4.20	0.06	4	4	0.74	0.55	2.40	-1.11	4	153
10. Teach and require the use of copyright law and fair use in student work and creation.	4.08	0.06	4	4	0.78	0.60	1.75	-1.00	4	153
11. Engage in responsible and professional digital social interaction.	4.44	0.05	4	5	0.62	0.38	4.91	-1.32	4	153
12. Integrate digital citizenship curriculum into student learning.	3.88	0.07	4	4	0.85	0.72	1.76	-1.07	4	153
13. Demonstrate global awareness through engaging with other cultures via advanced communication and collaboration tools.	3.65	0.08	4	4	0.95	0.90	0.36	-0.80	4	153
14. Ensure full, equitable access and participation of all learners through high-quality technology tools and resources.	3.95	0.07	4	4	0.89	0.79	2.64	-1.38	4	153
15. Design technology-enriched learning experiences that encourage all students to pursue their individual interests, preferences, and differences.	3.68	0.08	4	4	0.92	0.84	0.70	-0.80	4	145

Survey Item	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Count
16. Lead all students in becoming active participants in setting educational goals, managing learning, and assessing their progress through digital tools.	3.74	0.08	4	4	0.92	0.84	0.61	-0.83	4	145
17. Identify, evaluate, and utilize appropriate digital tools and resources to challenge students to create, think critically, solve problems, establish reliability, communicate their ideas, and collaborate effectively.	3.81	0.07	4	4	0.85	0.72	1.67	-1.08	4	145
18. Immerse students in exploring relevant issues and analyze authentic problems through digital tools and resources.	3.72	0.08	4	4	0.99	0.98	0.16	-0.69	4	145
19. Evaluate and appropriately modify the form and function of the physical learning environment to create a conducive digital learning environment.	3.72	0.08	4	4	0.93	0.87	0.81	-0.94	4	145
20. Integrate digitally enhanced formative and summative assessments as a part of the teaching and learning process.	4.05	0.07	4	4	0.81	0.66	2.81	-1.33	4	138
21. Use performance data and digital tools to empower student metacognition for self-assessment & self-monitoring their own learning progress.	3.74	0.08	4	4	0.94	0.88	1.51	-1.12	4	138
22. Utilize multiple and varied forms of assessment including examples of student work products.	4.17	0.06	4	4	0.69	0.48	5.59	-1.45	4	138
23. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to create individual learner profiles of strengths, weaknesses, interests, skills, gaps, and preferences.	3.67	0.08	4	4	0.92	0.85	0.44	-0.81	4	138
24. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to inform, personalize, and calibrate individual learning experiences.	3.66	0.07	4	4	0.88	0.77	1.23	-1.00	4	138

Survey Item	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Count
25. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to identify specific plans of action related to weaknesses, gaps, and needed skills as identified in the learner profile.	3.64	0.08	4	4	0.89	0.79	1.04	-1.00	4	138
26. Utilize technology and digital tools to synthesize and apply qualitative and quantitative data to reflect and improve upon instructional practice.	3.72	0.08	4	4	0.90	0.81	0.85	-0.94	4	138