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The Effectiveness of Digital Leadership at K-12 Schools in Mississippi Regarding Communication and Collaboration During CCRS Implementation

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THE EFFECTIVENESS OF DIGITAL LEADERSHIP AT K-12 SCHOOLS IN MISSISSIPPI REGARDING COMMUNICATION AND COLLABORATION DURING CCRS IMPLEMENTATION

by

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ABSTRACT

THE EFFECTIVENESS OF DIGITAL LEADERSHIP AT

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Successful College-and Career-Readiness Standards (CCRS) implementation requires educators to communicate and collaborate at the local, state, and national level. Technology plays an important role in successful CCRS implementation. This study aims to investigate how digital leadership improves communication and collaboration at K-12 schools in Mississippi regarding implementation of CCRS as well as the effectiveness of different ways of supporting communication and collaboration regarding CCRS implementation. Mixed-method was chosen to investigate the research questions. Ten public school principals from two school districts were interviewed and observed at qualitative stage, and two hundred fifty-four public schools teachers participated in the survey at quantitative stage. Interviews were transcribed and coded, while survey responses from the teachers were analyzed by SPSS. Findings at qualitative stage showed that the principals utilized hybrid ways to support the teachers' communication and collaboration regarding CCRS implementation, including formal meetings, group collaboration, trainings, social media, website, online learning, digital teaching, personalized professional development, peers' modeling, digital management, digital data collection and interpretation, digital citizenship promotion, and website filter. Results of

quantitative stage showed that the principals were more effective in supporting professional development and digital citizenship regarding CCRS implementation. However, principals were less effective in supporting visionary leadership, digital age learning culture, and systemic improvement regarding CCRS implementation.

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CHAPTER I - INTRODUCTION

Background

Common Core State Standards (CCSS) are high-quality national academic requirements in English Language Arts or Literacy (ELA) and Mathematics. Forty-three states and districts in the United States adopted CCSS voluntarily in 2009. CCSS prepares K-12 students to compete nationally and internationally. Mississippi adopted and implemented CCSS in 2010 with the purpose of preparing Mississippi K-12 students to compete globally. In 2015, Mississippi withdrew participation from the Partnership for Assessment of Readiness for College and Careers (PARCC) which was a test used to evaluate CCRS learning. However, Mississippi kept CCSS and modified it as the Mississippi's College and Career-Readiness Standards (CCRS). The adoption of CCSS in Mississippi indicates the state's desire to prepare students in Mississippi to succeed globally. All public schools in Mississippi are transitioning to the CCRS standards.

Principals of schools play an essential role in leading educational reform such as CCRS (Creighton, 2003). Romanowski (2014) points out that principals shape the implementation of educational reform. Principals have direct effect on how the CCRS is perceived by teachers, students, and parents. Teachers experience the CCRS through shared leadership. Professional community supported by principals also changes the ways in implementing CCRS in school system (Wahlstrom & Louis, 2009). Shared leadership, teachers' professional development, and school culture affect how teachers understand and implement the CCRS (Hargreaves & Fink, 2004; Little, 1993). In addition, principals' modeling strategies have an effect on CCRS implementation (Marks, 2003).

Teachers get direct experience of CCRS when they watch the principals' model of implementation and they can immediately apply their experiences to their classrooms.

Without the aid of technology, the implementation of CCRS is a challenge for principals. In today's digital world, a lot of resources are delivered and transmitted electronically. Technology is an embedded part of education. The ways of leading schools have changed from traditional face-to-face administration to digital leadership. Availability of increasing digital tools and resources requires principals to integrate technology to support digital age learning and teaching. In 2009, the International Society for Technology in Education (ISTE) released the standards of digital leadership, which is called ISTE standards for Administrators (ISTE-A). ISTE-A standards defined the skills and knowledge of digital leadership from five dimensions: (1) visionary leadership, (2) digital age learning culture, (3) excellence in professional practice, (4) systemic improvement, and (5) digital citizenship.

Another purpose of utilizing technology in leadership is to enhance the effectiveness of communication and collaboration during CCRS implementation. Effective communication and collaboration are the keys to successful educational reform. Blase and Blase (2000) investigated over eight hundred teachers' perspectives and observations about principals' leadership roles, and the results revealed that talking was an effective way of promoting teaching and learning. Communication and collaboration are two critical elements to ensure successful CCRS implementation (Hipsher, 2014; Underwood, 2014). CCRS is a very new and complicated concept that requires all educators to communicate and collaborate at the local, state, and national levels. Successful CCRS implementation needs effective communication and collaboration

among teachers, administrators, and related stakeholders. Clear communication decreases misunderstanding and collaboration increases productivity. In addition, effective communication during CCRS implementation facilitates group collaboration. For principals, establishing the school environment characterized by effective communication and collaboration has significant influence on successful CCRS implementation. Therefore, researching how to support communication and collaboration has practical significance in leading CCRS successfully.

Statement of the Problem

Successful CCRS implementation requires educators to communicate and collaborate at the local, state, and national level. Research (Hipsher, 2014; Underwood, 2014) shows teachers' frustration and confusion over the implementation of CCRS. Teachers are uncertain about the expectations of the assessment based on CCRS and how their students would perform. Lack of resources has increased teachers' frustrations. Teachers need additional support from principals to help with the communication and collaboration in developing informative documents and resources regarding CCRS. The principals, as the school leaders, should provide communicative and collaborative environments to help teachers learn and understand CCRS with the purpose of decreasing confusion and frustration.

Technology, which is identified as an effective way of supporting communication and collaboration, plays an important role in successful CCRS implementation (Christopher, 2014; Hipsher, 2014; Underwood, 2014). Therefore, vital is for the principal to know ways of supporting CCRS communication and collaboration through technology. Many researchers realize the important role of technology in CCRS

implementation (Cogan, Schmidt, & Houang, 2013; Gallia, 2013; Royer & Richards, 2013; Yim, Warschauer, Zhang, & Lawrence, 2014). Principals not only need to understand the importance of supporting communication and collaboration through technology but also need to know practical strategies of supporting CCRS digitally. However, supporting communication and collaboration through technology is rarely discussed. Therefore, there is a need to explore what ways principals can support technological communication and collaboration.

Purpose of Study

The main purpose of this study is to investigate how digital leadership improves communication and collaboration at K-12 schools in Mississippi regarding implementation of CCRS. In this study, digital leadership is defined as accepting and embracing new technology to transform schools into digital age learning places (ISTE-A, 2009). Digital leadership includes five categories: (1) visionary leadership, (2) digital learning culture, (3) professional development, (4) systemic improvement, and (5) digital citizenship (ISTE-A, 2009). The principals' experience of digital leadership regarding CCRS communication and collaboration is examined in-depth to provide practical strategies and methods that facilitate successful CCRS implementation. Another purpose of this study is to demonstrate the effectiveness of different ways of supporting communication and collaboration regarding CCRS implementation.

The researcher reviewed previous literatures of digital leadership and results showed that ISTE-A standards played an important role in evaluating digital leadership. Therefore, the following research questions have been proposed based on ISTE-A standards:

1. In what ways do K-12 principals support and promote communication and collaboration through visionary leadership to ensure successful CCRS implementation in Mississippi?
2. In what ways do K-12 principals support and promote communication and collaboration through digital learning culture to ensure successful CCRS implementation in Mississippi?
3. In what ways do K-12 principals support and promote communication and collaboration through professional development to ensure successful CCRS implementation in Mississippi?
4. In what ways do K-12 principals support and promote communication and collaboration through systemic improvement to ensure successful CCRS implementation in Mississippi?
5. In what ways do K-12 principals support and promote communication and collaboration through digital citizenship to ensure successful CCRS implementation in Mississippi?
6. To what extent is visionary leadership effective in supporting and promoting communication and collaboration regarding CCRS implementation in Mississippi?
7. To what extent is digital learning culture effective in supporting and promoting communication and collaboration regarding CCRS implementation in Mississippi?

8. To what extent is professional development effective in supporting and promoting communication and collaboration regarding CCRS implementation in Mississippi?
9. To what extent is systemic improvement effective in supporting and promoting communication and collaboration regarding CCRS implementation in Mississippi?
10. To what extent is digital citizenship effective in supporting and promoting communication and collaboration regarding CCRS implementation in Mississippi?
11. Do demographics make a difference in any of the scales of digital leadership?

Delimitations and Assumptions

One of the delimitations in this study is that not all principals have the same feelings toward CCRS and may have biases when answering interview questions. Principals' different levels of experience with CCRS could affect this study's results in the qualitative stage as they answer questions in the interviews. Principals with more CCRS experience may provide more in-depth information when explaining their perspectives during the interviews. In addition, principals with positive attitudes towards CCRS and technology may act positively in answering the questions. On the contrary, principals with less experience of CCRS may not be able to provide enough information of implementing CCRS in their schools. Thus, the results may be incomplete.

The same delimitations exist with participants in the quantitative phase regarding the surveys. Participants with more experience with CCRS or have better relationships with their principals may answer the questions differently. Those not familiar with or

have positive views toward CCRS or their principals' actions, may respond more inadequately toward the survey questions or statements.

This study is delimited to the state of Mississippi. Students in Mississippi are quite behind compared to students in other states. Instructional technology plays an important role in supporting Mississippi students' attempt to catch-up with students in other states. Researching ways of supporting CCRS implementation through technology in Mississippi has a significant influence on students' successful competition after graduation. Therefore, this study focuses on CCRS implementation in Mississippi. Although being delimited to the state of Mississippi could hurt generalizing the results, this study can provide other researchers valuable information on technology integration in places that lack educational resources and support.

In this study, the researcher assumes that all participants have the same level of CCRS experience and answer the questions honestly and freely without fear of repercussion. In addition, all participants are assumed to understand the questions being asked and respond as the researcher expected. Participants' names, locations, and other identifying information are kept anonymous. Only the researcher and participants can access the information with written permission. This study may have sampling bias because the researcher tends to select participants who agree with CCRS. Thus, participants may respond positively to the CCRS questions, and the researcher may obtain more positive responses from participants. Randomly choosing participants from the total population could help the researcher minimize research bias and strengthen the generalization of research results. For this study, however, the selection of participants, in

particular the personal interviews, is intentional to help the researcher collect the required data necessary to develop the survey instrument.

Justification

Adoption of CCRS ensures an equal education opportunity for K-12 students no matter where they reside or will move to. CCRS also provides ways for K-12 students to compete and succeed nationally and internationally. Successful CCRS implementation requires all educators to collaborate at the local, national, and international levels. The principals, as school leaders, play an essential role in supporting educators to collaborate. Technology is identified as an effective tool to support schools' CCRS implementation and integration (Underwood, 2014). Researching ways of supporting CCRS through technology can benefit schools that want to implement CCRS successfully. This study can be beneficial for principals who are dedicated to CCRS implementation and integration through technology. Results of this study can provide information on effective leadership strategies in supporting CCRS communication and collaboration. Therefore, principals can focus on effective CCRS communication and collaboration strategies. Results of this study also can reveal the barriers towards CCRS implementation, which faculty, staff, and teachers can try to avoid when implement CCRS.

Educational resources for Mississippi K-12 schools are not as rich as resources in other states. Mississippi ranks last in student performance according to the 2014 report from Mississippi Business Journal. Lack of educational resources limits students in Mississippi from competing with students in other states. However, the adoption of CCRS provides an opportunity for students in Mississippi to catch-up with students in other states. Technology enables educators to access rich educational resources that can

be utilized to support successful CCRS implementation. This study can provide useful information for principals in Mississippi on effectively using the limited technology available to expand educational resources with the intent of promoting CCRS implementation.

This study can add to the research field of supporting CCRS through technology. Many studies have addressed the importance of utilizing technology to support CCRS implementation (Christopher, 2014; Hipsher, 2014; Underwood, 2014). However, few studies have discussed ways of utilizing technology to support CCRS implementation and the effectiveness of utilizing technology to support CCRS implementation. This study explores ways that principals use technology to support CCRS communication and collaboration and also their overall effectiveness in using technology to achieve intended goals. Findings from this study can shed light on digital leadership research in regards to communication and collaboration.

Definition of Key Terms

The following terms in this study are defined to clarify the discussion and scope of this study.

Collaboration-collaboration is defined as the process of working together with other teachers, principals, and parents to assign and convey knowledge and resources of CCRS in an attempt to create shared understanding and develop effective instructional strategies and resources.

Common Core State Standards-Common Core State Standards is a set of expectations in English Language Arts/Literacy and Math that prepare students from Kindergarten to 12th grade to become ready for college and workforce after graduation.

Communication-communication is defined as the process of transmitting and receiving information related to CCRS.

Digital citizenship-digital citizenship is defined as educational administrators that model and facilitate understanding of social, ethical, and legal issues, and responsibilities related to an evolving digital culture (ISTE-A, 2009).

Digital leadership-digital leadership is defined as using technology resources (e.g., promethean board, computers, Chromebook, iPad, school management software, communication software, social media, online open education resources) to promote learning, teaching, and administration.

Digital learning culture-digital learning culture is defined as educational administrators that create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students (ISTE-A, 2009).

Professional development-professional development is defined as educational administrators that promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources (ISTE-A, 2009).

Systemic improvement-systemic improvement is defined as educational administrators that provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources (ISTE-A, 2009).

Technology-technology in this study is defined as digital hardware and software that include Promethean board, computers (PC & Macbook), Chromebook, iPad, iPod,

Sams7, schoolstatus, pinterest, open education resources, and other online resources and services.

Visionary leadership-visionary leadership is defined as educational administrators that inspire and lead the development and implementation of a shared vision for the comprehensive integration of technology to promote excellence and support transformation throughout the organization (ISTE-A, 2009).

Summary

As Mississippi continues reforming the K-12 education environment to meet the high academic standards established by CCRS, technology will play an important part during this transition period. Using technology is not just an option but also a necessary requirement for educators to support communication and collaboration with each other in this digital world.

This chapter introduces the study that will be conducted. Research questions have been introduced and serve as a guide for data collection. Assumptions that the researcher has for this study have been addressed along with the delimitations that could affect the results. Conducting this study has significance because researching how digital leadership affects communication and collaboration regarding CCRS implementation can enlighten K-12 principals to use instructional technology to facilitate successful educational reform transition like CCRS.

This dissertation includes the following chapters. Chapter II reviews related literature that focus on CCRS, (a) the relationship between CCRS and technology, (b) aspects of digital leadership, (c) the theoretical framework of this study with the social constructivist learning theory and connectivist learning theory, and (d) an overview of the

ITSE-A standards. Chapter III explains the research design, research setting, participants, data collection, and data analysis. Chapter IV interprets the research data and findings of the study that align with the research questions. Chapter V discusses the implications of the research findings and provides some recommendations for further study.

CHAPTER II - LITERATURE REVIEW

Introduction

Chapter II reviews related literatures of CCRS and digital leadership. This chapter first examines the development of CCRS and how technology influences CCRS. CCRS implementation actually is a meaningful learning process, and therefore, social constructivist learning theory and connectivist learning theory have been included to describe and explain the meaningful learning process when people communicate and collaborate in a digital world. Next, influence of technology on leadership, development of digital leadership, and the pathway of standardizing digital leadership are reviewed. The chapter closes with the summary of key points.

Common Core State Standards

Common Core State Standards (CCRS) are high-quality national academic requirements in English Language Arts or Literacy (ELA) and Mathematics. Two categories, including expectations for college and workforce after graduation and expectations for K-12 education, were incorporated into CCRS. CCRS was launched in 2009. Forty-three states and districts in the United States adopted voluntarily. CCRS clarifies what students need to know and be able to do after they finish learning at each grade level. The standards aim to prepare American students from kindergarten to 12th grade ready for their two-year or four-year college or workforce career after graduation. CCRS aligns all K-12 students together at a national level so that students have equal education access regardless of their locations. No matter where students reside or will move, they have equal educational opportunities because they are under the same evaluation standards. More importantly, CCRS, which were developed from an

international perspective, shows the pathway of successfully competing with peers from different states and even different countries. High-quality standards from different countries were referenced to during the CCRS development process to ensure students acquire adequate knowledge and skills to compete globally. Currently students are no longer just competing locally. As Manley and Hawkins (2012) state in their book, the world that students come from is changing so quickly that students need to be equipped more than ever to become global competitors in this growing world.

Mississippi adopted CCRS in 2010. K-12 schools in Mississippi are transitioning from Mississippi standards to CCRS standards. According to the transition timeline released by the Mississippi Department of Education (MDE) for the past school year of 2013-2014, CCRS was fully implemented, and students were ready to be assessed under the new standards. However, in August 2014, Daily Journal reported that Mississippi's public school children, teachers, and administrators still needed strong support in CCRS. Although districts were assessed by previous Mississippi assessment standards last year, test results showed an imbalance among different districts according to the data released by MDE on August 2014. Burton (2014) conducted a case study to explore teachers' experience of using technology to meet the requirements of CCRS in Mississippi. Results showed that teachers in Mississippi were still struggling with this new standard and additional support was needed. Although technology was introduced into the classroom to some extent, such as PowerPoint and Promethean board, teachers did not achieve the goal of CCRS standards. Teachers said the low level of technology utilization was caused by insufficient support from schools and districts. Burton (2014) suggested that professional development and technology support were needed for teachers. More

importantly, this imbalance does not only exist locally but also nationally (Kim, 2013). A lot of studies regarding CCRS have been conducted and reported in other states such as California (Robertson, 2013). California educators, Robertson (2013), for instance, reported how the Anaheim City School District used cloud-based computing environment to support teacher training on CCRS implementation. However, supporting CCRS through technology in Mississippi has been rarely discussed.

Communication and Collaboration in CCRS Implementation

CCRS shows educators what the international competitor looks like and how to become an international competitor step-by-step. Therefore, important is to ensure successful CCRS implementation with the goal of global competition after students' graduation. The key to successful CCRS implementation is communication and collaboration. Manley and Hawkins (2012) pointed out that the implementation of CCRS was the group work that involved everyone in the K-12 education system. Communication and collaboration were especially important for CCRS implementation because CCRS contained a lot of information that was very new to current K-12 educators (Calkins, Ehrenworth, & Lehman, 2012). Effective communication and collaboration create a shared understanding of what is CCRS, why students need CCRS, and how to put CCRS into practice. People would not be limited by their own knowledge if they communicated and collaborated with other more experienced educators (Huxham & Vangen, 2005). For teachers, they could expand their knowledge and resources by communicating and collaborating with colleagues. For parents and stakeholders, they were able to understand why students needed CCRS and how they could support CCRS implementation through their communication and collaboration with schools. With

adequate information and resources, school leaders could develop effective methods and strategies to support and promote CCRS application through collaborative work with districts and even educators from other districts or states. With more and more people becoming involved in CCRS implementation, how to effectively communicate and collaborate with each other is an issue. Not everyone can be reached and scheduled for meetings, conferences, and other collaborative activities. Therefore, necessary is to explore and develop strategies that meet diverse needs of communication and collaboration without interrupting regular work.

Technology has been identified as an effective way of supporting various needs of communication and collaboration during the process of CCRS implementation (Beldarrain, 2006; Hipsher, 2014; Tucker, 2012). Hipsher (2014) pointed out that technological collaboration was important for educators to support each other during CCRS transition period. The transition made impossible to have teachers sit in a room and had 2-hour session training (Triggs & John, 2004). Teachers had tight schedules and their time was limited for training. Technology connected people together regardless of their locations and created a collaborative environment that maximized the use of individual time (Robertson, 2013). For instance, district's online database of resources was addressed as a method of connecting educators (Hipsher, 2014). Online tools such as Google Drive could be utilized as an effective way of posting and sharing information (Ash, 2011). Robertson (2013) reported that cloud-based environment was able to support teachers' ongoing and dynamic requirements of training and instructional development. Districts and principals could provide ongoing support in the cloud-based environment while teachers were working on understanding and interpreting CCRS and

what changes were needed to adapt in their classrooms during CCRS transition. With the help of technology such as Twitter, teachers could access the latest information and resources of CCRS to help them understand the new standards (Jansen, Zhang, Sobel & Chowdury, 2009). Connecting with other educators through technology enabled teachers to share their understandings and resources of CCRS that helped decrease their confusion and more importantly, avoided unnecessary misunderstandings of CCRS (Kim, 2013).

Common Core State Standards and Technology

Technology is an important element of CCRS standards. The shifting role of technology requires educators to adjust teaching and learning to ensure successful CCRS implementation. This section discussed the role of technology in CCRS and rising frustrations and confusions related to technology during CCRS implementation. Lack of communication and collaboration was the explanation of the rising frustrations and confusions. Researchers have explored ways of supporting communication and collaboration, and technology has been identified as an effective way of supporting communication and collaboration. Therefore, ways of supporting effective communication and collaboration through technology are reviewed in the closing of this section.

Role of Technology in CCRS

Technology component of CCRS immediately caught educators' eyes when CCRS was launched in 2009. Technology was no longer an option for teachers and students to choose. Instead, technology was embedded into CCRS and considered "an integral tool for learning as mighty as the pen" (Graham, 2013, p. 1) rather than a set of skills. Goff (2013) specified the places where technology was mentioned in CCRS. For

instance, mathematical standards required students to use technology tools such as calculator to solve mathematical problems. Similar requirements were also found in English Language Arts standards. CCRS recognized the role of technology as the learning tool that supported learning in digital ways (Neuman & Gambrell, 2013). Technology was an essential part of CCRS implementation and could not be discussed separately. Besides, one of the CCRS goals was to ensure equitable learning opportunities. Technology was imperative for students with special learning needs to access educational resources as other students. Graham and Harris (2013) examined the advantages and challenges of implementing CCRS in writing instruction. Results indicated that assistive technology was needed if students with learning disabilities wanted to succeed. McNulty and Gloeckler (2014) suggested providing assistive technology devices and services for students with special learning. A number of researchers addressed the importance of technology in CCRS implementation and provided many technological tools and digital environment that supported CCRS implementation (Bean, 2014; Hutchison & Colwell, 2014; Moss, 2012; Siko & Franklin, 2013). McLaughlin and Overturf (2012) advocated using technology as an important way of improving learning effectiveness to meet CCRS standards. McLaughlin and Overturf (2013) further explained that technology helped educators plan learning activities, assess academic performance, and, more importantly, understand students' learning needs. Online learning space such as Wordpress was suggested as a good way of constructing the CCRS learning environment (McLaughlin & Overturf, 2012). Herbst, Aaron, and Chieu (2013) developed LessonSketch, which was a technological environment, to provide the communication place for mathematical educators through the use of Web 2.0

tools. Other tools, such as Core Math Tools, Digital Curriculum, Dynamic Geometry Software (DGS), and Google SketchUp, were described and explained in Polly's (2013) publication. Lassak (2015) showed that technology was utilized as a computational tool, an instructional tool, a relief of computational burden, and an exploration tool in mathematics class. Hall and Bush (2013) demonstrated various ways of using Web 2.0 tools, such as Weebly, GeoGebra, Quizlet, and Socrative, to meet the CCRS mathematical standards. Nichols (2012) collaborated with other 7th grade English teachers and developed a digital storytelling project that demonstrated the successful implementation of CCRS through technology.

Frustration and Confusion

As shown above, abundant of resources and tools were available for educators to meet the requirements of CCRS standards. However, studies showed that technology was an issue and teachers were still struggling with CCRS even teachers showed positive attitudes towards CCRS (Burton, 2014; Cheng, 2012). The CCRS survey conducted by the Center on Education Policy (CEP) showed that technology was one of the major challenges in implementing CCRS. According to the survey, 20 states reported that the major challenge for them was to have enough computers and Internet in schools. In addition, providing adequate technological experts at state, district, and school levels was also a challenge for administrators (Kober & Renter, 2012). Teachers expressed their needs of teaching strategies and resources in classroom (Hipsher, 2014).

According to the Gallup Panel survey (Gallup, 2014) that represented American public school teachers' feelings of CCRS, more than 67% teachers were worried and frustrated with CCRS. More than 47% teachers reported that they did not get sufficient

support from their schools and districts. Resources from schools and districts were needed to support the CCRS curriculum reform. Zhang (2014) investigated new teachers' challenges when implementing CCRS and results showed that new teachers had difficulties of interpreting CCRS as teaching content, having consistent teaching materials with CCRS, and gaining sufficient support from school districts. One of the participants in Zhang's (2014) study explained that the inconsistency of information made him confused. Participants from Hipsher's (2014) and Christopher's (2014) also reported confusion and frustration. Lack of communication and collaboration was considered as the explanation to the rising frustration and confusion (Hipsher, 2014), "Frustration stemmed from a lack of coordination of information" (p. 79). Different schools had different assessment approaches and teachers were uncertain about what students were expected to do because of the conflicting information. Thus, to successfully implement CCRS, effective communication and collaboration were important and should not be ignored (Stegmaier, 2013; Vasinda, 2014).

To meet the high expectations of CCRS standards instead of leaving CCRS on the shelf, strong communication and collaboration were required to create a shared vision and avoid misunderstandings (Willis, 2013). Communication and collaboration were the most mentioned topics regarding CCRS professional development (Demski, 2013). Communication and collaboration were considered as the key elements to help teachers become ready for CCRS implementation (Fletcher, 2012). A learning community should be provided for teachers so that they could purposefully collaborate with peers across grades, schools, and districts (Zhang, 2014). According to Demski (2014), a lot of resources such as learning units and lesson plans were online. Adjusting and modifying

the existing online resources could save a lot of time. Louisiana Department of Education (LDOE) placed communication as a strategy of implementing CCRS to ensure that everyone understands the expectations of CCRS. LDOE suggested that communication strategies should include collaboration with local education agencies, newsletters, videos, Websites, and regular meetings with district and state administrators (LDOE, 2013). Kirst (2014) stated that significant communication efforts were required for the CCRS implementation in the following years because of the low awareness of CCRS standards.

Communication and Collaboration through Technology

Technology has been immediately identified as an effective tool of enhancing communication and collaboration by researchers (Cogan et al., 2013; Gallia, 2013; Royer & Richards, 2013; Yim et al., 2014). Brandt (2012) emphasized that various media was pivotal to providing clear and consistent communication to all stakeholders. Creating online professional learning communities was reported as a good strategy of facilitating communication and collaboration (Underwood, 2014). This recommendation was proved to be effective in Robertson's (2013) report. Robertson (2013) shared his experience of assisting a district with cloud-computing system application to communicate with more than 600 staff members and to provide on-going professional development. Results showed that cloud-based computing system helped his district solve the problem of communication and provided a collaborative place that allowed teachers to develop and discuss instructional materials regarding CCRS. Zhang (2014) also recommended creating an online professional learning community so that teachers could share resources and discuss issues they encountered. Hipsher (2014) investigated educators' perceptions of CCRS and professional development through multiple cases of CCRS implementation.

Results showed that technology was a way of solving the issue of frustration and confusion during the implementation of CCRS. Specifically, technology was mentioned in her study as the tool of connecting educators at all levels together and restructuring professional development opportunities. Teachers that participated in her interviews expressed that technology was able to maximize the use of educational resources and was the most requested form of support during CCRS implementation. Hipsher (2014) advocated the incorporation of technology into professional development, educational learning communities development, and connection with all stakeholders. Using technology was also reported in Christopher's (2014) study. One of the participants in Christopher's study reported that she experienced ways of integrating technology in schools to promote students' engagement. Christopher (2014) proposed that high-level use of technology, which improved CCRS implementation, should be given priority and teachers' creative use of technology should be encouraged and promoted. Holliday and Smith (2012) reported the success of how principals in Kentucky integrated technology into leadership to communicate and provide necessary materials. Leadership networks and Continuous Instructional Improvement Technology System (CIITS) were reported as the major components of the support plan developed by the Kentucky Department of Education (KDE). Ten meetings across the state were held through the leadership network with the purpose of discussing curriculum development, information consistency, and professional development opportunities during the past two years. CIITS provided Kentucky districts places to share instructional resources, teaching materials, and lesson plans. Teachers across the districts were able to collaborate with each other on CCRS implementation. With support of technology, teachers and principals were able to

communicate and collaborate anywhere and at any time. Holliday and Smith (2012) concluded that working collaboratively across districts and schools was necessary for successful CCRS implementation.

CCRS was transforming teaching with collaborative technology (Tucker, 2012). According to Tucker (2012), introducing technology enabled teachers to overcome their fears and barriers. Providing teachers with appropriate technological resources would support teachers' effort of integrating technology into teaching (Holliday & Smith, 2012). As discussed above, principals played an important role in supporting and promoting communication and collaboration through technology in CCRS implementation (Agamba & Jenkins, 2012; Boudah, Flint, Engleman, & Gabbard, 2014; Grady, 2011; Jenkins & Pfeifer, 2012). Underwood (2014) asserted that principals played the leading role of supervising and evaluating CCRS implementation. In fact, recent studies showed teachers' urgent needs of support from principals (Hipsher, 2014). Cheng (2012) examined teachers' perceptions of CCRS; most teachers participated in the study reported that they needed support and resources from administrators to help them relieve stress and transit to CCRS. Underwood (2014) stated that adequate guidance and resources were the guaranty of successfully achieving the goals of CCRS. Collaborative vision should be created and supported by principals (Schuhler, 2013). Willhoft (2012) supplemented that effective planning and support from principals would help teachers understand CCRS and communicate and collaborate with parents and communities in the implementation of CCRS. Ensey and DeVore (2013) further explained that collaborative behaviors were understood as trust, common vision and goals, open and reflective dialogue, focus on student learning, critical review of practices, risk taking, and

recognition. Communication and collaboration were important for principals to adjust administration activities such as ways of delivering CCRS training. Principals were recommended to establish a trusting, reflective environment with shared vision to support teachers with resources and emotions (Holliday & Smith, 2012).

Review of the literature related to CCRS indicated that successful implementation of CCRS required educators to communicate and collaborate at the local, state, and national levels. However, studies that explored how principals could support communication and collaboration through the use of technology to help CCRS transition were quite limited. Researching how principals support communication and collaboration through technology during CCRS implementation has a practical significance for educators.

Social Constructivist Learning Theory

Leading educational reform such as CCRS is a process of promoting meaningful learning (Shulman, 1987). All educators need to understand what CCRS means before they can implement and meet the requirements. Therefore, understanding how meaningful learning occurs in a digital world is important for principals to support CCRS implementation through technology. The following section discusses the meaningful learning process when people communicate and collaborate in a digital world.

Meaningful Learning

Similar to cognitive constructivism, social constructivism also acknowledges that knowledge can be constructed and learning occurs through the construction process (Piaget, 1985). Comparing to cognitive constructivism, social constructivism focuses on the influence of social context on learning. According to Vygotsky (1978), the pioneer

researcher of social constructivism, meaningful learning occurred when people interacted with their social contexts. Learning was considered as a social interaction process. Zone of Proximal Development (ZPD), defined by Vygotsky (1962) as the distance between actual development and potential development, was formed when people involved themselves in an interactive environment. Vygotsky (1978) believed that if people interacted within a ZPD, cognition would be developed through the interaction process. People brought to the context diverse experiences and knowledge structures. They listened to others, exchanged individual opinions, negotiated with the context, and re-constructed their knowledge structures. This process was referred to meaningful learning. People gained the opportunities of expanding their insights when they become involved in the interactive environment. Experienced people brought new information and shaped ways of understanding. Meanwhile, experienced people were able to gain missing knowledge and develop understanding in new ways. Less experienced listened to the stories of experienced people and constructed their knowledge structures through the communication. When communication and collaboration happened within a ZPD, meaningful learning occurred.

With the purpose of promoting meaningful learning through interaction, researchers expanded Vygotsky's social constructivism theory and claimed that interaction was visualized as communication and collaboration (Ashton-Jones, Thomas, & Belenky, 1990; McAlpine, 2000; Murphy, Drabier, & Epps, 1998; Svensson, 2000; Whitman, 1993). Powell and Kalina (2009) pointed out that social constructivism would benefit teachers to create an effective classroom whereby learners actively communicated with each other. Through communication and collaboration, learners internalized

knowledge effectively. Powell and Kalina (2009) recommended that communication and collaboration were good approaches to solve the issue of learning diversity defined as the combined differences of ethnic and biological background (Woolfolk, 2004). Bronack et al. (2008) emphasized that communication and collaboration were the central elements of instructional design from the social constructivism perspective. Semple (2000) presented that communication and collaboration were keys in applying social constructivism to learning. Communication and collaboration were not only occurring between teachers and students, but also existed among students. Teachers served as guiders and supporters in the communicative and collaborative learning environment. Students gained necessary support from teachers to make sure they were following the right direction. At the same time, students extended their understanding through communication and collaboration with peers. Through social constructivist perspective, Maor (1998) evaluated students' interaction by focusing on their communication process. Results showed that providing feedback, stimulating discussion, providing outside resources, and writing reflections were good strategies of promoting interactive learning. Roth (1990) also believed that collaboration was necessary to classroom instruction based on the social constructivist learning theory. Roth (1990) stated that students were motivated by collaboration when they were exposed to the collaborative environment.

Meaningful Learning, Communication, and Collaboration

Literature has demonstrated that meaningful learning occurred and was enhanced through communication and collaboration (Bruffee, 1986; Diepen, Collis & Andernach, 1997; Hosking, 1999; Jackson & Fagan, 2000; McKenzie & Murphy, 2000; McCloughlin & Marchall, 2000; O'Reilly, 2000; Persico & Manca, 2000; Stables, 1995; Wan &

Johnson, 1994). As a consequence, researchers put a lot of effort into exploring and developing communicative and collaborative learning context with the intent of raising meaningful learning (Harper & Hedberg, 1997). Because of the interactive and collaborative nature, technology immediately gained researchers' attention with its potential of constructing interactive and collaborative learning environment (Parker & Chao, 2007). In fact, many researchers advocated technology as the way of creating collaborative environment to enhance meaningful learning occurred in the communication and collaboration process (Beldarrain, 2006; Huang, 2002). Barnes (2000) examined the relationship between technology development and theories. Her study concluded that social constructivism and technology development were closely related and should not be discussed separately. Maddux, Johnson, and Willis (2001) expanded more details of constructivists' view on the principals of applying Vygotsky's social constructivism in classroom. Maddux et al. (2001) believed that learning was a collaborative process. ZPD was important for curricular planning. Meaningful learning context was necessary for school learning that should be connected with outside experience. Maddux et al. (2001) suggested that educators should use technology to enhance communication and collaboration. Technology, for instance multimedia presentations, was recognized as a good way of connecting school learning with outside experience. People construct their understandings by communicating, interacting, and collaborating with the meaningful environment supported by technology. Within the collaborative environment, people could move forward to ZPD and, therefore, understand and master particular learning tasks. Woo and Reeves (2007) redefined the concept of meaningful interaction based on the framework of social constructivism. Meaningful

interaction was reframed within an online environment as "responding, negotiating internally and socially, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another while solving some real tasks" (Woo & Reeves, 2007, p. 19). They emphasized that meaningful interaction occurred when the interaction directly influenced learners' intellectual internalization.

Support Meaning Learning Through Technology

Technology, such as the Web, was recommended as an effective way of supporting meaningful interactions. Learners were able to share resources and communicate with others interactively through various technological tools and moreover, establish interactive relationships with other advanced educators. According to Vygotsky (1962), learning was more effective when scaffolding, defined as a supplemental learning process that assisted ZPD, was provided for learners. McLoughlin and Lee (2007) explained that interactive environment could be built through technology to provide various forms of scaffolding from peers, groups, and communities. Obtaining communication and feedback could be an impetus for collaboration and meaningful learning. McLoughlin and Lee (2007) suggested that social software, including virtual interactive environment exampled as Multiplayer Online Games (MMOGs), content management environment such as blog, and relationship management environment such as Facebook had the capacity of meeting goals of communicating and collaborating urged by social constructivists. Cochrane (2006) also supported the use of social software tools to create collaborative learning environment, and wireless mobile devices were addressed to enhance communication and collaboration among teachers to students and students to students.

Learning Community and Meaningful Learning

Besides the significance of communication and collaboration in fostering meaningful learning, influences from the group or community on meaningful learning should not be ignored. As discussed above, interaction context not only included individual or personal background brought to the context, but also involved the context that the individual belongs to. According to Vygotsky (1978), communities played a central role in the process of supporting interaction and generating meaningful learning. Beck and Kosnik (2006) pointed out that social constructivism implied collaboration learning with a strong sense of community. Learning with support of the community would be more effective (Palinscar, 1998; Parker & Chao, 2007; Tam, 2000). Communication, collaboration, interaction, and participation were identified as the key characteristics of constructivist learning community (Jonassen & Rohrer-Murphy, 1999; Lock, 2002; Taylor, Fraser, & Fisher, 1997). People involved in the community created a shared vision and common interest. Individual knowledge was shaped and re-constructed through the interactions with others in communities. Bronack et al. (2007) also consented to the essential function of community in meaningful learning and recommended 3D virtual immersive world, specified as Appalachian Educational Technology Zone (AET Zone), for educators to build effective learning community and enhance communication and collaboration. Stahl (2005) examined meaningful group interaction and pointed out that meaningful group interaction was not just the sum of individual opinions. Instead, group cognition was constructed through group members' interactions as the production of meaningful interactions. Meaningful learning occurred when individuals interpreted group cognition through the negotiation process based on their own experiences and

perspectives. Maor (2003) examined teachers' and students' experiences of online learning community. Although students were different in their online learning experience, results showed that social constructivist learning community fostered communication and collaboration. Anderson and Garrison (1998) further pointed out that communication and collaboration took place in the community composed of students' collaboration and communication between teachers and students, interaction between students, and the learning content. According to Anderson and Garrison (1998), in educational context, meaningful learning was the intended outcomes of communication and collaboration. Anderson and Garrison (1998) defined meaningful learning as personal learning and continuous learning. Learners not only confirmed the information delivery, but also interpreted the concepts. Communication and collaboration were considered as the two-way information transaction.

Six types of interaction were addressed in Anderson and Garrison's (1998) study: learner-teacher, learner-content, teacher-content, learner-learner, teacher-teacher, and content-content. This study chose the six categories of communication and collaboration as conceptualized by Anderson and Garrison (1998) and coded the communication and collaboration activities in the qualitative stage of the research.

Learning Community and Professional Development

Review of literature on community indicated that creating a learning community was important to enhance meaningful learning that occurred through communication and collaboration based on social constructivist learning theory. This notion not only applied in students' learning, but also to teachers' professional development. In fact, the necessity and importance of creating a learning community to support professional development

have been addressed in the literature (Bruce & Easley, 2000). Sempel (2000) stated that the learning community was a great place for learners to exchange resources and information. Members in the community were considered as partners rather than competitors. Experience of working in a community encouraged teachers to promote the learning community and group work. Learning was enhanced through community members' group work. Bruce and Easley (2000) pointed out that further support was still needed even when teachers participated in professional development. Placing teachers as the learners was a good professional development strategy to implement and promote educational reform. To implement CCRS, which was considered as the greatest educational reform in American K-12 education, educators were highly recommended to apply social constructivism in the reform, especially in professional development area. CCRS was very new to teachers. In the process of implementing CCRS, teachers were also learners. They also needed to learn and understand the requirements addressed in the standards. Palinscar (1998) pointed out that "educational innovation of particular importance is the application of the tenets of social constructivism to the design of professional development contexts with teachers" (p. 370). Stoll, Bolam, McMahon, Wallace, and Thomas (2006) also assented to the statement that the way educational reform was being implemented depended on how well teachers learned and understood the educational reform. The demands of the educational reform required appropriate professional development opportunities and contexts for teachers (Grossman &Weinberg, 1998; Palincsar & Magnusson, 1997; Schifter, 1996). Van Driel, Beijaard, and Verloop (2001) asserted that teachers' knowledge was constructed within their working contexts. To achieve the goal of educational reform, long-term planning of professional

development should be provided for teachers. Van Driel et al. (2001) further suggested that providing a learning community, such as learning networks, was able to foster reform implementation and avoid educational reform resistance.

Teachers interacted within the learning networks and taught each other through the interaction process. Opportunities of working collaboratively, such as collaborative action research projects, were needed for teachers to explore questions within their own contexts (Bencze & Hodson, 1999; Feldman, 1996; Lynch, 1997; Parke & Coble, 1997). Huang (2002) suggested that opportunities should be provided for learners to identify their personal interests to increase learners' intrinsic motivation for group construction. This self-identification process helped learners construct knowledge from various perspectives and develop meaningful learning. Teachers involved in the learning community work together to translate the educational reform, such as CCRS, into teachable materials such as teaching pedagogy, teaching strategies, and lesson plans. Borko (2004) stated that teachers' learning would be enhanced if strong professional communities were provided. Evidence of this notion already existed in the literatures (Ball, 1994; Smith, 1997; Wineburg & Grossman, 1998). Birman, Desimone, Porter, and Garet (2000) regarded professional development as the tool of narrowing the gap between teachers' current performances and expected performances required by the standard-based educational reform. Birman et al. (2000) pointed out that the professional development context was compromised of activity form, activity duration, and participation. Further, content focus, active learning, and coherence were addressed as the characteristics of professional development in Birman et al.'s (2000) study. Content of professional development was suggested to directly relate to teachers' experiences.

Briman et al.'s (2000) study showed that teachers increased their knowledge and skills when the context was more relative to their practical experiences. When teachers actively engaged in professional development, they were more productive in developing teaching materials. Furthermore, to successfully implement education reform, connecting with politics was an important part that should not be ignored. Briman et al. (2000) concluded that providing appropriate professional development content directly related to politics, played the central role in implementing educational reform. Therefore, necessary and important is to examine how professional development, including the context and opportunities, was provided for teachers with the intent of successfully implementing educational reform like CCRS.

Social constructivism explained that learning was a constructive process under the influence of interactions within the context, including human beings and the environment that human beings belong to. However, with the fast development of technology, interactions historically have changed in ways that could not have been imagined. Learning was not limited to location or time any more. Anyone could acquire professional knowledge in a second with the support of technology regardless of location. With deepening impact on learning, researchers need to consider the influence of technology on knowledge construction, which was not explained in social constructivism. In other words, the learning process influenced by technology should be addressed and explained. Hence, connectivist learning theory is discussed in the following section to describe and explain the core statements of connectivist learning theory and the learning process in digital world.

Connectivist Learning Theory

With technology's continuous influence on learning, knowledge distribution and learning patterns have changed tremendously. Understanding the learning process and patterns in a digital world is important for principals to successfully lead and support CCRS. This section reviews the key points of connectivist learning theory and the relationship between connectivist learning theory and leadership. The importance of supporting a dynamic learning environment through communication and collaboration is reviewed at the end of this section.

Connnectivist Learning Theory

Siemens (2005) introduced the concept of connectivism as a learning theory with the purpose of describing and explaining the learning process in today's digital world. Siemens (2005) perceived that learning was moving toward various forms because of the constant development of technology. Informal learning, which utilized technology as the primary learning channel, compromised an important part of today's learning. People can easily access abundant information through technology such as Internet. However, the chances of accessing huge amounts of information do not imply meaningful learning. As discussed above, meaningful learning occurs only when learners construct useful information to the current knowledge structure. Therefore, today's learners need to have the ability of filtering information from overflowing digital resources and quickly make decisions on the quality of information (Kop & Hill, 2008).

Learners' ability of understanding a subject area has changed over time coupled with the rapid expansion of technology (Downes, 2006). As a result, the emphasis of learning shifts from knowledge construction to learning capacity extension. For learners,

the ability to learn is more important than what is already learned. Impacted by this notion, connectivism has considered learning as the decision-making process that utilizes technology to seek, develop, and preserve the connections among various information resources (Siemens, 2005). These connections not only contain the learning networks in social context but also across different fields, ideas, and concepts (Siemens, 2005). Learners share new information and adjust their knowledge structure through connections. This learning cycle is repeated all times both during formal and informal learning. Connectivism set up an excellent model for continuous and life-long learning (Downes, 2006).

Theoretically, connectivist learning theory is an extension of social constructivist learning theory. Similar to social constructivist learning theory, connectivist learning theory also addresses the external influence on learning. Differently, connectivist learning theory views knowledge as dynamic and connected. Knowledge not only resides inside the mind but is also distributed outside across the network connections in different forms and patterns of today's digital world. Chatti, Jarke, and Frosch-Wilke (2007) agreed that "knowledge is fundamentally social, personal, flexible, dynamic, decentralized, ubiquitous, networked, and complex in nature" (p. 410). Knowledge was not stable any more. Kop and Hill (2008) pointed out that the validity and accuracy of knowledge was changing all the time in today's world. The ideas people used to believe may not be correct any more after a few years. Consequently, learning was considered as knowledge creation rather than knowledge consumption (Kop & Hill, 2008). On the internal level, learners purposefully updated and integrated new information into existing knowledge networks. Knowledge was constructed as a set of connections. The connections were

organized in the forms of experience and activities. Learning was the process of internalizing knowledge and fostering meaningful learning. On the external level, learning was a dynamic knowledge acquisition process. Knowledge was acquired in the form of activities that learners participated. Learning result was the ability of extending learning to different networks. The connections and networks facilitated through technology were the intermediaries and conduits of externalization (Siemens, 2006). According to Siemens (2006), people were social beings. The needs of expressing themselves lead to externalization. People convey thoughts through experience and activities across different networks. Externalization of information ensures people completely understand the knowledge. As asserted by Vygotsky (1978), "thoughts did not come into existence unless expressed in words" (p. 218).

Although connectivism argued that knowledge was not held in one place social constructivism believed knowledge was static object; this internal knowledge organization process occurred on the internal level was consistent with the viewpoints advocated by social constructivism. Connectivism acknowledged individual diversity and encouraged learners to modify and organize their learning networks based on the connections to learning communities. The comparison between social constructivism and connectivism did not indicate that connectivism was the best theoretical framework to explain the learning process in a digital world. On the contrary, educators need to include both connectivist learning theory and social constructivist learning theory to avoid shortages of each framework. Grooms and Reid-Martinez (2011) combined social constructivism and connectivism and created the sustainable leadership development model. Results demonstrated that learners gained broader knowledge when their personal

contexts were expanded by technology in sustainable leadership development model. Sustainable connection helped learners maintain accuracy and currency of information. Anderson and Dron (2011) suggested that connectivist learning needed to "gain high levels of skill using personal learning networks that provide ubiquitous access to resources, individuals and groups of potential information and knowledge servers" (p. 8). The focus should be given to knowledge creation instead of knowledge consumption.

Connectivism and Leadership

The realization of learning patterns and environmental shifts was especially essential for educational leaders to lead educational reform such as CCRS. Informal learning played an essential part in teachers' learning and resulted in diverse ideas and resources. Leading a team with diverse viewpoints can be quite challenging for principals. Siemens (2005) stated that the ability of organizing and synthesizing various viewpoints decided the success of educational reform. Brown (2006) explained the education paradigm shifts and stated that organizations should provide a connected environment that enabled learners to explore, evaluate, and share knowledge and information as well as construct individual knowledge structure instead of offering consumed or digested knowledge. Creating continual leadership connection was identified as an approach of solving the issue of diversity (McElvaney & Berge, 2009). The intention of continuous or life-long learning emphasized by connectivism coincided with the innovative objectives of digital leadership. The International Society for Technology in Education for Administrators (ISTE-A, 2009) required that educational administrators in a digital world should possess the capability of leading digital transformation, creating digital learning culture, supporting ongoing professional growth,

enhancing continuous organization improvement, and assisting digital citizenship. The dynamic learning environment highlighted by connectivism was a good approach of supporting ongoing professional growth and digital learning (Grooms & Reid-Martinez, 2011). Bever Goodvin and Gibson (2008) confirmed the essential role of connectivism in educational leadership by examining school leaders' experiences and perceptions of systemic change. Results implied that continuous learning or lifelong learning was essential for school leaders to maintain the innovative changes. Jones and Dexter (2014) examined different forms of learning and their results showed that teachers needed in-time, content-specific, and ongoing support. In other words, school leaders should provide an effective learning environment that should be learner-centered, knowledge-centered, assessment-centered, and community-centered. When providing professional development for teachers, school leaders should consider all learning patterns, including formal, informal, and independent learning (Jones & Dexter, 2014). Formal learning, which most people were familiar with, was defined as organizational learning such as district training. Informal learning, as discussed by Jones and Dexter (2014), was described as peers' learning (e.g., interaction and learning with colleagues). Independent learning was explained as individual learning activities. This present study included all of the learning patterns and examined how the three types of learning were supported through technology. Supporting teachers' learning was an important part especially in the initial stage of CCRS implementation.

Literature of connectivism showed that connected, networked, and dynamic learning environments were imperative to enhance and especially expand meaningful learning through communication and collaboration. Communication and collaboration

were important elements of the connected, networked, and dynamic learning environment. Learning was a dynamic process and would not stop at communication and collaboration. Providing sustainable and on-going support for teachers should be included and considered in digital leadership. Although studies related to digital leadership addressed this concern (Browne-Ferrigno & Muth, 2004; Den Hartog, House, Hanges, Ruiz-Quintanilla, & Dorfman, 1999; Pearce, 2004; Thach, 2002; Twiss et al., 2003), few studies were conducted to explore how to create a dynamic learning environment so that teachers can obtain on-going support. For instance, Kam, Greenberg, and Walls (2003) pointed out that leadership in today's digital world should be explained and assessed according to the International Society for Technology in Education for Administrators (ISTE-A, 2009). Five aspects were mentioned by ISTE-A as ways of evaluating digital leadership. However, how to specifically evaluate each aspect was not provided. Therefore, it was necessary to investigate how leadership has been influenced by technology and how digital leadership examined quantitatively was needed. The following section discusses the influences of technology on leadership and how researchers examine digital leadership based on ISTE-A standards.

Leadership and Technology

Technology not only influences on education, but also has a great effect on leadership. International Society Technology in Education (ISTE) published standards with the intent of providing ways of evaluating digital leadership. This section reviews the development of digital leadership and the process of standardizing digital leadership. International Society for Technology in Education Standards for Administration (ISTE-A) is reviewed at the end of this section.

Digital Leadership

Research on leadership started from 1900s with the focus on differences between leaders and followers. Leadership research in the following decade shifted to investigation of how settings affected leadership after no evidence was found to explain leaders' behaviors. The trend of including technology into leadership research could be ascribed to the tremendous growth of digital tools and resources in early 21st century. Researchers began to discuss the relationship between technology and leadership when education was in transition to a digital learning environment. School leaders were compelled to explore ways of administrating schools through technology (Hess, 2003).

Digital leadership was one of the concepts that described and explained the leadership role shift. Digital leadership that bridged two fields of leadership and instructional technology was also termed by other researchers as educational technology leadership (Kearsley & Lynch, 1994), information and communication technology (ICT) leadership (Afshari, Bakar, Luan, & Siraj, 2012), technology leadership (Arokiasamy, Abdullah & Ismail, 2014), and e-leadership (Jameson, 2013). Anderson and Dexter (2005) stated that effective integration and utilization of technology in schools required support from principals' digital leadership. Kearsley and Lynch (1992) further pointed out that principals' digital leadership not only included getting themselves familiar with technology, but also involved in creating a shared vision of technology and providing professional learning opportunities for teachers. Kearsley and Lynch (1992) provided a conceptual framework that addressed skills of digital leadership from the cultural view. Skills of digital leadership were sorted at five levels: state, district, principal, teacher, and technology specialist. At the state level, leaders maintained and provided support across

the state for data processing, hardware, software, technology budget, policies, and network. At the district level, skills included addressing technology integration strategies, conducting teacher training, and other technological needs related to district. At the principal level, digital leaders offered appropriate opportunities and policies for technology use and resources. For teachers, they needed to provide and encourage students as well as parents to involve technology integration. Technology specialists offered necessary technological support and identified useful technology resources and applications for teachers' future professional training.

Standardized Digital Leadership

In 2001, The Collaborative for Technology Standards for School Administrators (TSSA Collaborative) was released through collaborative work of several organizations, including American Association of School Administrators (AASA), National Association of Secondary School Principals (NASSP), National Association of Elementary School Principals (NAESP), National School Boards Association (NSBA), Association of Educational Service Agencies (AESA), International Society for Technology in Education (ISTE), Consortium for School Networking (CSN), North Central Regional Educational Laboratory (NCREL), Southern Regional Education Board (SREB), Kentucky State Department of Education (KSDE), Mississippi State Department of Education (MSDE), Principals' Executive Program - U of North Caroline, and the College of Education – Western Michigan University. TSSA established a set of technology standards that explained specifically what school leaders needed to know and what they should do with technology (McCampbell, 2001). School principals showed positive attitudes towards TSSA and stated that TSSA Collaborative could help

technology integration and facilitation in instruction and schools (Brockmeier, Sermon, & Hope, 2005). However, TSSA Collaborative emphasized the role of leadership in school technology enhancement and facilitation, but did not provide a way to achieve the goal of effective technology leadership (Kara-Soteriou, 2009). A year after the TSSA Collaborative release, National Educational Technology Standards (NETS) for Administrators (ISTE, 2002) was published through the International Society Technology in Education (ISTE) that made significant contribution in developing the TSSA Collaborative. NETS for Administrators (ISTE, 2002) defined six dimensions to specifically evaluate technology leadership: leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal and ethical issues. Each dimension had six standards that described and explained the dimension. For the following years, NETS-A played an essential role in leading and evaluating digital leadership. According to ISTE's Website report, there were more than 29 states that adopted NETS-A standards in different ways. Some researchers used ISTE (ISTE, 2002) standards as a theoretical framework to investigate how elementary principals performed as technology leaders, and results showed that teachers needed technology professional development opportunities (Macaulay, 2008). Other researchers utilized NETS-A standards to develop technology leadership indicators (Anderson & Dexter, 2005). Yu and Durrington (2006) introduced NETS-A standards as effective leadership indicators to examine school administrators' technology competencies and investigated the differences among the indicators. Results showed that there were significant differences among the indicators.

The most significant work related to NETS-A standards during this period was the development of Principals' Technology Leadership Assessment (PTLA) by American Institutes for Research. PTLA, which contained six sections developed from NETS-A standards with six items under each section, was an instrument with the purpose of assessing principals' technology leadership abilities. PTLA provided an effective instrument for researchers to study and evaluate digital leadership quantitatively. Banoglu (2011) utilized and modified PTLA to examine principals' technology leadership competency and the results showed that technology leadership should be discussed together with shared vision and technology planning skills. Unfortunately, Banoglu's (2011) paper did not provide the modified survey in the appendix section and therefore, the survey was difficult for other researchers to expand further. Duncan (2011) chose PTLA to investigate whether principals in Virginia met the ISTE standards (ISTE, 2002). In her study, she transformed the original survey instrument to an online survey without changing any information of the instrument. Results showed that public schools made little progress in technology engagement and school administrators barely met the standards. Although at the end of the study Duncan (2011) advocated that necessary strategies should be provided to help public school administrators in Virginia to meet the new NETS-A standards (ISTE, 2009), it was not appropriate to give recommendation of meeting new NETS-A standards (2009) based on the research results from the old ISTE standards (ISTE, 2002). In fact, research revealed that PTLA was not a good instrument of school technology use (Raman, Don & Latif Kasim, 2014). To effectively examine how principals met the new NETS-A standards, the PTLA survey instrument needed to

be modified based on the new ISTE-A standards (ISTE-A, 2009), or a completely new assessment instrument needed to be developed.

One of the purposes of this dissertation study was to develop a new technology leadership assessment instrument based on the new ISTE-A standards (ISTE-A, 2009) to fit the CCRS context. With the new survey instrument, principals' technology leadership could be measured and evaluated quantitatively and helped make decisions about whether principals met the new NETS-A standards or not within the context of Common Core. Therefore, understanding the new NETS-A standards was important and necessary for researchers to develop an effective technology leadership assessment instrument based on the new NETS-A standards.

International Society for Technology in Education Standards for Administration (ISTE-A)

In 2009, International Society for Technology in Education (ISTE) updated NETS-A standards, re-named as ISTE-A, to assist education leaders to be better prepared for the fast developing digital world. Compared with the 2002 version standards, ISTE-A standards focused on administrators' necessary technological needs (Schrum, Galizio, & Ledesma, 2011). To avoid confusion about the old and new standards for administrators in this present study, NETS-A would be used to describe the old ISTE standards (ISTE, 2002) while the new ISTE-A standards (ISTE-A, 2009) would be labeled as ISTE-A standards during the following discussion. After the update in 2008, ISTE-A standards were re-grouped as visionary leadership, digital age learning culture, excellence in professional development, systemic improvement, and digital citizenship (ISTE, 2002).

ISTE-A standards have been published for several years and play an essential role in explaining and evaluating digital leadership for the past years. Researchers utilized

ISTE-A standards as a framework and performance indicators to decide what technology skills administrators should possess and how to evaluate administrators' digital leadership skills (Cakir, 2009; Dickerson, Winslow, Lee, & Geer, 2011; Garcia & Abrego, 2014; Newton, da Costa, Peters, & Montgomerie, 2011; Rivard, 2010; Winslow, Dickerson, Lee, & Geer, 2012). Among numerous studies of ISTE-A, researchers not only took use of ISTE-A standards as tools to address and evaluate digital leadership skills (McLeod & Richardson, 2013), but also went further to discuss each indicator of digital leadership addressed by ISTE-A standards (Afshari et al., 2010; Butler, 2010; Dessoff, 2010; Lecklider, Clausen, & Britten, 2009; McCombs, 2010; Ribble & Miller, 2013; Richardson, Flora, & Bathon, 2013; Yang & Chen, 2010). Darrow (2010) described how administrators worked together with students, teachers, and stakeholders to create a shared vision on online programs. Lecklider et al. (2009) provided an example of creating a digital learning culture to promote education innovation. Results emphasized that professional development was the first priority indicator compared with others. Banoglu (2011) adapted ISTA-A evaluation survey (PTLA) and examined principals' digital leadership competency. Further comparison and discussion of each dimension of the ISTA-A standards were also conducted in the study. Statistical results showed that visionary leadership had the lowest value compared with other indicators. Results revealed that gender had an effect on the technology vision because female principals possessed stronger communication and collaboration skills to build a shared visionary leadership with other educators. Additionally, technological resource, such as the technology coordinator, was reported as the leading contributor of principals' technology

proficiency because of technology coordinators' encouragement of technological innovation.

The conclusion was evidently consistent with Metcalf and LaFrance's research (2013). Metcalf and LaFrance (2013) measured technology leadership preparedness from principals' perception guided by the five themes of ISTE-A standards. Results revealed that digital citizenship was the most prepared indicator while visionary leadership was the least prepared indicator. Metcalf and LaFrance agreed that ISTE-A standards should be aligned and incorporated with principal preparation programs as well as district supplemental programs. Curnyn (2013) asserted that visionary leaders should lead and consider the influence of the emerging technology on learning and teaching. Visionary leaders should seek and promote communication and collaboration. Larson, Miller, and Ribble (2009) suggested five considerations regarding the five standards of ISTE-A standards. Larson et al. asserted that a proactive technology plan includes a creative and innovative classroom environment, use of a systems perspective, a consistent professional development plan, and an assessment of appropriate technology use. **Garcia** and Abrego (2014) interviewed five principals and surveyed 67 in-service elementary principals to explore fundamental skills of digital leadership. Four themes aligned with ISTA-A standards were summarized as fundamental skills of digital leadership: familiarity of software and hardware, using information and data retrieval, communicating with stake holders, and planning and management of resources. Wang (2010) discussed all sections of ISTE-A standards with situational contexts and specific activities and tasks. Guiding questions, which were useful for school leaders, were provided after each discussion section. Richardson et al. (2012) reviewed the studies published from 1997 to 2010 to

investigate how each performance indicator of digital leadership was studied in the field. Results showed that systemic improvement and digital citizenship were paid less attention and more studies were needed for the two indicators. They suggested that in-depth research could help school leaders face the challenges of implementing digital transformation in schools. Unfortunately, Richardson et al.'s (2012) study did not discuss the possible relationship that existed among indicators, even though results revealed the existence of the relationship. Results in the systemic improvement standard section showed that systemic improvement had positive impact on digital learning culture (Lecklider et al., 2009). In addition, visionary leadership combined with systemic improvement had an effect on digital learning culture (Ritzhaupt, Hohlfeld, Barron, & Kemker, 2008).

Summary

Successful implementation of CCRS requires all educators communicate and collaborate at local, state, and national level. With technology's continuous influence on the education area, principals should possess the skills of supporting communication and collaboration technologically. ITSE-A provided a set of knowledge and skills for researchers to examine principal's digital leadership. To support communication and collaboration through digital leadership regarding CCRS implementation, principals need to know ways of creating a shared vision, building a digital age learning environment, providing professional development, supporting systemic improvement, and promoting digital citizenship.

Researching how digital leadership supports communication and collaboration regarding CCRS implementation can enlighten K-12 principals to lead schools' digital

transformation and more importantly, decrease teachers' confusion and frustration regarding how to (a) communicate and collaborate with other educators, (b) increase coordination of information and resources, (c) provide appropriate professional development opportunities, and (d) better support and facilitate successful CCRS implementation.

The next chapter discusses the methods and procedures of conducting the present study. Areas such as participants, research design, instrument construction, and steps that will be taken are addressed.

CHAPTER III - METHODOLOGY

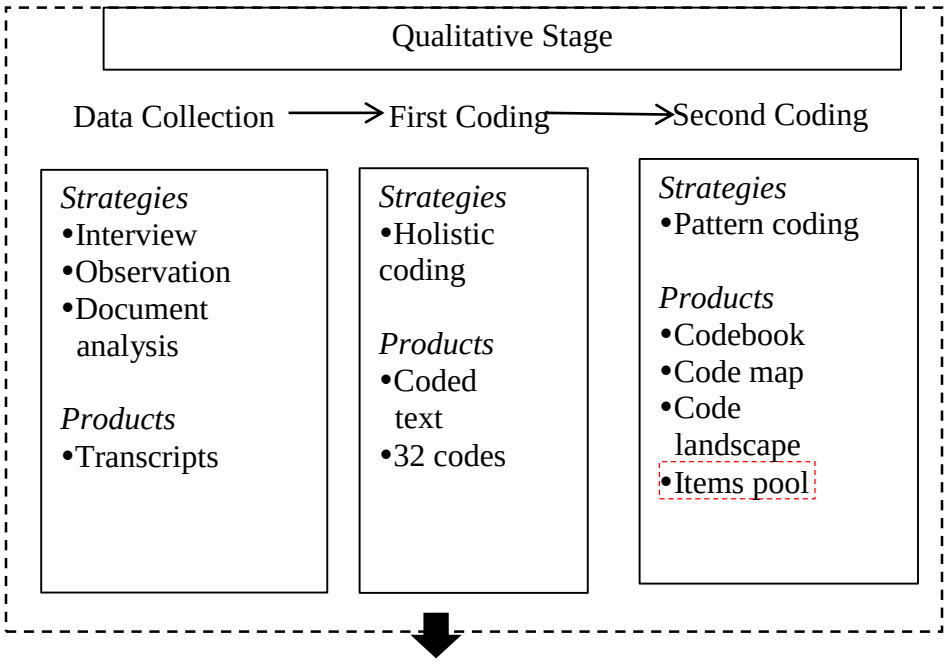
Chapter III explains the research methods for answering the research questions proposed in Chapter I. The research design of this study is a mixed-methods approach that consists of both qualitative and quantitative methods. This chapter begins with the explanation of the reasons for choosing mixed methods, specifically exploratory sequential design. The research setting, participants, data collection instruments, procedures, and data analysis are explained in the following sections.

Research Design

The purpose of this study was to investigate how K-12 principals support communication and collaboration through technology to implement the CCRS. To achieve this goal, the researcher first explored principals' ways of utilizing technology to support school communication and collaboration. Mixed-method was appropriate to explore the research problem of this particular study because it helped the researcher gather adequate data to develop the digital leadership assessment survey (Creswell & Plano-Clark, 2011). In addition, mixed-method strengthened the reliability of the study because this design included two forms of data to be collected. Qualitative data could provide a detailed explanation of how K-12 principals understood and carried out digital leadership. Quantitative data collected from a digital leadership assessment survey could demonstrate the level of effectiveness of digital leadership.

Mixed-methods consisted of several designs, including convergent parallel design, explanatory sequential design, exploratory sequential design, embedded design, transformative design, and multiphase design (Creswell & Plano-Clark, 2011). Exploratory sequential mixed-method strategy was appropriate for this study because no

valid instrument was found and the researcher needed to develop an appropriate instrument (Creswell & Plano-Clark, 2011). According to Creswell (2003), exploratory design included four steps: (1) collect and analyze qualitative data, (2) develop a quantitative instrument, (3) deliver quantitative instrument, and (4) analyze the quantitative data. Based on Creswell's (2003) steps, the researcher collected and analyzed qualitative data first to explore how K-12 principals understood and carries out digital leadership. After that, the researcher coded the qualitative data and used the results to develop and evaluate a quantitative instrument. In the third step, the quantitative instrument was delivered to participants. Finally, the researcher examined the effectiveness of digital leadership through statistical analysis of quantitative data. The process and relationship of each stage were shown in Figure 1.



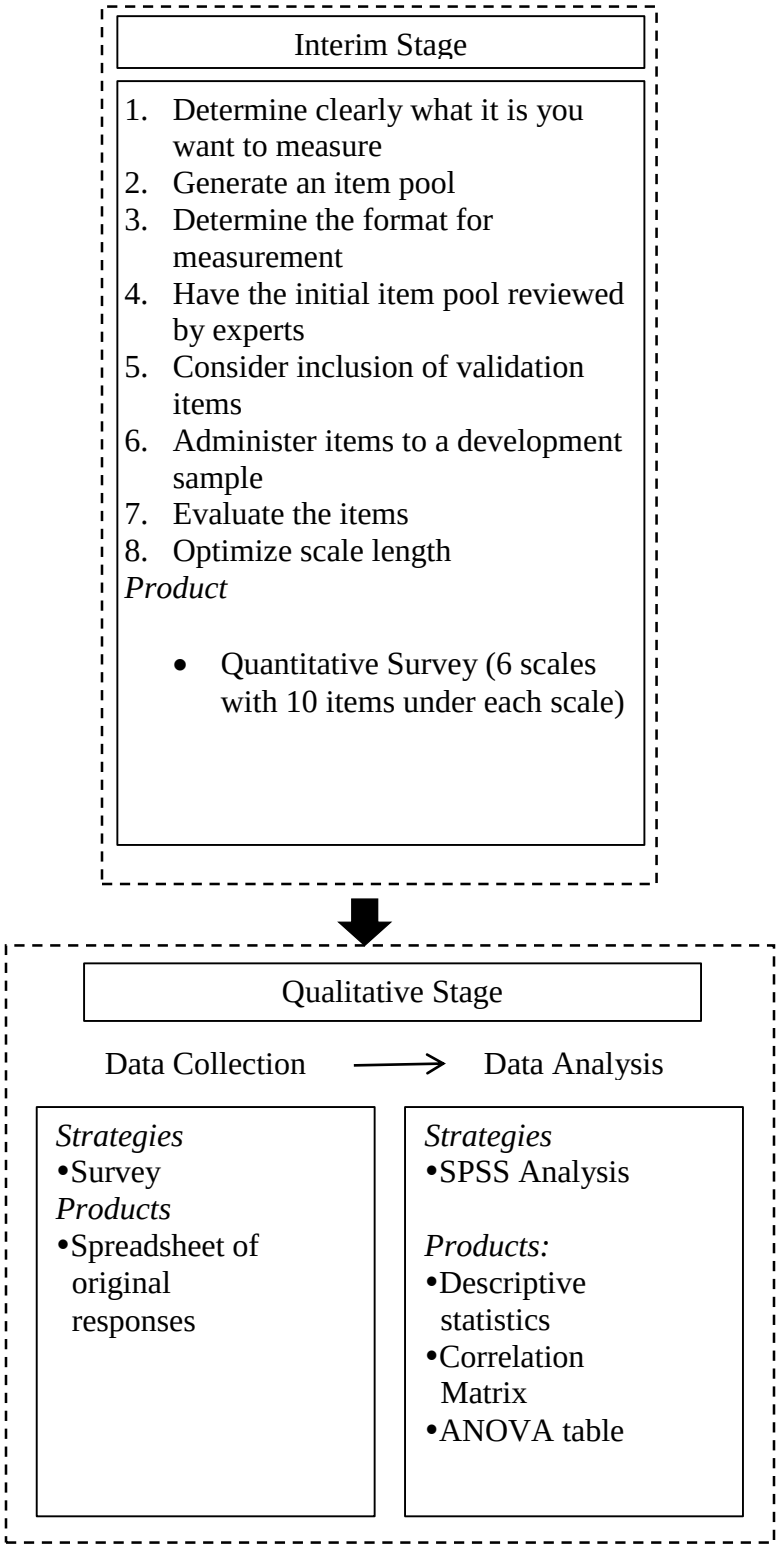


Figure 1. Research timeline of study.

Qualitative Stage

The initial qualitative stage of the study utilized a case study approach as the research method because of the unique context of this study. This study was conducted in K-12 schools that were implementing CCRS. Case study was well-suited for this qualitative stage because the purpose of the study was to explore participants' real-life experiences with regard to CCRS communication and collaboration. In addition, case study had the ability to provide rich information to understand and explore the process from within the unique context (Creswell, 2003). During the qualitative stage, this study focused on understanding and exploring how K-12 principals integrated technology into leadership to promote and foster communication and collaboration on campus during CCRS implementation. The following research questions were proposed for the qualitative stage:

1. In what ways do K-12 principals support and promote communication and collaboration through visionary leadership to ensure successful CCRS implementation in Mississippi?
2. In what ways do K-12 principals support and promote communication and collaboration through digital learning culture to ensure successful CCRS implementation in Mississippi?
3. In what ways do K-12 principals support and promote communication and collaboration through professional development to ensure successful CCRS implementation in Mississippi?

4. In what ways do K-12 principals support and promote communication and collaboration through systemic improvement to ensure successful CCRS implementation in Mississippi?
5. In what ways do K-12 principals support and promote communication and collaboration through digital citizenship to ensure successful CCRS implementation in Mississippi?

Quantitative Stage

Quantitative research had two types of design: non-experimental design and experimental design (Rovai, Baker, & Ponton, 2014). Non-experimental design tested the variables without controlling the research conditions while experimental design tested the variables by controlling the research conditions. A non-experimental design was appropriate for this study because the researcher did not change the research setting during this stage. According to Rovai et al. (2014), there were three types of non-experimental design: descriptive design, correlational design, and causal-comparative design. This study aimed to describe the effectiveness of supporting communication and collaboration through technology, and thus descriptive design was suitable for this study. Specifically, cross-sectional design, which was one of the basic types of descriptive design, was utilized to collect data because the data was collected on a single point time. Surveys were frequently used method to collect data within cross-sectional design (Rovai et al., 2014). The following research questions were proposed for the quantitative stage:

1. To what extent is visionary leadership effective in supporting and promoting communication and collaboration through technology regarding CCRS implementation in Mississippi?

2. To what extent is digital learning culture effective in supporting and promoting communication and collaboration through technology regarding CCRS implementation in Mississippi?
3. To what extent is professional development effective in supporting and promoting communication and collaboration through technology regarding CCRS implementation in Mississippi?
4. To what extent is systemic improvement effective in supporting and promoting communication and collaboration through technology regarding CCRS implementation in Mississippi?
5. To what extent is digital citizenship effective in supporting and promoting communication and collaboration through technology regarding CCRS implementation in Mississippi?
6. Do demographics make a difference in any of the scales of digital leadership?

Research Setting

Qualitative Stage Setting

For convenience, the qualitative phase was conducted at 2 public school districts in southeast Mississippi. Schools in these districts were varied in technology integration and implementation. Both school districts had a technology department that supports schools' technology development. There were 3 groups in the technology department of the district, including instructional technology, technical support, and data processing. The instructional technology group had 3 instructional specialists. The technical support group had 10 technical specialists. The data processing group had 3 data processors. Schools shared an instructional technologist from the district's technology department.

The instructional technologist was in charge of teachers' training, support of technology integration, and other technology issues.

Although schools in this school district were varied in instructional technology resources, all schools had at least one computer lab equipped with computer stations with Mac operation system, projector, and printer. All teachers and students had access to the computer lab. Each classroom had at least one computer lab class during the week. All libraries were provided with certain number of computer stations. Ninety-five percent of classrooms were equipped with a Promethean board. Half of the classrooms had iPads. Three classrooms were equipped with iPods. All schools had at least one Chromebook cart that teachers could check out during the workdays.

Quantitative Stage Setting

The research settings for quantitative stage were 5 public school districts in Mississippi. All school districts had technology department that focused on technical support for teachers, students, and staff. There were 59 public schools in the 5 school districts, including 14 high schools, 11 middle schools, and 34 elementary schools. All schools provided Internet connections for students, teachers, and administrators. Most classrooms had at least three desktops. All the libraries were equipped with computers connected to online learning resources. All buildings had access to Internet and mobile computer carts. All teachers were provided with laptops. After-school technology workshops were provided for teachers once a week. The after-school technology workshop participation was voluntarily. Teachers could request technology assistance from the help desk of the district official website. Teachers' requests were delivered to different instructional specialists based on the request categories. Instructional specialists

scheduled the date and time with the teachers to solve issues addressed at teachers' requests. Teachers' smartphones were also important communication tools. Text message was an important way of communication because teachers could acquire quick responses. School announcements were made over email, school speaker, and other notification system. Monthly meetings were held during the last week of each month with the intent of providing opportunities for teachers to communicate and collaborate.

Participants

The targeted samples in the qualitative stage were K-12 principals, assistant principals, and curriculum specialists who were implementing CCRS. Principals, assistant principals, and curriculum specialists who were administrating and implementing CCRS were identified as potential participants because they were leading CCRS transition and could provide rich information about communication and collaboration with regard to CCRS implementation. A criterion sample method was used to locate potential participants with the criterion of (a) being principal at least one-year in Mississippi, (b) leading CCRS transition in schools, and (c) working in K-12 schools. When the Institutional Review Board (IRB) approval was obtained, a participation recruitment email was delivered to potential participants immediately. After receiving responses from potential participants, interviews were scheduled for respondents who met the sampling criteria and volunteered to participate. The researcher contacted principals with a letter of consent (see Appendix A) and set up an interview time that was convenient. After the participants signed the consent forms, the researcher explained to the participants the purpose of the study and participants were interviewed with the open-ended interview questions (see Appendix B).

The total participants were 10 principals from 2 school districts. Demographic characteristics such as, age, race, gender, and school level represented a diverse distribution that allowed a better chance of making comparisons in the discussion chapter.

The samples for the quantitative phase included K-12 teachers in Mississippi. Principals and school district superintendents helped send out the recruitment invitation email to the teachers in their schools. Besides principals, the technology director at the school district also helped with recruitment invitation email delivery. In addition, the researcher contacted the local teachers to help with participant recruitment. The participant recruitment process started immediately after Institutional Review Board (IRB) approved this study. Convenience sampling, which was the most commonly used sampling method in social science research, was chosen as the sampling strategy for this study to ensure all people were included as research participants. Criteria for being included in the sample was that participants (a) were at least 19 years old, (b) had experience of working as K-12 teachers, and (c) participated in CCRS implementation.

254 teachers from 5 school districts participated in the survey. Similar to the qualitative stage, demographic characteristics such as, age, race, gender, school location, and grade level of teachers were diversified. Research participation was voluntarily and anonymous. A participation invitation letter (see Appendix E) was sent to K-12 teachers in the 5 school districts in the form of email.

Survey Development

The quantitative survey was developed after the qualitative data was coded and interpreted. DeVellis's (2012) 8-step scale development guidelines were used to assist

with the quantitative survey development. He suggested researchers first obtain a clear idea of what to measure with the aid of specific theory. In this study, ISTE-A standards have been utilized to guide the survey development. According to the International Society for Technology in Education standards for administrators (ISTE-A, 2009), digital leadership was evaluated by visionary leadership, digital age learning culture, excellence in professional practice, systemic improvement, and digital citizenship. The five dimensions of ISTE-A standards provided organization for the five subscales of the survey. Some of the standard names were modified to avoid confusion and misunderstanding with other terms used in this study. Names of the subscales are shown in Table 1. The modified scales represented visionary leadership, digital learning culture, professional development, systemic improvement, and digital citizenship. Besides the five scales, a demographic scale was developed as the first scale with the intent of collecting demographic information of the participants. Therefore, a total of six scales of the instrument identified in the first step were (1) demographic information, (2) visionary leadership, (3) digital learning culture, (4) professional development, (5) systemic improvement, and (6) digital citizenship.

Table 1

Subscales of Quantitative Survey

ISTE-A standards	Quantitative Instrument Subscales
Visionary Leadership	Visionary Leadership
Digital Age Learning Culture	Digital Learning Culture
Excellence in Professional Development	Professional Development

Table 1 (continued).

Systemic Improvement	Systemic Improvement
Digital Citizenship	Digital Citizenship
	Demographic Information

The second step of DeVellis's 8-step guidelines was to generate an appropriate item pool, which contained the survey items for quantitative stage. The initial pool was tested and items revised if they were not worded appropriately. For example, some items that expressed strong disagreement or attitudes might be altered to avoid acquiescence bias (DeVellis, 2012). Besides modifying items, the number of items in each scale was determined. Although impossible to indicate the exact number of items in the item pool (see Table 5), items of initial pool were suggested to be at least three or four times of the final pool (DeVellis, 2012). This study has chosen 6 scales with 10 items for each scale. Therefore, the initial items pool of the 10-item was a 40-item pool. Consequently, a 40-item for each scale of items pool was created in this step with appropriate items included.

The third step was to determine the format of organizing and presenting the items to respondents. Various formats were available for researchers to consider. This study utilized a Likert scale, which was one of the most commonly used response formats. Items were presented as statements within the Likert scale format followed by five levels (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5=strongly agree) of response options that designated degrees of agreement with the statements. Items were revised again to ensure that the statements were clear.

The fourth step was to review the initial items pool by experts. The initial items pool was sent to dissertation committee methodology professor. Professor provided feedbacks after evaluated the clarity of items as well as the relevance of items to research questions. The researcher revised items pool based on feedback from the methodology professor and developed the initial survey instrument that contained six scales with ten items under each scale.

The rest steps focused on instrument's revision and optimization, including considering validation items, administering all the items, evaluating items of the instrument, and optimizing the length of the instrument. The researcher went to the initial items pool and checked the items that had the potential of detecting flaws and constructing scale validity. The researcher included more items from the items pool and developed the final draft survey, which had 24 questions organized into 6 sections. The final draft survey was sent to the committee methodology professor for reviewing and evaluation. Based on reviewers' comments, the researchers updated a few. This process continued several rounds until the instrument was clear and related to the research questions addressed in Chapter I. The final version of the survey is shown as appendix D.

Data Collection

Qualitative Data Collection

The data collection process of qualitative step strictly followed the 4 principles of data collection described by Yin (2014). These included "multiple sources of evidence" (p. 118), "create a case study database" (p. 123), "maintain a chain of evidence" (p. 127), and "exercise care when using data from electronic sources" (p. 129). According to Yin (2014), the four qualitative data collection principles maximized the benefits of the data

sources and reinforced the validity and reliability of the research. During the qualitative stage, data was collected through interview, participant observation, and document analyses.

Interview. According to Seidman (2013), three interview series were utilized to study research problems, including life history, details of experience, and reflection on meaning. The second interview series was chosen in this study because the purpose of qualitative stage was to examine the concrete details of all participants' current experiences in communicating and collaborating through. A set of in-depth interview questions (see Appendix B) was the data collection instrument in the qualitative stage. The interview questions were open-ended questions with 6 scales that included demographic information, visionary leadership, digital learning culture, professional development, systemic improvement, and digital citizenship. The interview questions and categories were developed from ISTE-A standards. As this study was investigating leadership related to CCRS implementation, the researcher included CCRS standards during interview questions development.

The interview was conducted once for each participant and last from half an hour to one hour. The interview was conducted face-to-face and videotaped with permissions of participants. Participants could choose the time and place for conducting the interviews. The researcher negotiated the interview place with participants to make sure the participants' privacy and confidentiality were protected.

Participant observation. According to Yin (2014), using multiple sources of qualitative data could help construct reliability and validity of the study. Therefore, participants' observation was also included as one of the data collection methods.

Principals were observed at the computer lab, library, career center, classrooms, and administration offices after the researcher obtained permissions from principals and teachers. Notes were taken while the researcher was observing. Researcher completed the observation form after each observation. The observation form was developed from ISTE standards for Teachers (ISTE-T), which was a set of requirements for digital teaching. Format of observation notes was available at Appendix C.

Document analysis. Related documents, including the Mississippi technology plan, the district technology plan, the school technology plan, newsletters, student handbooks, student academic schedules, class and activities pictures, school annual reports, lesson plans, class schedules, course syllabus, weekly newsletter, and teachers' website resources, were included in data collection process to help the researcher gain full comprehension of CCRS implementation in K-12 schools. These relevant documents were downloaded from schools' and districts' websites. The researcher also invited principals to share lesson plan, class schedule, course syllabus, weekly newsletter, additional documents, and teachers' websites resources.

Quantitative Data Collection

The researcher contacted the superintendents of the K-12 public school districts in Mississippi to request research approvals. Five public school districts approved the research request. After receiving research permission from school districts (see Appendix G) and university (see Appendix H) to perform the study, an invitation letter, along with the short consent form was sent to all of the principals via email and the principals forwarded the invitation email to the teachers in their schools. The invitation email explained the purpose of the research and participants' right to withdraw the study. The

survey link generated by Qualtrics was included at the end of the email. By clicking the survey link, teachers showed their consent of participating in the study. Participants were informed of the purpose of the study and their rights to withdraw from the study at any time. In addition, participants were also informed that any sensitive information such as names, school locations, and ages were substituted with pseudonyms in the study. Participants needed to click the agree button at the bottom of the consent form if they were willing to participate in the study.

The survey instrument composed of 6 scales: (1) demographic information, (2) visionary leadership, (3) digital learning culture, (4) professional development, (5) systemic improvement, and (6) digital citizenship. Each scale of the survey instrument contained 4 items that described the principals' activities. Qualtrics research suite was utilized as the survey development and delivery tool. Qualtrics research suite enabled the researcher to create a survey, edit a survey, distribute a survey, and view results. Data for quantitative analysis was downloaded from Qualtrics, including spreadsheet, SPSS save data file with raw data, variable, and value labels, and fixed field text.

Data Analysis

Qualitative Data Analysis

For the qualitative data analysis, the first step was preparing the data from interviews, documents, observations, and notes for analysis. A case study database was created to document and organize the collected data. The next step was to review and transcribe the data into word processing files for analysis. The researcher read through all data to develop a general understanding of the database. This process included writing memos in the margins of transcripts or documents. After the first cycle of coding, the

second cycle of coding developed a qualitative codebook for the consistency of coding process. The codebook included the codes and the definitions of the codes for the database (Creswell & Plano Clark, 2011). In addition, an item pool was generated in the second cycle of coding. The item pool was a collection of potential items for "eventual inclusion in the scale" (DeVellis, 2012, p. 63). For the purpose of privacy, pseudonyms were used throughout the data collection process whenever possible. All names used in this study were fictional names.

HyperTRANSCRIBE and HyperRESEARCH were utilized to help analyze the qualitative data. HyperTRANSCRIBE was qualitative transcription software that helped the researcher transcribe the original audio and video data sources into text format that was easier to code and analyze. HyperRESEARCH was qualitative analysis software that supported the researcher in analyzing qualitative data collaboratively with other researchers. In addition, HyperRESEARCH enabled the researcher to be consistent in the coding process by generating a codebook and code map.

Holistic coding method was the coding strategy in the first cycle of coding. According to Saldana (2013), holistic coding allowed analysis of a wide range of data sources, including transcripts, documents, notes, audio, and video. Because this study was mixed-methods design, the researcher conducted the qualitative stage first before working on quantitative stage. Holistic coding was especially appropriate for qualitative beginners because it helped researchers quickly grasp the basic themes from the data.

Pattern coding was identified as the coding strategy in the second cycle coding because pattern coding could be used as the sole second cycle coding method (Saldana, 2013). According to Saldana (2013), using pattern coding was appropriate when the

researcher needed to develop major themes and provided explanation from the data. During the second cycle pattern coding, the researcher reviewed the codes from the first coding cycle again and assigned the codes with a pattern code when the codes had commonality. A pattern code was used "as a stimulus to develop a statement that described a pattern of action" (Saldana, 2013, p. 150). The statements generated by pattern coding were important sources for instrument development. A codebook, code map, and code landscape were products of the second cycle coding.

Quantitative Data Analysis

In quantitative stage, one-way ANOVA and post-hoc Tukey's HSD were the data analysis strategies. ANOVA was used to determine the statistical significance of the items in each scale. ANOVA were also conducted to find the statistical significance of the scales of digital leadership. After got results of ANOVA, Tukey's HSD was conducted to identify the significantly different scale of digital leadership and significantly different item of each scale. Bar chart, which was the agreement proportion of each item, was generated for each scale of digital leadership.

According to Fowler (2014), data collected by a survey must be translated into an appropriate format that can be read and analyzed by computer. The process of translating survey data was called coding data (Fowler, 2014). Qualtrics could code survey responses automatically when the survey report was generated. Code of each response is shown in Table 2.

Table 2

Codebook of Survey

Survey Answer	Code
Female	2
Male	3
20-25 years old	1
26-34 years old	2
35-54 years old	3
55-64 years old	4
65 or above	5
High School/GED	1
Some College	2
2-year College Degree	3
4-year College Degree	4
Masters' Degree	5
Specialists' Degree	6
Doctoral Degree	7
Professional Degree (JD, MD)	8
Kindergarten	1
Elementary grade 1-4	2
Elementary grade 5-8	3
High School grade 9-12	4

Table 2 (continued).

Strongly Disagree	1
Disagree	2
Neither Agree nor Disagree	3
Agree	4
Strongly Agree	5

Internal consistency was first checked before data analysis. Cronbach's alpha was calculated to determine the reliability for each of the 5 scales. The average rating for each statement and each scale were calculated. By comparing the average score of each scale, the researcher determined the effectiveness of each scale and answered the research question 6 to10. MANOVA was then calculated to determine the impact of demographics on the scales of digital leadership, which indicated the answers to the research question 11.

Summary

This research was a mixed-methods study that included a qualitative stage and quantitative stage with the intent of exploring principal's experience of digital leadership and examining the effectiveness of digital leadership regarding communication and collaboration in Mississippi. Case study was chosen as the research method in the qualitative phase while cross-sectional design was chosen as the research design for the quantitative stage. Data has been collected through principals' interviews, participation observations, document analysis, and teachers' survey. Data interpretation and analysis

were conducted through coding, categorizing, and statistical analyzing. The following chapter discusses the research findings based on the ten research questions.

CHAPTER IV - FINDINGS

This study chose exploratory sequential mixed-method design to investigate the effectiveness of digital leadership on supporting K-12 teachers' communication and collaboration regarding CCRS implementation in Mississippi. Two data collection stages were conducted to address the research questions: qualitative stage and quantitative stage. The qualitative stage interviewed and observed ten K-12 principals in Mississippi and the quantitative stage delivered a survey based on the qualitative stage results to K-12 teachers who were involved in CCRS implementation. This chapter first presents the data collection results from the qualitative stage including the process of developing the survey based on the qualitative data. After the qualitative results section, results from the quantitative stage are presented and explained.

Qualitative Stage Findings

As mentioned in Chapter I, the purpose of the qualitative stage was to investigate how the principals support and promote communication and collaboration through visionary leadership, digital learning culture, professional development, systemic improvement, and digital citizenship to ensure successful CCRS implementation in Mississippi. Another goal of the qualitative stage was to develop the survey used in quantitative stage based on qualitative results. The theories and standards (social constructivist learning theory, connectivist learning theory, Anderson and Garrison's interaction model, ITSE-A standards, and CCRS standards) discussed in Chapter II served as the guide for the researcher to interpret (a) digital leadership experience, (b) observation notes, (c) technology plan from state, district, and schools, (d) websites from districts, schools, and teachers, (e) schools' technology handbooks, and (f) instructional

materials. The coding strategies used in qualitative stage included holistic coding in the first coding cycle and pattern coding in second coding cycle.

Based on the research statement and the research questions in Chapter I, the results were organized in seven sections: overview of participants (section one), visionary leadership (section two), digital learning culture (section three), professional development (section four), systemic improvement (section five), digital citizenship (section six), and demographic impact (section seven). The first section reviewed the demographic information of the principals, including school level the principals was working at, gender, working experience as a principal, school district, teachers' numbers, and students' enrollment at each school. Ways of supporting and promoting communication and collaboration regarding CCRS implementation through technology were presented from section two to section seven.

Overview of Participants

After receiving research approval from the university (see Appendix F), 10 K-12 principals (coded as principal Ant, Beer, Cat, Deer, Eagle, Fox, Goat, Horse, Impala, and Jaguar) from 10 schools (also coded as school Ant, Beer, Cat, Deer, Eagle, Fox, Goat, Horse, Impala, and Jaguar) in 2 school districts (coded as district 1 and 2) were interviewed with in-depth questions as shown in Appendix B. Codes of the participants were shown in Table 3. Observation notes were taken, and the interviews were video recorded. Related documents, including the Mississippi Technology Plan, the district technology plan, school technology plan, newsletters, student handbooks, student academic schedules, class and activities pictures, school annual reports, lesson plans,

class schedules, course syllabus, weekly newsletter, and teachers' website resources were also included in data analysis.

Table 3

Codes of the Participants

Principal	School	District
Ant	Ant	1
Bear	Bear	1
Cat	Cat	1
Deer	Deer	1
Eagle	Eagle	2
Fox	Fox	2
Goat	Goat	2
Horse	Horse	1
Impala	Impala	1
Jaguar	Jaguar	1

Of all the participants, 3 were male principals. Two of them worked at middle schools and one worked at a high school. Principal Ant from district 1 had been a principal for 25 years. Principal Bear from district 1 had been the principal for 2 years. Principal Cat at district 1 had been the principal for more than 10 years. Principal Deer had worked as the principal for one year. Her school had more than 500 students. Principal Eagle from district 2 had been the principal for 8 years. Principal Fox had worked as a principal for 11 years. Principal Goat had ten-year experience. She worked in

a small school with 50 students and 13 teachers. Principal Horse just began the principal position. He was an assistant professor in the previous year. Principal Impala worked in school Impala, which was a lower elementary school with more than 400 students and 30 teachers. She had been a principal for 6 years. Principal Jaguar was a male principal and had been a principal for 8 years. He worked in a high school which had more than 500 students and 60 teachers. Demographic information of the participants was shown in Table 4.

Table 4

Demographic Data of Principals

Principal	Grade	Gender	Experience as Principal	Students Enrollment	Teachers Number
A	K-1	F	25	784	49
B	2-3	F	2	721	50
C	9-12	F	11	732	121
D	9-12	F	1	512	42
E	K-6	F	11	427	44
F	7-8	M	11	650	75
G	4-12	F	10	49	13
H	7-8	M	2	372	32
I	K-1	F	6	416	31
J	9-12	M	8	550	60

All the qualitative data were coded and summarized into twenty-seven themes based on the qualitative research questions. Table 5 displays the themes of each research question. As shown in Table 5, the principals utilized formal meetings, group collaboration, teachers' training, standard-embedded evaluations, social media interactions, newsletters, and websites to support and promote communication and collaboration through visionary leadership to ensure successful CCRS implementation in Mississippi. Online training, digital resources, onsite teaching support, external support, digital communication, at-home access, and digital teaching were opportunities supported by the principals to implement CCRS within the digital learning culture. The principals promoted teachers' training, personalized professional development, Personal Learning Community (PLC), digital information sharing, social media collaboration, and peers' modeling to ensure excellence in professional practice. The principals also collected and interpreted digital data to teachers, utilized technology to manage schools, recruited competent personnel, and promoted good teaching to improve schools' development when implementing CCRS. Technology agreement forms and handbooks and website filters were utilized in schools to ensure appropriate technology use. The principals modeled and promoted digital citizenship to ensure that CCRS was implemented legally and safely. Analysis of the themes was discussed in the following paragraph.

Table 5

Qualitative Research Questions and Over-Arching Themes

Qualitative Research Question	Themes
Research Question 1: In what ways do K-12 principals support and promote communication and collaboration through visionary leadership to ensure successful CCRS implementation in Mississippi?	• Formal Meeting with Teachers • Group Collaboration • Training for Parents • Standard-Embedded Evaluation • Social Media Interaction • Newsletter • Website
Research Question 2: In what ways do K-12 principals support and promote communication and collaboration through digital learning culture to ensure successful CCRS implementation in Mississippi?	• Online Learning • Digital Resources • Onsite Teaching Support • External Support • Digital Communication • At-Home Access • Digital Teaching

Table 5 (continued).

Research Question 3: In what ways do K-12 principals support and promote communication and collaboration through professional development to ensure successful implementation CCRS in Mississippi?	• Training • Personalized Professional Development • Personal Learning Community • Digital Information Sharing • Social Media Collaboration • Peers' Modeling
Research Question 4: In what ways do K-12 principals support and promote communication and collaboration through systemic improvement to ensure successful CCRS implementation in Mississippi?	• Digital Data Collection • Digital Management • Competent Personnel Recruit • Good Teaching Promotion
Research Question 5: In what ways do K-12 principals support and promote communication and collaboration through digital citizenship to ensure successful CCRS implementation in Mississippi?	• Technology Agreement Form and Handbook • Digital Citizenship Promotion • Website Filter

Visionary Leadership

As defined in Chapter I and Chapter II, visionary leadership was described as inspiring and leading school transformation through technology. In this study, finding

showed that the principals created a shared vision of supporting CCRS with technology through many different communication and collaboration opportunities, including face-to-face meeting with teachers, group collaboration, training for parents, online discussion, digital evaluation, social media, newsletter, and school websites.

Formal meeting with teachers. Findings indicated that face-to-face meeting with teachers was the most important opportunity for the principals to inspire and create a shared vision for comprehensive integration of technology in CCRS implementation (Grissom, Loeb, & Mitani, 2015). Findings showed that formal meeting with teachers was an effective way of promoting digital communication and collaboration in CCRS implementation. Teachers were required to attend the routine face-to-face meetings with the principals and instructional technologists from school districts to better understand and implement CCRS.

Findings from this study also indicated that required formal meetings with teachers were good opportunities to hear their feelings and receive feedback from them. The principals adjusted their leadership strategies based on feedback from the teachers. Formal meetings also provided more opportunities for the teachers to collaborate with each other. Meeting with the teachers could also ensure ongoing CCRS implementation.

Group collaboration. Findings from this study showed that the principals worked with the teachers and instructional technologists and divided teachers into several groups to increase the utilization of CCRS resources. Teachers collaborated with each other and worked in groups to make sure all students were exposed to technology rich classrooms. Besides collaboration with teachers' groups, the principals collaborated with other

principals to ensure their professional growth. Findings showed that the principals' group meeting was an essential part of professional development.

Training for parents. Findings from this study indicated that parents' training was a good opportunity for the principals to include all stakeholders and promote technology-infused vision. The principals met with parents and showed them how technology was going to impact and help teachers with their instructional strategies. All the principals in this study provided teachers and parents with technology training to help teachers and parents obtain ideas of using technology in their classes and at home. The effectiveness of parents' training in supporting CCRS implementation was also provided at school Eagle. School Ant reported that how Parents-Teachers Organization (PTO) played an important role in supporting CCRS implementation. PTO helped schools' funding and some parents donated significant technological resources to schools.

Standard-embedded evaluation. Findings from this study indicated that teaching evaluation software and apps were important tools for the principals to use in digital evaluation. The digital evaluation tools enabled the principals to record evidences of teaching, including pictures, videos, and audio, and give feedback to teachers immediately. More importantly, CCRS standards were embedded into those evaluation tools. The standard-embedded evaluation facilitated the teachers thinking about CCRS when they were planning teaching.

Social media interaction. In this study, findings showed that social media was an emerging trend in digital leadership with the intent of promoting visionary leadership. Social media were growing very fact in schools. All principals said they used Facebook and Twitter to communicate and engage all stakeholders, especially parents.

Newsletter. Same as social media, findings from this study showed that newsletter was another essential tool to include all stakeholders, especially the parents who did not use digital devices. The principals encouraged hard copy newsletters to make sure all parents could get information from schools. Parents could know what skills teachers would teach this week and what activities schools would have. Principal Beer mentioned that newsletter was a great home-school communication tool because there were still many parents who used paper and pencil.

Website. Findings from this study showed that each school had its own school website and each teacher had her/his own teaching website that connected with the school website. Findings indicated that website was a vital tool to communicate with teachers, parents, the local community, and other website users. Therefore, the principals encouraged teachers to regularly update teachers' websites so that parents could get new information from schools. According to principal Goat,

> All teachers have teaching websites that are connected with school's website. You can see teachers' names from school's website and access individual teaching website by clicking that teacher's name. Most teaching materials, including syllabus, test, and assignments, can be accessed and downloaded from the teaching website. My teachers post newsletters weekly so the parents can click the buttons to see what is going on.

Digital Learning Culture

Findings from this study indicated that digital learning culture did not only evolve students but also teachers. As mentioned in Chapter II, during CCRS implementation, the principals and the teachers changed their roles to the students because all educators

needed to understand CCRS before they implemented CCRS. Leading CCRS reform was in fact, a process of supporting and promoting meaningful learning (Shulman, 1987). To create and sustain digital age learning culture, the principals in this study developed strategic plans from students' perspectives that focused on online training, digital resources, onsite teaching support, teaching monitoring, external support, digital communication, peers training and modeling, external collaboration through technology, after-school access, and digital teaching.

Online learning. Findings from this study showed that the principals did not only provide face-to-face training for the teachers but also supported online learning opportunities. Of the 10 principals interviewed, principal Deer mentioned online learning as a training method for teachers in her school. Principal Deer collaborated with the district instructional technologist to decide the format and content of online learning. According to principal Deer,

> Teachers are required to complete various online subject area learning. The subject technology trainings equipping teachers with strategies to use in the classroom that promote higher level thinking skills and problem solving skills in students.

Digital resources. Findings indicated that providing various digital resources for teachers and students was an important responsibility for the principals to create a digital age learning culture. Digital resources did not only include digital devices such as iPad, interactive board, and Chromebook, but also contained software, mobile applications, and online tools and sites.

Findings indicated that Chromebooks were the most requested resource among all the digital resources. Although all schools had Chromebook carts for teachers to check out, schools were still short of Chromebook because of the increasing needs. Most online resources and technological skills came from the instructional technologists at school districts.

Onsite teaching support. Findings indicated that onsite teaching support provided an opportunity for teachers to collaborate with other teachers and district instructional technologists. As principal Cat mentioned that instructional technologist came to the campus and helped teachers with technology. Instructional technologist also informed teachers of any updates that they needed to be aware of regarding technology equipment in the classroom. Teachers also had co-teaching opportunities with instructional technologists to better implement CCRS.

Findings of visionary leadership showed that the principals provided many ways for teachers to request onsite support, including email, phone call, district online help desk, text message, and schools' help desk. Various forms of technology were used for onsite support at school. For example, there was a tool called District Wide Telephone Communication System, which enabled all administrators, teaches, and district officers to communicate with each other.

External support. Findings of digital learning culture demonstrated that support from the university and the digital devices company helped the principals and the teachers a lot. External support not only brought in new devices and digital services but also gave students and teachers new ideas of technology. Principal Eagle mentioned that

schools had university students to provide extra support. Those personnel encouraged students and teachers to become familiar with technology.

Digital communication. Findings showed that digital communication was key to ensure effective CCRS implementation. A lot of materials regarding CCRS needed to be sent to the whole community quickly and accurately. In this process, the principals played an important role in promoting and supporting digital communication. All the principals realized the importance of modeling technology integration and they all were constantly modeling digital communication for teachers.

Findings of digital learning culture also showed that communications among the teachers were important for successful CCRS implementation. Teachers needed to share teaching materials such as the syllabus to understand and implement CCRS. All the principals said Google Docs was an important tool for teachers to communicate with each other. The principals were working hard to promote Google Docs as a tool of digital communication and collaboration. As principal Ant mentioned that schools taught teachers and students to share documents through Google Docs. The principals used Google Docs to share their internal surveys.

The principals also reported that getting support from parents were important for the principals to implement CCRS successfully. Effective communication with parents could help the principals include all stakeholders to support CCRS implementation. Most schools reported that they provided a lot of different programs to help communicate with teachers. Teachers had web pages. They post newsletters weekly so that parents could click the buttons to see what was going on at school.

At-home access. Findings showed that having access at home was another element of digital age learning. With support of digital tools, such as Google Drive, students were able to read and view instructional materials whenever they needed. In addition, if students could access instructional materials off campus, teachers could try the latest instructional strategy such as flipped classroom. As principal Impala reported, the schools looked for some resources that not just the teachers could access in classrooms but also parents could access at home. Students also needed to access teaching materials at home. Some teachers were trying flipped classroom so that students could get information at home and get refreshed at school. At-home access also provided opportunities for parents to work with their children and participated in schools' activities.

Digital teaching. Findings indicated that using various technologies in classroom was an important characteristic of digital age learning culture. A lot of digital resources were provided for students and teachers. For example, the principals mentioned SmartMath, which was a conceptual math program. Students could practice their math skills through this program. Teachers could assign homework to students through this program according to what was happening in the classroom. The basis of integrating technology into classroom was to let teachers understand the importance of technology for their students. As Principal Beer reported that children were so familiar with technology. Every classroom had at least one iPad. Students did the tests on iPads instead of computers because they were so much more comfortable with touch screen.

Besides digital resources, findings showed that giving students access to digital devices was the basis of achieving the goal of digital teaching. All the principals mentioned device issues when they were asked about challenges. The principals were

trying hard to utilize limited number of devices to best support CCRS implementation. For instance, principal Cat mentioned that teachers in school Cat were teaching from Promethean boards. Teachers were able to model how to use the tools appropriately, how the students could come up and demonstrate how to drag and drop to appropriate places, how to use the calculator for Math, and highlight text with different tools that were available. Many of the assessments moved from paper assessment to the computer-based format. So that students could have more opportunities to take the assessment online and use the computers. Teachers would also take the students to the labs and students were allowed to take the assessment in the lab.

Professional Development

Findings indicated that ensuring teachers' professional development was the most important part of digital leadership. To support teachers' professional development, the principals reported that they collaborated with the school districts to provide opportunities for training, professional learning community, learning through sharing, social media collaboration, and peers' training and modeling.

Training. Findings showed that teachers' training was the most popular format for professional development. There were two types of training: after-school training and group training. After-school training, delivered by the district instructional technologists, was optional for teachers. After-school training was open to everyone, no matter which grade or subject teachers are teaching. The purpose of after-training was to expose teachers to the latest technologies that teachers may use in their classrooms.

Besides after-school training, findings showed that group training was another important way of conducting teachers' professional development. Group training

contained district-level group training and school-level group training. District-level training usually was conducted during off-school period such as summer time. The main goal of district-level group training was to provide opportunities for teachers to plan lessons for next academic year. Ways of communication and collaboration usually were hybrid.

Findings indicated that school-level group training was more focused than district-level group training. Teachers were divided into several groups based on the grades they are teaching. Each group was required to meet with the district instructional technologist at least once a month to collaborate on CCRS. As principal Eagle mentioned that each teacher group was required to meet with instructional technologist at least once a month to work on teaching and learning. Schools had the group training required because after-school training was optional. Some teachers might not go after-school training. To ensure all teachers meeting the requirements of CCRS, some principals asked district instructional technologist to work with teacher group so that they could focus on specific content.

Personalized professional development. Findings indicated that personalized professional development was a thought-provoking finding in professional development. Because of the diverse needs of professional development support, the principals worked with the district instructional technologist to provide 1:1 personalized professional development based on teachers' requests. Teachers could send their requests via email, text message, phone call, and district help desk. Once instructional technologists received teachers' requests, they would schedule with teachers immediately to help teachers with their technology integrations. The principals met with instructional technologists

regularly to discuss what schools would focus this semester. So when instructional technologists were doing 1:1 professional development, they could focus on the things that the principals wanted their teachers to do.

Professional learning community (PLC). Findings indicated that PLC was an important professional development format for teachers. All the principals mentioned PLC when they were asked for teachers' professional development. PLC was more focused than regular professional training. The teachers who taught same grade or subject worked together to plan or discuss their classes. The teachers met in small groups during their off period to plan, talk about concerns, share ideas, and prepare materials for their lessons. In every meeting, the teachers had to bring their laptops because there was always some pieces of technology teachers could try out. Collaboration via PLC was also conducted in schools. PLC provided the opportunity of collaboration for teachers to discuss areas that students might have difficulties and challenges.

Digital information sharing. Findings from this study showed that the principals recorded and shared good examples of teaching with teaching through technology besides providing training for teachers. The principals used cell phone to record and share good examples of teaching with other teachers. The principals sent observation emails to the teachers when they completed the observations. The principals also connected with mentor the teachers to discuss weaker teachers who missed the observation.

Social media collaboration. Finding indicated that social media was another tool for teachers to get professional development opportunities. Principal Goat mentioned that she got teachers to start to use Twitter. She told teachers that they could use Twitter to meet other educators all over the world and learn ideas and strategies. She had

professional development via Twitter instead of face-to-face meeting. She post topics and questions and teachers responded and interacted with her.

Peers' modeling. Findings showed that learning from peers had significant impact on teachers. Teachers could be more motivated when they heard peers' success. Principal Fox reported that she had some teachers who did not check their emails. They were just afraid. Principal Fox tried to provide them with more support and encouragement. When teachers saw their peers were successful, they wanted to try. Teachers also could work with their team teachers. Teachers who were good at technology became the trainers to help other teachers with technology integration. Some teachers went off campus for technology professional development. When they came back, they became the trainers and team leaders.

Systemic Improvement

Findings from this study showed that the principals used multiple technologies to ensure systemic improvement. With support of digital tools, the principals were able to utilize collected digital data to improve decision-making such as professional development areas. Technology also made management more efficient and flexible. To advance academic goals, the principals recruited and promoted competent personnel to help with schools' technology integration regarding CCRS implementation.

Digital data collection and interpretation. Findings from this study showed that the principals not only used technology to manage schools but also took advantage of technology to support systemic improvement through data collection and interpretation. Principal Horse used different technologies to help decide what school should focus or

the targeted areas. When the principals did observations, they used technology to record and analyze the observations.

Digital management. Findings from this study showed that utilizing technology to manage schools was an important characteristic of digital leadership for the principals. All the principals in this study reported that they used technology to help them with CCRS implementation such as information sharing. Most principals used SchoolStatus, which was a school management system, to help manage school data, test scores, and attendances.

Findings also showed that evaluating teachers through technology enabled the principals to communicate with teachers faster and easier. The principals in this study sent out evaluation results after observations. The teachers immediately received emails or messages about their evaluations. Principal Eagle reported that they conducted observations when they went to the classrooms. The principals took laptops, iPads, and phone to take pictures and videos. Then the principals uploaded the information and gave feedback to the teachers very quickly. If the principals had concerns with a student, they could click that student and send comments and questions to the teacher. Technology provided the teachers an opportunity to get quick feedback.

Competent personnel recruit and reward. Findings showed that besides getting help from district instructional technologists, hiring schools' own instructional technologists could help school's needs of instructional technology. Other schools reported that they had hired instructional technologists, who helped the teachers with technology integration into CCRS. When the principals saw something was going on and felt that was not appropriate, the principals would ask the instructional technologist to

come and check the teachers to ensure the teachers could use technology more appropriately.

Besides hiring more instructional technologists, findings also showed that the principals recognized teachers for their teaching. Giving teacher rewards, such as certifications, could increase the teachers' confidence of using technology. The principals used social media to post teachers' pictures online so that the teachers' efforts could also be shown and recognized by parents. Many principals reported that they collaborated with the district to recognize the teachers' efforts. For instance, the teachers could get Continuing Education Units (CEUs) if they attended certain numbers of training.

Good teaching promotion. Findings showed that the principals recorded and shared with other teachers via technology if they saw a wonderful class. As discussed earlier, the teachers were more motivated when they see peers' success. Therefore, most principals often promoted good teaching through technology. For example, Principal Jaguar reported that she took phone or iPad with her so that she would take pictures and record good class teaching when she saw good teaching. When schools had staff meeting, the principals would show the good teaching demonstration to other teachers. In addition, the principals post the good teaching demonstration on school's Facebook page so that parents also could see it.

Digital Citizenship

Findings in this study implied that digital citizenship was the weakest part compared with other parts based on the principals' responses. Schools did not have specific digital citizenship policies and resources. Most support regarding digital

citizenship came from school districts, including district policies, technology agreement form and handbook, and website filters.

Technology agreement form and handbook. Findings from this study showed that school districts provided technology agreement forms and handbooks when students and teachers first came to schools to ensure that teachers exactly know how to use technology appropriately. Teachers and students were required to read district technology policies. Students, teachers, and parents received the copy of Acceptable Use Policy (AUP) handbook at the beginning registration. Teachers and students were responsible for reading the district handbook and policies before signing a technology agreement. This agreement was put in place to ensure students, faculty, and staff understand that they were responsible for appropriate, responsible use of technology. While responsibility was stressed, innovative technology was encouraged to ensure that schools remains successful in CCRS implementation.

Digital citizenship promotion. Findings from this study indicated that the principals and school administrators taught and encouraged proper use of technology. There were some students who did not have access to computers or other technology at home. Therefore, principal encouraged teachers to do everything at schools.

Website filters. Findings from this study showed that filter was an important tool to ensure students and teachers use technology appropriately. Filters were set up by district. Schools used filters to ensure that students do not access inappropriate websites. Some parents were afraid of technology because they thought their children were exposed to the things that they did not want them to see. With filters in schools, parents did not

worry about this issue any more after they understood how filter worked to protect their children.

According to the research timeline (Figure 2), an items pool was generated at the end of second coding cycle to help the following survey development. Based on DeVellis's (2012) 8-step guidelines, the researcher completed the first three steps and synthesized the qualitative findings and generated the items pool as shown in Table 6.

Table 6

Items Pool of Survey

Survey Scale	Items
Visionary Leadership	• Teachers are required to attend the routine face-to-face technology meetings with technology specialists from district. • Teachers work in groups to ensure students are exposed to technology rich classroom. • Principals provide teachers with technology training to help teachers get ideas of using technology daily in their classes. • Principal supports and provides technology that both teachers can use in classroom and parents can access at home. • Principal leaves comments to teachers as a way of online discussion.

Table 6 (continued).

	• Principal use the data and information from evaluation software or app (e.g. schoolstatus, feedback) in school's leadership meeting. • Principal meets with parents to show parents how technology is going to impact and help teachers with their instructional strategies. • Principal uses social media, such as Facebook page and Twitter, to communicate and engage with all teachers and parents in digital learning and teaching. • School also encourages paper communication, such as paper newsletter, to make sure all parents are able to communicate with schools. • Teachers are also encouraged to regularly update teaching website as a home-school communication tool.

Table 6 (continued).

Digital Learning Culture	• Teachers are required to complete various online subject area trainings and district training. • Many software and online resources (e.g. Plato, USA Test Prep, Edgenuity, Mobi Mac, ICAP, Cool Math, Remind.com) are provided for students to improve student achievement. • Technology representatives come to the campus and provide hands-on support, including technology updates and new tools demonstration. • Principals monitor lessons and lesson plans. • Principal support communication with the company if teachers have concerns with the technology in classroom. • Principal help and support good communication with teachers (e.g. explaining the ways of communication, how to use some communication tools, explains the value of the communication tools, and constantly show the teachers why digital communication tools are

Table 6 (continued).

	important). • Teachers train each other and model lessons and provide trainings for the rest of the teachers. • Some digital learning resources and tools are not just used on one campus. Other schools in the district are also using the same software or apps. • School is trying to encourage teachers to put as much information as they can on the school website so that students can pull up the book online or see the notes that might be helpful when they are at home. • Teachers save and share instructional materials (flipped charts) with each other via digital tools (Google drive).

Table 6 (continued).

Professional Development	• Teachers are required to attend professional development technology meetings (face-to-face). • Many software and digital tools are provided for teachers to communicate with students, other teachers, and parents (SAMS, remind.com, blackboard, google drive, school wires) • Teachers are also provided with many tools to communicate with school administrators, principals, and district (e.g. district wide telephone communication system, district wide radios). • School provides emerging technology information and training through email, district technology specialist, and software company representatives. • School does a need assessment survey to ask teachers what types of training they need and what areas they feel they are week.

Table 6 (continued).

	• All administrators, teachers, and staff are involved in trainings and learning communities that promote and encourage the use of technology to improve school communication and productivity. • Teachers also meet in small groups (grade level meeting) to plan teaching, talk about concerns, share ideas, and prepare materials for their lessons. • Principals and administrators share information and thoughts or questions with teachers through google docs. • Principal tries to promote digital communication tools (e.g., have professional development via Tweeter or other tools instead of face-to-face meetings). • Principal promotes and models effective technology use (e.g., show how the evaluation app/website looks like) during meetings with teachers.

Table 6 (continued).

Systematic Improvement	• School collects and analyzes school data and interprets the results to teachers via email. • Principal uses digital tools (e.g., schoolstatus, feedback) to manage, evaluate, and assess teaching. Assessment results are shared with teachers via email. • Principal provides professional development opportunities for teachers to lead CCRS change through appropriate use of technology. • Principal works with district (technology department) to hear teachers' thoughts and concerns. • Principal recruits technology specialists to support teachers' technology professional development. • Principal communicates to teachers and ask questions about the lessons through Google docs before going to the classroom. • Principal uploads and gives back the classroom observation/evaluation information to teachers very quickly through technology (e.g.

Table 6 (continued).

	feedback). • Principal leaves comments to teachers if concerns with the students through management system or app. • Principal records and shares with other teachers if wonderful classroom experience is occurring through technology. • Teachers receive an email with principal's comments when principal finishes the teaching observations.
Digital Citizenship	• Teachers and students are required to read the district technology policies and sign a technology agreement. • Principal supports district level regulations that outline safe ethical use of technology. • Principal and administrators teach and encourage proper use of technology. • Students, teachers, and parents receive the copy of Acceptable Use Policy (AUP) handbook (or other technology use handbook) at the beginning of registration.

Table 6 (continued).

	• School works with district to provide filters for technology use in school to ensure appropriate use of technology. • School helps teachers access some useful websites that are blocked by the filters.

In conclusion, the principals utilized a variety of ways to support teachers' communication and collaboration regarding CCRS implementation. Specifically, face-to-face meetings, trainings, online group collaboration, social media, newsletter, and website were utilized to promote visionary leadership. Digital learning culture focused on online learning, digital resources, at-home access, and digital teachers. In professional development, the principals were dedicated to support personalized professional development, personal learning community, social media professional development, and peers' modeling. Digital data collection and interpretation, digital management, competent personnel recruitment, and good teaching promotion were chosen to assist systemic improvement regarding CCRS. Digital citizenship aimed to promote technology agreement form and handbook, digital citizenship knowledge promotion, and website filter. Interpretations of the findings in qualitative stage were provided in Chapter V. The following section provided the findings in quantitative stage.

Quantitative Stage Findings

This section provided findings of the quantitative stage, including demographic information of teachers who participated in the study, the reliability of the instrument,

statistical analysis results of each scale of digital leadership, and the impact of demographics on each scale of digital leadership.

Cronbach's Alpha was first calculated to determine the reliability of the subscales within instrument. If the value of Cronbach's Alpha is less than 0.7, items in each scale should be checked and deleted. In this study, results showed that the Cronbach's Alpha value of visionary leadership was 0.79. Similarly, Cronbach's Alpha value of digital learning culture was 0.74. Cronbach's Alpha value of professional development was 0.80. Cronbach's Alpha value of systemic improvement was 0.80. Cronbach's Alpha value of digital citizenship was 0.77. All the Cronbach's Alpha values were higher than 0.70, which indicated a high level of internal consistency for the scales of digital leadership in this study. Therefore, data collected from the survey were reliable.

Demographic information

Original data sets and reports were downloaded directly from Qualtrics. The next step was to organize the data. According to Fowler (2014), data cleaning helps avoid errors and ensures everything works as planned. In this study, there were 254 teachers responded the survey. The participants consisted of 208 female teachers and 46 male teachers. Most participants were over 35 years old and had Master's degree. More than half of the participants were teaching grade 5 to grade 12. Demographics were summarized in Table 7, Table 8, Table 9, and Table 10.

Table 7

Gender of Teachers

Gender	Teacher Number
Female	210
Male	44

Table 8

Age of Teachers

Age	Teacher Number
20-25	24
26-34	62
35-54	128
55	37
64	3

Table 9

Education of Participants

Education	Teacher Number
High School/GED	1
Some College	0
2-year College Degree	0
4-year College	101

Table 9 (continued).

Masters' Degree	134
Specialists' Degree	12
Doctoral Degree	4
Professional Degree (JD, MD)	2

Table 10

Teaching Grade

Teaching Grade	Teacher Number
Kindergarten	30
Elementary grade: 1-4	54
Elementary grade: 5-8	85
High school: 9-12	86

Digital Leadership

As proposed in Chapter I, digital leadership contained 5 subscales, including visionary leadership, digital learning culture, professional development, systemic improvement, and digital citizenship. Table 11 showed the initial diagnostics statistics of each scale. The professional development subscale had the highest rating. Digital citizenship had the second highest rating. Digital learning culture was in the third place, which had 3.61 rating on average. Visionary leadership had similar rating as systemic improvement.

Table 11

Descriptive Statistics of the Scales of Digital Leadership

Scale	Mean	SD	N
Visionary Leadership	3.55	0.91	255
Digital Learning Culture	3.61	0.87	255
Professional Development	3.97	0.81	256
Systemic Improvement	3.56	0.85	255
Digital Citizenship	3.92	0.79	254

Within each subscale of digital leadership, there were 4 items that described the strategies. All items were developed from the results of qualitative stage. Table 12 showed the descriptive statistics of each item. Overall, Q23 had the highest rating, and Q19 had the lowest rating. In the scale of visionary leadership, Q6 had the highest rating, while Q8 had the lowest rating. In digital learning culture scale, Q12 had the highest rating, and Q9 had the lowest rating. In professional development scale, Q15 had the highest rating, while Q16 had the lowest rating. In digital learning culture scale, Q18 had the highest rating, and Q19 had the lowest rating. In digital learning culture scale, Q23 had the highest rating, and Q24 had the lowest rating.

Table 12

Descriptive Statistics of the Scales of Digital Leadership

Item	Mean	SD	N
Q5	3.65	1.15	251
Q6	3.83	1.02	251
Q7	3.37	1.16	251
Q8	3.37	1.30	251
Q9	3.40	1.21	253
Q10	3.62	1.10	253
Q11	3.71	1.13	253
Q12	3.72	1.18	253
Q13	3.97	1.05	253
Q14	4.10	0.95	253
Q15	4.24	0.95	253
Q16	3.58	1.10	253
Q17	3.67	1.05	249
Q18	3.89	1.06	249
Q19	3.05	1.13	249
Q20	3.63	1.09	249
Q21	3.82	1.01	249
Q22	4.06	1.03	249
Q23	4.11	0.94	249

Table 12 (continued).

Q24	3.73	1.08	249

Visionary Leadership

Related to RQ6, which asked to what extent visionary leadership was effective in supporting communication and collaboration through technology regarding CCRS implementation in Mississippi, the means from item Q5 to item Q8 were calculated.

Table 13 contains the descriptive statistics of each item in visionary leadership. Among the 4 items in the visionary leadership scale, the Q6 statement had the highest rating. Q7 had the same lowest rating as Q8. Figure 2 shows the agreement proportion of the item. Responses of either agree or strongly agree were counted as the number in agreement with the item. Q6 had the highest percent of agreement, which took 72% of total responses. Q7 had the least proportion of agreement, which accounted only for 52%. The proportion of Q6 was 20% higher than Q7.

Table 13

Descriptive Statistics of Visionary Leadership

Item	Mean	SD	N
Q5	3.63	1.16	253
Q6	3.82	1.03	253
Q7	3.37	1.17	250
Q8	3.37	1.30	252

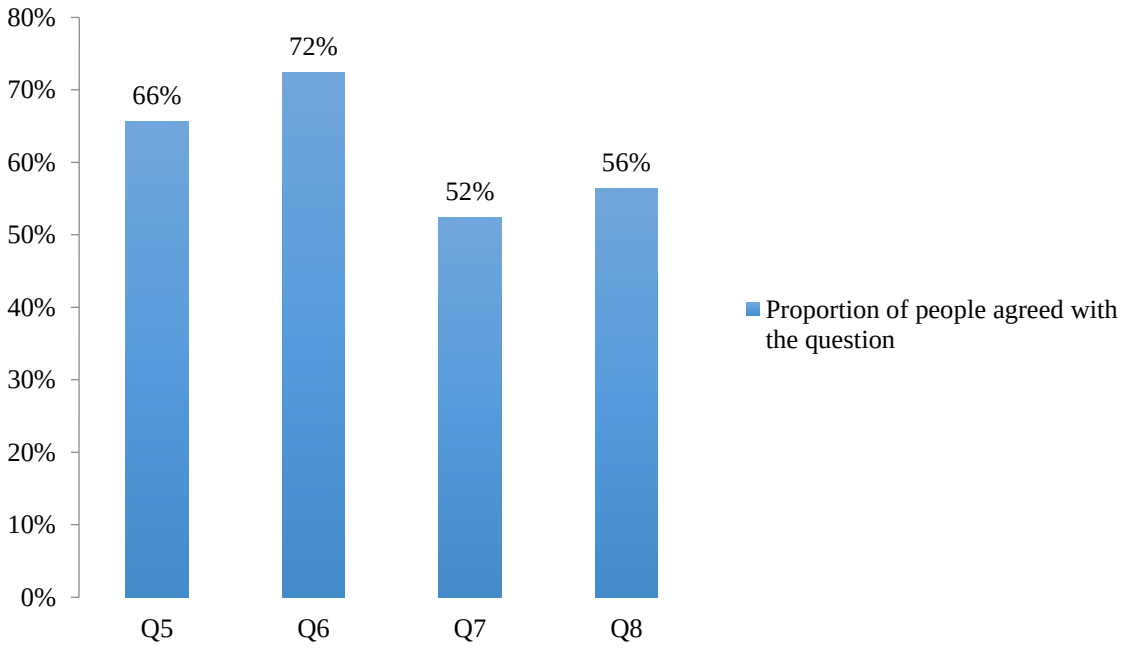


Figure 2. Proportion of people agreed with the visionary leadership questions.

Digital Learning Culture

In order to answer RQ 7, which asked to what extent digital learning culture was effective in supporting communication and collaboration through technology regarding CCRS implementation in Mississippi, the means from item Q9 to item Q12 were calculated.

Table 14 contained the descriptive statistics of each item in digital learning culture scale. Among the 4 items, item Q9 had the lowest rating. Q10 had the same lowest rating as Q11. Figure 3 shows the agreement proportion of each item in digital learning culture. Responses of either agree or strongly agree were counted as the number in agreement with the item. Q10 and Q11 had the highest agreement proportion, which took 68% of total responses. Q9 had the least agreement proportion, which accounted for 57%. The agreement proportion of Q10 was almost 10% higher than Q9.

Table 14

Descriptive Statistics of Digital Learning Culture

Item	Mean	SD	N
Q9	3.40	1.20	253
Q10	3.63	1.10	252
Q11	3.71	1.13	253
Q12	3.71	1.18	252

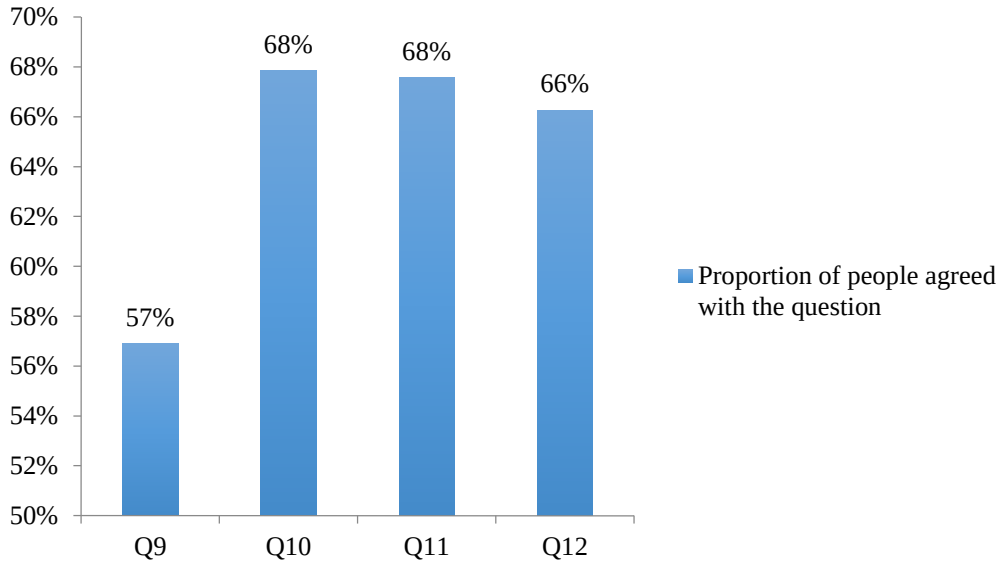


Figure 3. Proportion of people agreed with the digital learning culture questions.

Professional Development

In order to answer RQ 8, which asked to what extent professional development was effective in supporting communication and collaboration through technology regarding CCRS implementation in Mississippi, the means from item Q13 to item Q16 were calculated.

Table 15 contained the descriptive statistics of each item in professional development scale. Among the 4 items in the professional development scale, item Q16 had the lowest rating and Q15 had the highest rating. Figure 4 shows the agreement proportion of each item in professional development. Responses of either agree or strongly agree were counted as the number in agreement. Q15 had the highest agreement proportion, in which 90% people agreed with this item. Q16 had the least agreement proportion, which accounted for 68%. The highest proportion of agreement was more than 30% higher than the lowest proportion of agreement.

Table 15

Descriptive Statistics of Professional Development

Item	Mean	SD	N
Q13	3.95	1.06	252
Q14	4.11	0.95	252
Q15	4.23	0.96	254
Q16	3.58	1.10	253

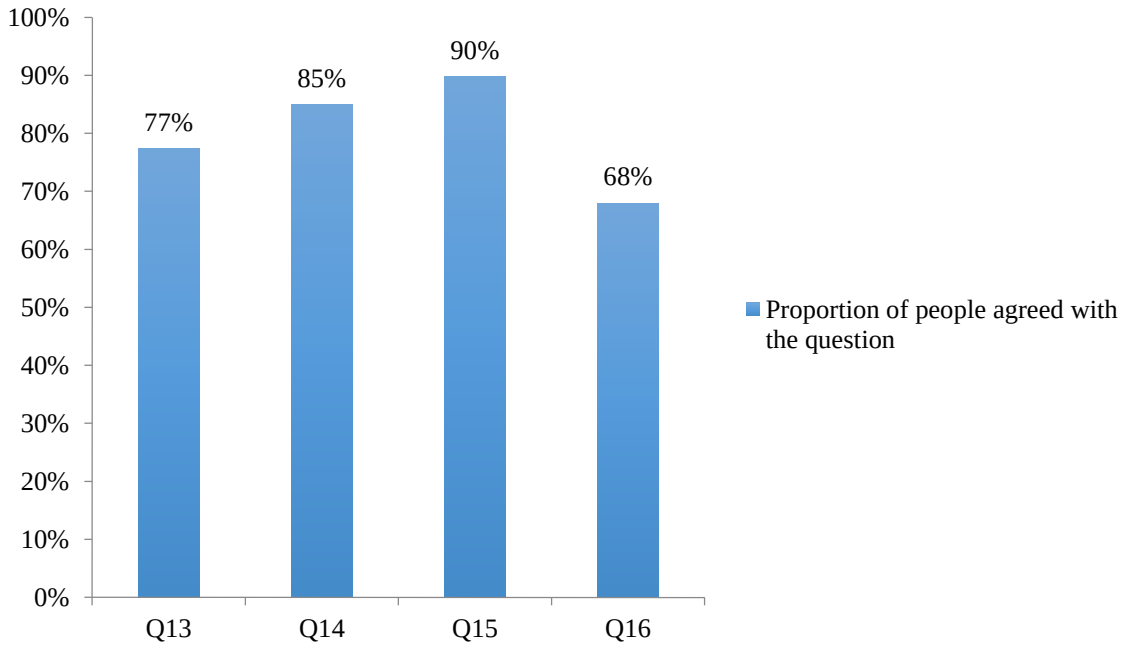


Figure 4. Proportion of people agreed with the professional development questions.

Systemic Improvement

Related to RQ 9, which asked to what extent systemic improvement was effective in supporting communication and collaboration through technology regarding CCRS implementation in Mississippi, the means from item Q17 to item Q20 were calculated.

Table 16 contained the descriptive statistics of each item in systemic improvement scale. Among the 4 items in the systemic improvement scale, item Q19 had the lowest rating and Q18 had the highest rating. Figure 5 shows the agreement proportion of each item in systemic improvement. Responses of either agree or strongly agree were counted as the number in agreement. Q18 had the highest proportion of agreement, in which 78% people agree with this statement. Q19 had the least proportion of agreement, which accounted for 37%. In other words, more than half of the

participants did not agree with Q19. The highest proportion of agreement was more than 40% higher than the lowest proportion of agreement.

Table 16

Descriptive Statistics of Systemic Improvement

Item	Mean	SD	N
Q17	3.67	1.04	248
Q18	3.88	1.06	253
Q19	3.06	1.13	251
Q20	3.63	1.09	252

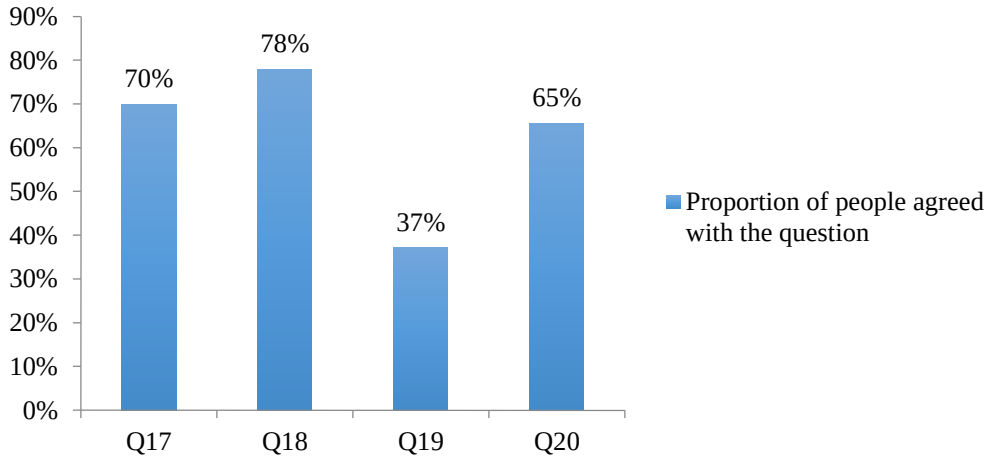


Figure 5. Proportion of people agreed with the systemic improvement questions

Digital Citizenship

To answer the RQ 10, which asked to what extent digital citizenship was effective in supporting communication and collaboration through technology regarding CCRS implementation in Mississippi, the means from item Q21 to item Q24 were calculated.

Table 17 contained the descriptive statistics of each item in digital citizenship scale. Among the 4 items in the digital citizenship scale, item Q24 had the lowest rating and Q23 had the highest rating. Figure 5 shows the agreement proportion of each item in digital citizenship. Responses of either agree or strongly agree were counted as the number in agreement. Q23 had the highest agreement proportion, which accounted for 84% agreement with this item. Q24 had the least agreement proportion, which accounted for 69% agreement with this item. The highest agreement proportion was 15% higher than the lowest proportion of agreement.

Table 17

Descriptive Statistics of Digital Citizenship

Item	Mean	SD	N
Q21	3.80	1.02	249
Q22	4.06	1.03	250
Q23	4.12	0.94	251
Q24	3.74	1.08	251

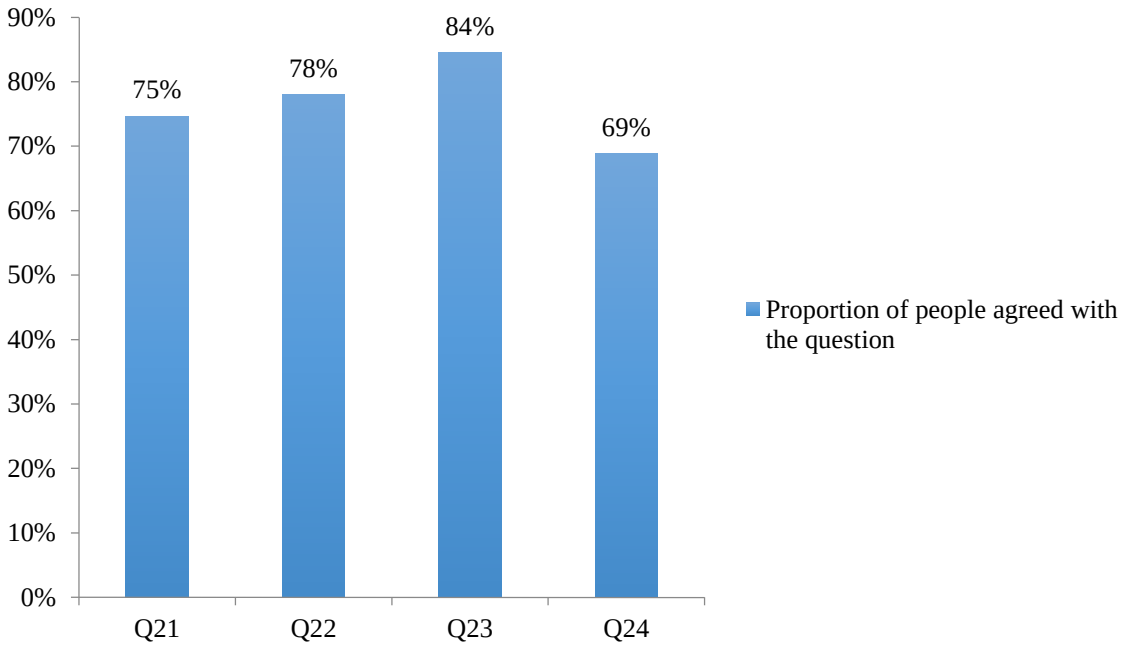


Figure 6. Proportion of people agreed with the digital citizenship questions

Demographic Impact

The last research question focused on the impact of demographics on each scale of digital leadership. Demographic information included teachers' gender, age, education background, and the grade they were teaching. MANOVA was utilized to determine the impact of demographics on each scale of digital leadership.

According to the results, there was no statistically significant difference in digital leadership based on teachers' gender ($p>0.05$). There was a statistically significant difference in digital leadership based on teachers' age ($F (5, 247) = 3.54$, $p<0.05$). Specifically, teachers' age had impact on the digital citizenship scale ($F (4, 248) = 3.68$, $p<0.05$). There was no statistically significant difference in digital leadership based on teachers' education background ($p>0.05$). There was a statistically significant difference in digital leadership based on teaching grade ($F (5, 246) = 4.33$, $p<0.05$). Specifically,

teaching grade was related to visionary leadership ($F (3, 248) = 3.68$, $p<0.05$) and professional development ($F (3, 248) = 2.95$, $p<0.05$).

Tukey's HSD post-hoc tests were conducted to follow up the significant finding. Results showed that the mean scores for digital citizenship were statistically significantly different between 20-25 years old teachers and 26-34 years old teachers ($p<0.05$) and 20-25 years old teachers and 55-64 years old teachers ($p<0.05$). The mean scores for visionary leadership were statistically significantly different between kindergarten and grade 1-4 ($p<0.05$) and kindergarten and high school ($p<0.05$). The mean scores for professional development were statistically significantly different between kindergarten and grade 1-4 ($p<0.05$) and kindergarten and high school ($p<0.05$).

Summary

This chapter summarized the main findings of the mixed-methods study. The qualitative stage aimed to collect data for the development of the quantitative survey instrument. Ten K-12 principals from 2 school districts were interviewed and observed. Interviews were transcribed and coded and formed the foundation for the survey items of the quantitative instrument based on ITSE-A standards. The survey was then delivered to Mississippi K-12 teachers from 5 school districts via email. There were 254 effective responses, which consisted of 208 female teachers and 46 male teachers. Results showed professional development and digital citizenship have higher rating than the ratings of visionary leadership, digital age learning culture, and systemic improvement.

CHAPTER V - DISCUSSION

This chapter aligned findings with the research questions to interpret and explain the results and to compare the results to those of prior studies. Educational and practical implications of the study were then discussed by exploring the ways that administrators and practitioners could apply the results to actual situations. Limitations of the study were discussed to remind other researchers to be cautious in generalizing the findings to other contexts. Finally, this chapter ended with suggestions and recommendations for future research to indicate how the findings of this study might spur additional investigations on digital leadership.

Conclusions and Discussions

This mixed-method study investigated digital leadership in Mississippi and the effectiveness of digital leadership in supporting teachers' communication and collaboration regarding CCRS through technology. The researcher first interviewed 10 principals to explore their strategies of supporting teachers' communication and collaboration regarding CCRS through technology. Based on the interview findings, a quantitative survey instrument related to the effectiveness of the principals' support of CCRS implementation was developed based on ITSE-A standards. The survey was sent to K-12 teachers from 5 school districts in Mississippi and their responses were recorded and analyzed. Findings of this study were organized in the following sections based on the data collection sequence. Themes emerging from the qualitative stage were summarized under the 5 research questions in qualitative stage and statistical analysis results in the quantitative stage were aligned with the 6 research questions in quantitative stage.

Qualitative Stage

The main goal of the qualitative stage was to collect data for instrument development. Ten K-12 principals with various background and experience participated in the qualitative data collection. Besides traditional ways of communication and collaboration such as email and meetings, some principals found new ways to support CCRS implementation such as data-driven decision-making, mix-ways of communication and collaboration, and personalized learning environments development. The following section discussed the details of principals' strategies for supporting communication and collaboration regarding CCRS through technology.

Research Question 1: In what ways do K-12 principals in Mississippi support communication and collaboration through visionary leadership to ensure successful CCRS Implementation?

The first research question addressed the perspective from the visionary leadership of digital leadership in supporting communication and collaboration regarding CCRS implementation. As defined in Chapter II, visionary leadership meant that educational administrators were to inspire and lead development and implementation of a shared vision for the comprehensive integration of technology to promote excellence and support transformation throughout the organization (ISTE-A, 2009). According to the qualitative stage findings, principals in this study utilized seven ways of communication and collaboration to achieve the goal of inspiring and leading a shared vision of CCRS implementation, including formal meetings with teachers, group collaboration, and training for parents, standard-embedded evaluation, social media, newsletters, and

websites. The findings of the first research question indicated that principals utilized mixed-methods for communication and collaboration.

Mix-ways of communication and collaboration are essential to include all stakeholders. Findings of qualitative stage indicated that principals utilized mixed-ways to promote visionary leadership regarding CCRS implementation. Most communication and collaboration were conducted through technology, including cloud computing, social media, mobile applications, and website. The main purpose of communication and collaboration in visionary leadership was to diffuse knowledge regarding CCRS. People involved in the knowledge diffusion process included school administrators, teachers, and parents. In other words, administrators, teachers, and parents interacted with each other to learn CCRS. This finding is consistent with Manely and Hawkins's (2012) study that CCRS implementation was the group work that involved everyone in K-12 education system. Principals in this study realized the importance of including all stakeholders and utilized mix-ways to communicate and collaborate.

Besides digital communication and collaboration, there were some traditional face-to-face communication and collaboration opportunities, which were an essential part of inspiring visionary leadership. As discussed in Chapter II, successful CCRS implementation required efforts from all stakeholders. Getting support from the entire community was essential to CCRS implementation. All participants in the qualitative stage reported that mix-ways of communication and collaboration were important to include all stakeholders. As mentioned in Chapter IV, there were some families who still used traditional, non-digital communication. Schools provided both electronic newsletters and paper-based newsletters for parents to ensure all people were involved. Besides

newsletter, schools also created many opportunities for parents, which were coded as trainings for parents in Chapter IV, to come to the classrooms to experience CCRS. This traditional communication and collaboration method provided more options for parents who could not access technology.

The content of communication and collaboration is more important than the format. As seen in Table 4, not all themes in the first research question were relying on technological methods. Some of the themes were traditional ways of communication and collaboration, such as formal meeting with teachers. Findings of different themes in the first research question indicated that the core of technology integration had changed from tools learning to technology integration awareness. In other words, schools emphasized the content of communication and collaboration more than the format of communication and collaboration during CCRS implementation. No matter which format of communication and collaboration teachers used, the goal of communication and collaboration was to improve technology integration through a shared visionary leadership. As principal Bear reported, principals demonstrated and modeled technology use during the face-to-face meetings. The format of communication and collaboration was traditional face-to-face but the content in the meetings was technology-infused visionary leadership. One of the reasons for the changing was the CCRS implementation.

Findings of this study are consistent with the study conducted by Goff (2013), who reported that technology was embedded into CCRS standards, such as the mathematical standards and English Language Arts standards. Findings from this study showed that the software and programs principals used already included CCRS standards. Schools were more motivated to integrate instructional technology because CCRS was

assessing technology. Teachers not only had to use technology to teach lessons but also needed to learn how to teach students to use technology so students could complete CCRS assessment.

Research Question 2: In what ways do K-12 principals in Mississippi support communication and collaboration through digital age learning culture to ensure successful CCRS implementation?

In Chapter II, digital learning culture was defined as creating, promoting, and sustaining a dynamic, digital-age learning culture (ISTE-A, 2009). The second research question investigated digital leadership from the digital learning culture and aimed to find out the ways of supporting CCRS implementation through digital learning culture. Findings from this study revealed that principals chose online learning, digital resources, onsite teaching support, external support, digital communication, at-home access, and digital teaching as the ways of supporting communication and collaboration regarding CCRS implementation. Findings from this study showed that communication and collaboration occurred among principals, districts, teachers, students, and parents regarding digital learning culture. All stakeholders collaborated with each other to ensure CCRS was fully understood and implemented.

Continuous CCRS support is the key of successful CCRS implementation. Educational reform usually takes long time to understand and fully implement (Creighton, 2003). People need time to understand and interpret CCRS that contains a lot of information (Calkins et al., 2012). Therefore, continuous support is important for teachers and other stakeholders to understand what they are expected to do and how they can achieve the goals of CCRS. Principals in this study utilized multiple ways to provide

continuous support regarding CCRS. For instance, online learning and training opportunities were provided for teachers to review the training materials. Findings from this study indicated that online training provided another way for teachers who could not participate in face-to-face professional development to maintain continuous professional development. Principals collaborated with district instructional technologists, who worked directly with teachers, to determine the content and the format of offering online training based on CCRS requirements. Thus, online training was demonstrated as another method to meet teachers' needs and CCRS requirements. This finding is consistent with the study conducted by Graesser (2015) that proved the effectiveness of using different media channels to support teachers' deeper comprehension of CCRS.

Learning resources are the basis of supporting CCRS implementation. Findings from this study showed that an important element of the digital learning culture was learning resource, including digital devices, digital supporting resources, and digital services. Principals tried to provide sufficient digital learning resources for teachers and students such as learning software and websites. However, obtaining enough devices was one of the challenges reported by principals in this study. At the initial stage of CCRS implementation, the focus of CCRS implementation was to get adequate devices for teachers and students so that teachers could teach and students could practice. Principals collaborated with districts and other organizations such as parent-teacher organizations to acquire an ample number of devices. Concurrently, principals worked with the district instructional technologists to effectively utilize available devices. For instance, teachers shared the devices with each other. In addition, information and digital recourses related to the devices accessibility and CCRS were shared with teachers through technology such

as email, Google Docs, and social media. During the interaction process that involved all stakeholders, principals not only promoted CCRS implementation in local communities but also stimulated CCRS implementation and digital collaboration in external communities. This finding is consistent with McLaughlin and Overturf's (2012) study that technology was proved to be an important way to improve learning effectiveness to meet CCRS standards.

Research Question 3: In what ways do K-12 principals in Mississippi support communication and collaboration through professional development to ensure successful CCRS implementation?

Findings showed that professional development was the most important part of supporting CCRS implementation because most teachers learned CCRS in this manner. Professional development was addressed as excellence in professional practice in ISTE-A. Professional development was defined as promoting professional learning environment and innovation. The third research question emphasized the ways of supporting CCRS through professional development, and the findings revealed that principals supported professional development through training, personalized professional development, professional learning community, digital information sharing, social media collaboration, and peers' modeling. Most communication and collaboration occurred between principals and teachers.

Personalized training ensures all teachers' ongoing professional growth in CCRS. Findings from this study indicated that training was the most important way of offering professional development. The principals reported two types of training, including after-school training and group training. Both after-school training and group

training involved several teachers and focused on one specific topic. However, as mentioned by principal Ant, not all teachers were at the same level of technology integration. Teachers' diverse needed had to be addressed. Therefore, principals worked with district instructional technologists to provide personalized training for teachers to ensure the continuous growth. As principal Ant said, she met with the district instructional technologist to discuss the topics the school wanted to focus upon. This helped ensure that the instructional technologist remained focused when working with the teachers. By providing personalized professional development for teachers, teachers could be more confident of implementing CCRS because they could request more help after the trainings. This finding is consistent with Lock's (2015) study that teachers were more confident in implementing CCRS if teachers have more opportunities of communication and collaboration such as personalized professional development.

Learning from peers enhances teachers' confidence of integrating technology into classroom to assist CCRS implementation. Findings showed that principals provided a collaborative learning environment for teachers with the purpose of promoting meaningful learning regarding CCRS. Various opportunities for learning from peers were provided to teachers such as PLC, social media, and other teachers' modeling. Principals set up PLC so teachers could share their ideas and experience with other. In addition, principals invited some teachers who did well in integrating technology to present and share their experiences and strategies at the meetings with teachers. Those advanced teachers became the trainers later to help other beginners with technology integration regarding CCRS. Principals also reported that they would video some good examples of teaching and post those good teachings on social media such as Facebook and Twitter.

When other teachers saw the excellent teaching examples, they became more confident and thought that they could do the same thing. The interactions between principals and teachers facilitated the occurrence of meaningful learning. As discussed in Chapter II, technology-based collaborative learning environment was an impetus for collaboration and meaningful learning (McLoughlin & Lee, 2007). This was confirmed by the themes that emerged from the principals' interviews. Findings of the third research question also discovered the significant effect of the learning community on meaningful learning. Learning community was more focused and effective than regular training (Palinscar, 1998). When teachers received more experience in integrating technology to improve CCRS implementation, they became confident in CCRS. Teachers' confidence further influenced and stimulated other teachers and even parents to support CCRS implementation. This finding is consistent with the study conducted by Zhang (2014), who reported that a learning community should be provided for teachers so that they could purposefully collaborate with peers. Teachers were divided into several groups in this study. Teachers' knowledge and skills regarding CCRS were re-constructed when they saw the good examples and interacted with the members in the community.

Research Question 4: In what ways do K-12 principals in Mississippi support communication and collaboration through systemic improvement to ensure successful CCRS Implementation?

The fourth question addressed the systemic improvement of digital leadership to support communication and collaboration regarding CCRS implementation. ISTE-A defined systemic improvement as providing digital age leadership and management to continuously improve the organization through the effective use of information and

technology resources. The principals in this study collected and interpreted digital leadership data, utilized technology to management schools, recruited competent personnel, and promote good teaching. Interactions occurred among principals, teachers, and parents.

Collecting and interpreting the digital data is a new way of utilizing technology to improve teachers' performance regarding CCRS. As addressed in the definition of systemic improvement, another important responsibility for principals was to effectively use information to improve schools. Most principals in this study mentioned data collection and interpretation to teachers. Several principals reported the use of a variety digital tools such as Excel to help them analyze and interpret schools' data. Findings from the data analysis were shared with teachers via email and during the meetings with teachers. As principal Ant mentioned, systemic improvement was not just related to the classroom. The quantified system with quantitative data allowed principals to see how schools' performance could be improved with individual improvement. Technology enabled principals to see teachers' and schools' performance in a quantitative way. Furthermore, data interpretation results also improved principals' decision making. As principal Horse mentioned, after interpreting the data and seeing the weak points regarding CCRS, the principal collaborated with district instructional technologists or CCRS experts from other districts to decide how to help teachers improve the weak points. Therefore, teachers could acquire more specific support rather than general trainings. The treatments to schools' disadvantages could be more effective. In general, principals not only used technology as a way of communicating and collaborating with

teachers regarding CCRS, but also use technology to support decision making regarding CCRS implementation.

Recruiting and maintaining competent personnel is important at the initial stage of CCRS implementation. At the initial stage of CCRS implementation, teachers would have a lot of questions regarding CCRS. Therefore, including competent personnel to help and advance CCRS implementation was necessary. Among all the principals interviewed in this study, only principal Cat mentioned that she recruited one instructional technologist to assist with school's CCRS implementation. The reason why only one principal recruited an instructional technologist was the financial challenge. Most principals reported limited budgets were the biggest challenge they faced. Schools did not have extra funding to hire instructional technologist. Teachers and principals in most schools relied on the assistance from the district's instructional technology personnel. However, in school Cat the number of teachers was almost three times than teachers in other schools. Support from district was not enough for school Cat as mentioned by principal Cat. Thus, principal Cat had to manipulate the budget to hire competent personnel to support the school's CCRS implementation. Although recruiting or hiring more competent personnel may not be possible for all schools, there are some opportunities such as inviting volunteers from universities or other organizations. However, most principals in this study did not mention how they would improve the limitation of hiring more instructional technologists.

Research Question 5: In what ways do K-12 principals in Mississippi support communication and collaboration through digital citizenship to ensure successful CCRS implementation?

The last research question focused on how principals support teachers' communication and collaboration from the perspective of digital citizenship to ensure successful CCRS implementation. Digital citizenship was defined as modeling and facilitating understanding of social, ethical, and legal issues and responsibilities. In this study, the principals utilized the technology agreement form and handbook to help the teachers and the students become aware of using technology appropriately. The principals also promoted and modeled appropriate technology use to teachers. In addition, school districts provided website filters to help the teachers and the students use technology appropriately and legally.

Most support of digital citizenship comes from the school district. The findings of the fifth research question indicated that most knowledge and support of digital citizenship came from the district. As principal Deer mentioned that school district provided the technology handbook and all teachers could obtain a copy of the handbook at the beginning of schools' registration. The principals' responsibility related to digital citizenship was to ensure that teachers obtained the hard copy materials. During the interview, none of the principals said they would check back on whether teachers and students adhered digital citizenship. In addition, when the principals were asked about digital citizenship, none of them mentioned other ways of supporting digital citizenship besides the three methods mentioned above. When they were asked about digital citizenship in their own schools, none of them said they had special methods of supporting digital citizenship. All the principals said that the district instructional technologist was offering tutoring of digital citizenship during training of the teachers. However, none of all the principals reported that training of digital citizenship was given

to the students. In other words, teachers' knowledge of digital citizenship was from the district instructional technologist and the handbook of appropriate technology use came from the district. Compared to other subscales of digital leadership, findings from this study indicated digital citizenship was the weakest part that needed more improvement.

Digital citizenship is not just following the copyright laws. When the principals were asked about digital citizenship, they all said that the website filters, the technology agreement form, and handbook were used. Those strategies emphasized what teachers could do and what they could not do to avoid breaking related laws. However, digital citizenship was not just about following related laws. The ISTE-A standards showed that digital citizenship also contained equitable access to digital resources, responsible social interactions, and cultural understanding of digital citizenship. In schools, the teachers needed to provide the opportunities of equitable access to digital resources to meet the needs of all students. However, none of the principals reported how they supported equitable access to digital resources. In addition, responsible social interactions and cultural understandings of digital citizenship were rarely mentioned during the interviews. The principals' understandings of digital citizenship focused on the laws related to digital citizenship. The findings from the fifth research question were consistent with the previous studies (Richardson et al., 2012; Wang, 2010), which reported digital citizenship the least significant part of digital leadership. Such findings call for more attention toward digital citizenship as principals support CCRS implementation.

Quantitative Stage

In the quantitative stage, there were 254 responses, which consisted of 208 female teachers and 46 male teachers. Results showed that the principals were more effective in supporting professional development and digital citizenship related to CCRS. However, supports were less effective in visionary leadership, digital age learning culture, and systemic improvement. Specifically, the Q6 (my principal uses the data and information from evaluation software or app (e. g. schoolstatus, feedback) in school's leadership meeting) was reported as the most effective support for visionary leadership. The Q9 (technology representatives regularly come to the campus and provide hands on support, including technology updates or new tools demonstration) item was the least effective support for the digital age learning culture. The Q16 (my principal models effective technology use during meetings with teachers) item was the least effective support for professional development. The Q19 (my principal asks questions about the lessons through Google Docs) item was the least effective support for systemic improvement. In particular, the agreement proportion of Q19 was unusual in that less than 40% of total responses agreed. There was no significant or least effective support for digital citizenship from the study. The following section discusses each research question in details in terms of the findings.

Research Question 6: To what extent is visionary leadership effective in supporting communication and collaboration regarding CCRS implementation in Mississippi?

Visionary leadership was measured by attendance of face-to-face technology meetings with the technology specialists from district (Q5), usage of data and information

from evaluation software or apps in school's leadership meeting (Q6), demonstration of how technology was going to impact instructional strategies for teachers (Q7), and utilization of social media such as Facebook and Tweeter to communicate and engage with all teachers (Q8).

Results indicated that the principals' strategies of visionary leadership were the least effective digital leadership strategies compared with other scales of digital leadership. Specifically, the principals need to improve their strategies related to technology modeling, which would impact instructional strategies for the teachers (Q7). In addition, the agreement proportion of social media utilization was similar to technology modeling. Only half of the teachers agreed with the visionary leadership strategies related to technology modeling and social media utilization. However, all of the principals mentioned that they modeled technology use in the meetings with teachers. One explanation may be the different perspective of how technology integration should be demonstrated. The principals understood technology demonstration as just presenting and introducing information at the meeting digitally. However, the teachers understood technology demonstration to be instructionally focused and just convey general information without introducing instructional applications. Conclusively, the principals should continue promoting utilization of social media in visionary leadership (Q8).

Besides the most and least effective items of visionary leadership, the principals were doing well in supporting technology meetings and utilizing social media. Most schools required the teachers to meet with the technologist from the district and utilized social media to connect the teachers with schools. The use of social media and support from district showed that the principals realized the importance of communication and

collaboration and utilized the available resources to support the teachers' communication and collaboration regarding CCRS. The proportion of the two items showed that the principals still needed to improve the support regarding district resources and social media.

Findings of visionary leadership were evidently consistent with previous studies (Banoglu, 2011; Metcalf & LaFrance, 2013). In the study conducted by Banoglu (2011), results showed that visionary leadership was the lowest value compared with other indicators. Metcalf and LaFrance (2013) had the same conclusion in their study that visionary leadership was the least prepared indicator. Besides the conclusion of visionary leadership, findings of this study also indicated how the principals could improve their strategies of visionary leadership. As discussed in Chapter IV, although the principals' strategies of visionary leadership were the least effective strategies, the principals were doing great in supporting teachers' meetings and digital evaluation. The principals should focus on their strategies of supporting technology modeling and social media utilization in visionary leadership.

Research Question 7: To what extent is digital learning culture effective in supporting communication and collaboration regarding CCRS implementation in Mississippi?

Digital age learning culture was measured through the support of technology representatives (Q9), introduction to some communication tools (Q10), utilization of Google Docs to share materials (Q11), and encouragement of using teaching websites (Q12).

Results showed that strategies of digital learning culture were more effective than strategies of visionary leadership and digital citizenship but less effective than professional development and systemic improvement. Specifically, in digital learning culture, the principals' strategies in district technology representatives were the least effective strategies for teachers (Q9) compared with other strategies in digital learning culture scale. Only 57% teachers agreed with item Q9. Similar to visionary leadership, all the principals reported they asked technology representatives to come to campus and provide technology demonstrations. However, findings showed that support from technology representatives were not enough. One of the reasons of this inadequate support from technology representatives might be the technology representatives' main purpose to sell and maintain equipment, rather than providing instructional technology support.

The other three items in digital learning culture had similar effectiveness in supporting teachers' communication and collaboration regarding CCRS, which indicated that communication tools, Google Drive, and teaching websites were good ways for teachers' communication and collaboration. The agreement proportions of the three items except Q9 were almost 68%, which meant that two-thirds of the teachers were using digital tools for communication and collaboration regarding CCRS. On the contrary, the proportions of the three items also indicated that there were one-third of teachers who did not use technology for communication and collaboration. Based on the data in this study it was difficult to conclude why those one-third of teachers did not use technology for communication and collaboration Thus, investigating why those one-third of the teachers

did not use technology, and how to support those teachers with their communication and collaboration regarding CCRS could benefit the principals and policy makers.

Findings of digital learning culture were new findings that have not been addressed in previous studies. Although Lecklider et al. (2009) provided an example of creating digital learning culture, discussion of effectiveness of strategies in digital learning culture were not included in this study. This study filled this gap by providing the evidence of the effectiveness of strategies in digital learning culture. In addition, this study demonstrated that teachers' gender, age, educational background, and teaching grade did not have impact on the principals' strategies in digital learning culture. Therefore, the principals are suggested to plan digital learning culture for all the teachers regardless of their demographics.

Research Question 8: To what extent is professional development effective in supporting communication and collaboration regarding CCRS implementation in Mississippi?

Professional development was measured by the attendance of face-to-face professional development meetings (Q13), having available digital tools (Q14), group meeting (Q15), and promotion of effective technology use (Q16).

Compared with other 4 scales of digital leadership, strategies in professional development were the most effective strategies. As showed in Chapter IV, the teachers' average agreement proportion of professional development items was above 80%, which indicated that the principals fully understood the requirements of professional development and placed their effort in supporting teachers' professional development. Almost 90% of the teachers showed their agreements for holding group meetings, which

indicated that group meetings were the most effective strategy for supporting professional development. The principals reported that teachers preferred group meetings and wanted to discuss with other teachers in the same grade or subject area. The teachers' responses in the quantitative stage supported the principals' reports and proved that group meetings were great for communication and collaboration regarding CCRS. This finding also demonstrated the importance of establishing a learning community. Group meeting plays an essential role in the process of supporting interaction and meaningful learning (Vygotsky, 1978). The teachers learn from each other by sharing experiences and gaining support from the community and individual knowledge is re-shared and improved during the interaction process.

Findings also showed that technology promotion was the least effective strategy from the principals. In the qualitative stage, the principals reported that they promoted effective technology use when they met with teachers. However, the teachers' responses showed that not all principals promoted effective technology use. The low technology promotion showed that the understanding of professional development in digital leadership was still limited to providing training regarding the digital resources. Communication and collaboration regarding professional development between the principals and the teachers were constrained by traditional strategies of professional development. Although some principals mentioned using social media as a way of professional development, those principals acknowledged that they were just starting to use social media and the teachers still needed long time to become comfortable with professional development in social media. Conclusively, more support was required in promoting effective technology use among teachers.

Findings of professional development were also consistent with previous study (Lecklider et al., 2009), which showed that professional development was the first priority for principals compared with other scales. Findings in Chapter IV also demonstrated that strategies of professional development were the most effective strategies in digital leadership. Most items in professional development were rated above 75%, which indicated the principal's success in supporting the teachers' professional development. The principals should continue their strategies in professional development. For future improvement, the principals are suggested to improve technology modeling during the meetings with teachers.

Research Question 9: To what extent is systemic improvement effective in supporting communication and collaboration regarding CCRS implementation in Mississippi?

Systemic improvement was measured by evaluation results email (Q17), digital teaching evaluation (Q18), utilization of Google Docs (Q19), and teaching examples promotion (Q20).

As reported in Chapter IV, systemic improvement was as less effective as visionary leadership. The rate of the utilization of Google Docs for questions was quite low. More than half of the teachers did not agree with this item, which indicated that there was something wrong with the utilization of Google Docs. According to the interviews with the principals, communication through Google Docs seemed like a good way for both principals and teachers. One of the explanations of the low rate of utilization of Google Docs might be the ways that Google Docs were not appropriately used. Teachers might not be comfortable in discussing lessons with principals through Google

Docs. Communication and collaboration via Google Docs might occur a lot between teachers instead of between teachers and principals.

The high rates of evaluation results demonstrated explanation of the low rate of utilization of Google Docs. More than two-thirds of the teachers agreed that their principals used email and digital evaluation tools for teaching evaluation. Principals used technology as a tool of sharing information rather than a way of communication and collaboration. All of the items except the third item Google Docs in systemic improvement scale were one-way communication that began from principals to teachers. The responses of systemic improvement scale showed that technology was rarely used to communicate and collaborate with teachers. Instead, technology was a tool of delivering information for principals. There was no two-way communication under systemic improvement.

Findings of systemic improvement were consistent with the study conducted by Richardson et al. (2012), which showed that systemic improvement was paid less attention and more studies were needed for systemic improvement. This study also demonstrated that strategies of systemic improvement were as less effective as the strategies of visionary leadership. One possible explanation was principals' inadequate understanding of systemic improvement. Principals also need extra help with strategies of systemic improvement. Thus, principals and school districts should pay more attention to systemic improvement, especially the utilization of Google Docs. Further research is required to investigate the strategies that principals can use to improve the effectiveness of strategies in systemic improvement. Findings in this study also showed that teachers' demographics did not have impact on principals' strategies in systemic improvement.

Research Question 10: To what extent is digital citizenship effective in supporting communication and collaboration regarding CCRS implementation in Mississippi?

Digital citizenship was measured by the promotion of proper use of technology (Q21), technology use handbook (Q22), website filter (Q23), and support of access to digital resources (Q24).

Similar to professional development, the principals were effective in supporting digital citizenship than the other three scales. Based on the principals' interviews, most support of digital citizenship came from the school district. School district provided the technology use handbook, website filters, and other digital citizenship resources for schools. The digital citizenship support was carefully designed and developed by the instructional designers in school districts. This might be the reason of why support of digital citizenship was more effective.

Among the items in digital citizenship, the principals were less effective in supporting digital resources access. The lack of support in access to digital resources may cause teachers' inconvenience of implementing CCRS. Schools had website filters that protected the teachers and the students from inappropriate information on the Internet. However, the website filter also blocked some instructional resources from being used in classrooms. Although one of the principals said schools would contact school district if teachers requested some online resources for instructional use, she did not show how fast teachers would get help from district. It was hard to identify whether the teachers got to necessary resources at the time they needed.

The high rate of website filter was evidently consistent with the principals' interviews. All the principals reported the existence of website filters. In addition, three-

fourths of the teachers responded positively in promoting proper technology use. Results showed that most principals have the awareness of digital citizenship and tried to create a safe environment of using technology. This was also the only digital citizenship support provided at school level, which should be encouraged and improved upon in the future.

Most support of digital citizenship came from the school districts. Although schools have a few digital citizenship supports, more effort should be placed on improving digital citizenship. Effective digital citizenship support does not only mean following copyright rules and laws, but also helping students and teachers improving digital learning environment. Success of digital citizenship comes from the school districts' effort, which heavily relies on professional knowledge and skills from the instructional designers. For principals, taking full use of instructional designers from school districts and if possible, hiring schools' own instructional designers are keys toward more successful digital citizenship support in the future.

Findings of digital citizenship in this study were consistent with the study conducted by Metcalf and LaFrance (2013) but contradicted with the study conducted by Richardson et al. (2012). Metcalf and LaFrance (2013) measured technology leadership preparedness from principals' perceptions and results showed that digital citizenship was the more prepared indicator. However, Richardson et al. (2012) reviewed the literature related to digital leadership and reported that digital citizenship was paid less attention and more studied were needed for digital citizenship. Findings from this study showed similar conclusion as the study conducted by Metcalf and LaFrance (2013) that strategies in digital citizenship were the most effective strategies of digital leadership.

In general, strategies of professional development and digital citizenship were more effective compared with strategies of visionary leadership, digital culture learning, and systemic improvement. Specifically, principals were successful in supporting group meeting and website filters. Principals needed to improve strategies of supporting technology integration demonstration and access to digital resources. When principals provide support of visionary leadership, digital age culture learning, and systemic improvement, more efforts should be on improving in technology demonstrations related to instructional strategies, collaborating with technology representatives, and having more two-way communication and collaboration with teachers through web 2.0 tools such as Google Drive.

Research Question 11: Do demographics make a difference in any of the scales of digital leadership?

According to the results in Chapter IV, demographics did make a difference in the scales of digital leadership. Specifically, teachers' age had impact on strategies in digital citizenship. Teachers' teaching grade had effect on strategies related to visionary leadership and professional development.

Teachers' age had impact on the effectiveness of principals' strategies in digital citizenship. As reported in Chapter IV, teachers between 20 years old and 25 years old were different from teachers between 55 years old and 64 years old in strategies in digital citizenship. Teachers between 20 years old and 25 years old were different from teachers between 26 years old and 34 years old in strategies in digital citizenship. Thus, principals needed to consider the different age groups when planning digital citizenship strategies.

Findings also showed that teachers' teaching grade had impact on principals' strategies in professional development. As reported in Chapter IV, kindergarten teachers were different from grade 1-4 teachers and high school teachers. Therefore, principals should make different strategies for kindergarten teachers, grade 1-4 teachers, and high school teachers.

There was significant difference between kindergarten teachers and 1-4 grade teachers. High school teachers were also different from kindergarten teachers regarding visionary leadership strategies. Those differences indicated that principals should consider the teaching grade in visionary leadership strategies. For instance, principals were highly recommended to make different visionary leadership for different grade teachers.

Implications

Findings of this study have provided empirical evidence of the effectiveness of digital leadership in supporting communication and collaboration regarding CCRS. Besides school principals, other school leaders and educators who are interested in CCRS implementation could also benefit from the results. They can benefit from knowing the effectiveness of their strategies of supporting communication and collaboration regarding CCRS. For example, findings showed that more effort was required on technology demonstration. Principals can pay more attention to technology demonstration and improve the strategies of promoting technology demonstration, including encouraging chromebook use, helping teachers share their ideas and experiences of using technology in classroom, and inviting instructional technologist to demonstrate technology integration in classroom.

Digital learning environment is critical for effective digital leadership. Most principals interviewed in this study showed positive attitudes toward technology integration and had been aware of the importance of technology in supporting CCRS implementation. However, most principals ignored the need of digital learning environment and placed too much effort on professional development, which aimed to provide technology training for teachers without considering teachers' needs for technology. For principals and other school leaders, creating a technology-enhanced learning environment that fully uses available devices in classroom is recommended instead of offering too many technology trainings, such as new tools training and demonstration. Principals can encourage, demonstrate, and model technology use when they interact with teachers. Therefore, teachers can increase their awareness of technology integration when they work on CCRS.

To support schools' CCRS implementation, school district leaders also need to improve the support for schools. Principals' digital leadership training should improve visionary leadership, digital age learning culture, and systemic improvement. As mentioned in Chapter IV, visionary leadership and systemic improvement have the lowest rating, which means that principals are not good at providing supporting related to visionary leadership. Therefore, district leaders need to focus on how to improve principals' knowledge and skills of visionary leadership, digital age learning culture, and systemic improvement. In addition, for specific school districts, they can refer to the results of this study to improve one scale of digital leadership such as systemic improvement. For instance, encouraging and demonstrating how Google Docs can enhance the interactions with teachers is a good strategy of improving effectiveness of

systemic improvement. Principals can share schools' documents with teachers through Google Docs. Another good strategy to improve systemic improve is to collect information from teachers through Google Docs. Teachers have to use Google Docs to complete their work. Thus, teachers can get experience of using Google Docs to communicate and collaborate with others during the process of interacting with principals.

Recommendations for principals to complete CCRS integration and perform better digital leadership include improvement in hands-on support of technology representatives, development of technology integration promotion strategies, and encouragement of Google Docs. Principals are highly recommended to keep continuous support in professional development and digital citizenship. Particularly, although strategies of digital citizenship were effective based on the findings, more effort were suggested on digital citizenship. Most strategies of digital citizenship came from school districts. However, each school had different situation and principals need to develop their own strategies of digital citizenship according to their schools' need.

One obstacle of supporting CCRS implementation includes the options of participating digital leadership activities. Principals should avoid setting digital leadership activities as optional choices for teachers. As reported in Chapter IV, some principals did not require their teachers to participate in professional development opportunities. As a result, only one or two teachers came to the professional development opportunities. Principals need to improve participation of the opportunities and resources offered to teachers. For example, requiring at least one attendance in professional development may help improve participation percentage. Another recommendation is to

include required meeting or training in teachers' evaluation. If teachers were evaluated by their participations in meeting, they would more like to show up. Besides required participation, principals should encourage teachers to learn from technology trainings and meetings.

Another obstacle is technology integration evaluation. Principals mentioned that it was difficult from them to evaluate technology use in classroom. Although schools and districts encourage teachers to use technology in teaching, few schools and districts provided methods of evaluating schools' technology integration. Principals are highly encouraged to develop their own technology methods. Classroom observation is a good way of evaluating technology. Other ways, such as devices checkout record, teaching with technology demonstration, and digital teaching and learning competition are also good ways of assessing technology. Inviting technologists from districts to evaluate technology is another great way to promote technology use in CCRS implementation. Schools even can make technology required in their own schools based on the teachers' need.

Limitations

Confounding variables in the participant pool for the survey in regards to the gender, age, education background, and the teaching grade existed. An imbalance could have impacted teachers' preferences and answers on the survey instrument. For instance, in regards to gender, more than 80% participants were female teachers as shown in Figure 3. The final results showed positive responses of the survey, which indicated that female teachers' responses have had a great impact on the final results. Most male teachers on the survey actually disagreed with the effectiveness of using social media as a

way of communication and collaboration, while most female teachers agreed with this statement. In addition, male teachers primarily disagreed with the effectiveness of promoting effective technology use, while female teachers agreed with the statement. If more male teachers were included in the participant pool, results of some responses on the survey may be different. Table 4 showed that more than half teachers were between 35 years old and 54 years old. In addition, more than half of the teachers have Masters' degree as shown in Table 4. Previous studies have demonstrated that the teachers' demographic information such as age, education background, and teaching experience could have negative impact on the attitudes of technology integration (Inan & Lowther, 2010). Distribution of teachers' demographics in this study was varied and should not be ignored.

Another limitation of this study is that the principals interviewed in qualitative stage all came from the same location and only from 2 school districts. The limited demographic information may restrict the findings of qualitative stage. The technology environment may be different in other school districts. Therefore, the items included in the survey may not include all the technology. Studies are encouraged to interview principals in other locations to investigate other technology utilizations.

One more limitation is the technology background information of the schools. The survey did not include questions that addressed whether teachers' schools were technology-rich or not. The technology environment background of schools may affect the teachers' responses. In addition, schools and principals may not have the same collaborative and encouraging environments as others. The different environment may affect teachers' responses to the survey. Some schools do not have enough devices to

support teachers' technology integration while some schools have necessary devices but lack digital leadership strategies. The technology environment may constrain teachers' experience at schools and affect their understandings and responses to the survey. Studies are suggested to collect technology background information for digital leadership analysis.

Future Research

The analysis of qualitative data and quantitative data shows the need for further research in the area of digital leadership. As mentioned above, results of the digital learning culture showed that there were one-third teachers who did not use technology at all for communication and collaboration. The teachers' reasons for not using technology for communication and collaboration need to be addressed. Questions such as do they have difficulties of using technology, and what factors could have affected their attitudes towards technology could be answered. Discovering the teachers' reasons for not using technology could help principals and other administrators identify teachers needing assistance to improve the effectiveness of technology integration to support CCRS implementation.

Another direction for future research is to investigate how teachers' demographics can affect attitudes toward digital leadership. Because this study was delivered to teachers randomly, to the researcher could not control the balance of teachers' demographics. Future research is recommended to adjust the sampling strategies and obtain samples with more balanced demographics. Results may then be more comprehensive in how digital leadership support communication and collaboration. Research is suggested to use a different population of principals or schools to develop a

survey. Or interview superintendents and assistant principals and include their opinions of digital leadership related to CCRS implementation.

Longer qualitative studies that focus around one school is recommended. Researchers can do longer and in-depth observations of the principals' leadership and examine how the principals' leadership impacts the classroom over a longer period of time. In addition, asking more specific questions as to how the digital leadership has helped schools in implementing CCRS is also highly recommended.

Summary

This chapter interprets the findings of this mixed-methods study based on the data in Chapter IV. Findings of qualitative stage showed that supporting communication and collaboration regarding CCRS needed hybrid ways, content-based and personalized professional development, various learning resources, peers' support, digital evaluation, and efforts of all stakeholders. Results of the quantitative stage showed that professional development and digital citizenship were more effective compared with visionary leadership, digital age culture learning, and systemic improvement. Principals were successful in supporting group meetings and through website filters. Principals needed to improve the strategies of supporting technology integration demonstration and access to digital resources. More effort should be taken in technology demonstration related to instructional strategies, collaborating with technology representatives, having two-way communication and collaboration with teachers through web 2.0 tools such as Google Drive. More studies are required to examine how the demographic data affects the effectiveness of digital leadership in supporting communication and collaboration regarding CCRS.

APPENDIX A – Authorization to Participate in Research Project

Participant's Name: _____

Participant's Contact Information: Phone_____

Email_____

Consent is hereby given to participate in the research project entitled **The Effectiveness of Digital Leadership at K-12 Schools in Mississippi Regards Common Core State Standards (CCRS) Implementation.** All procedures and research purposes was explained by Lin Zhong. Information was given about all benefits, risks, inconveniences, or discomforts that might be expected.

The opportunity to ask questions regarding the research and procedures was given. Participation in the project is completely voluntary, and participants may withdraw at any time without penalty, prejudice, or loss of benefits. All personal information is strictly confidential, and no names will be disclosed. Any new information that develops during the project will be provided if that information may affect the willingness to continue participation in the project. There is a possibility that results will be published in academic-related journals.

Questions concerning the research, at any time during or after the project, should be directed to **Lin Zhong** at 601-434-6309. This project and this consent form have been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

_____ _____

Signature of participant Date

_____ _____

Signature of person explaining the study Date

APPENDIX B – Interview Questions

I. Demographic Information

1. Could you please briefly introduce yourself?
2. What does digital leadership mean to you?
3. What does CCRS mean to you?

II. Visionary Leadership

1. What activities do you take to advocate on local, state and national levels for policies, programs, and funding to support implementation of a technology-infused vision and strategic plan regards CCRS?
2. How do you promote teachers' adoption and implementation of CCRS through technology?
3. What efforts did you put in outside CCRS resources?

III. Digital learning culture

1. What strategies do you take to ensure CCRS focused on continuous improvement of digital-age learning?
2. What methods do you use to model and promote the frequent and effective use of technology for CCRS implementation?
3. What do you do to provide learn-centered environments equipped with technology and learning resources to meet the individual, diverse need of all learners regards CCRS?
4. How do you ensure effective practice in CCRS through technology and its infusion across the curriculum?

IV. Excellence in professional practice

1. How do you allocate time, resources, and access to ensure ongoing professional growth in CCRS through technology integration?
2. How do you facilitate and participate in communities that stimulate, nurture and support administrators, faculty, and staff in the study of CCRS through technology?
3. How to you promote and model effective communication and collaboration among stakeholders regards CCRS?
4. What do you do to stay abreast of educational research and emerging trend regarding CCRS and encourage evaluation of new technologies for their potential to improve CCRS learning?

V. Systemic improvement

1. How do you lead purposeful change to maximize the achievement of learning goals through the appropriate use of technology and media-rich resources?
2. What and how do you collaborate to establish metrics, collect and analyze data, interpret results, and share findings to improve staff performance and student learning?
3. What strategies do you use to recruit and retain highly competent personnel who use technology creatively and proficiently to advance academic and operational goals?
4. How do you establish and leverage strategic partnerships to support systemic improvement?

5. How do you establish and maintain a robust infrastructure for technology including integrated, interoperable technology systems to support management, operations, teaching, and learning?

V. Digital citizenship

1. How do you ensure equitable access to appropriate digital tools and resources to meet the needs of all learners?
2. How do you promote, model and establish policies for safe, legal, and ethical use of digital information and technology?
3. What do you do to promote and model responsible social interactions related to the use of technology and information?
4. How do you model and facilitate the development of a shared cultural understanding and involvement in global issues through the use of contemporary communication and collaboration tools?

APPENDIX C – Observation Form for Classroom Technology Use

Subject & Grade:	Date:
Class Length:	Number of Students:
Goals/Objectives:	

Considered Questions	**Notes**
What preparation teacher needs to do before class?	
What does the classroom technology environment look like?	
What hardware does teacher use?	
What software does teacher use?	
How the teacher is using technology?	
What support from principal teacher has in her classroom?	
How do students response to technology?	
What are students' attitudes with technology in class?	
What can be improved regards technology?	

APPENDIX D – Survey for K-12 Teachers

How do you rate your experience with principal in supporting communication and collaboration regarding CCRS implementation? Please select the appropriate rate.

	Female	Male
1. What is your gender?	❍	❍

	20-25	26-34	35-54	55-64	65 or above
2. How old are you?	❍	❍	❍	❍	❍

	High School/GED	Some College	2-year College Degree	4-year College Degree	Masters' Degree	Specialists' Degree	Doctoral Degree	Professional Degree (JD, MD)
3. What is the highest level of education you have completed?	❍	❍	❍	❍	❍	❍	❍	❍

	Kindergarten	Elementary: grade 1-4	Elementary: grade 5-8	High School: grade 9-12
4. In which educational categories do you currently teach? Please select all that apply. (U.S. Census) (1)	❍	❍	❍	❍

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
5. Teachers are required to attend the regular face-to-face technology meetings with technology specialists from district.	❍	❍	❍	❍	❍
6. My Principal uses the data and information from evaluation software or app (e. g. schoolstatus, feedback) in school's leadership meeting.	❍	❍	❍	❍	❍
7. My principal models how technology is going to impact instructional strategies for teachers.	❍	❍	❍	❍	❍
8. My principal uses social media, such as Facebook page to communicate and engage with all teachers.	❍	❍	❍	❍	❍
9. Technology representatives regularly come to the campus and provide hands on support, including technology updates or new	❍	❍	❍	❍	❍

tools demonstration.					
10. My principal will help and support good communication with teachers (e. g., explaining the ways of communication, how to use some communication tools, explains the value of the communication tools, and constantly show the teachers why digital communications tools are important).	❍	❍	❍	❍	❍
11. Teachers will train each other, model lessons, and share training materials with other teachers through Google Drive.	❍	❍	❍	❍	❍
12. School is trying to encourage teachers to put as much information as they can on school website so that students can pull out the book online or see the notes that might be helpful when they are at home.	❍	❍	❍	❍	❍
13. Teachers are	❍	❍	❍	❍	❍

required to attend face-to-face professional development technology meetings.					
14. Digital tools are provided for teachers to communicate with principals. (e.g., SAMS, Remind.com, Blackboard, Google Drive, School Wires)	❍	❍	❍	❍	❍
15. Teachers meet in grade level meetings to share ideas for their lessons.	❍	❍	❍	❍	❍
16. My principal models effective technology use during meetings with teachers.	❍	❍	❍	❍	❍
17. My principal interprets the evaluation results to teachers via e-mail.	❍	❍	❍	❍	❍
18. My principal uses digital tools (e. g., School Status, Feedback) to evaluate teaching (e.g. leave comments after observation).	❍	❍	❍	❍	❍
19. My principal asks questions about the lessons through Google	❍	❍	❍	❍	❍

Docs.					
20. My principal uses technology to share good examples of teaching with other teachers.	❍	❍	❍	❍	❍
21. My principal teaches proper use of technology.	❍	❍	❍	❍	❍
22. Teachers get copy of technology use handbooks at the beginning of registration.	❍	❍	❍	❍	❍
23. My school works with the district to filter inappropriate websites to ensure appropriate use of technology.	❍	❍	❍	❍	❍
24. School helps teachers access useful websites that are blocked by the filters.	❍	❍	❍	❍	❍

APPENDIX E – Participation Invitation Letter for Teachers

Dear K-12 teachers,

My name is Lin Zhong and I am a doctoral candidate in the Curriculum, Instruction, and Special Education Department of The University of Southern Mississippi. I am conducting a research study as part of the requirements of my Ph.D. degree in Instructional Technology and Design. I would like to invite you to participate my study. Your work would be highly appreciated.

I am studying how schools principals use technology to improve communication and collaboration at K-12 schools in Mississippi to promote successful CCRS (Common Core State Standards) implementation. If you decide to participate in study, you will be asked to complete a survey about school's support of communication and collaboration for CCRS implementation. This survey needs less than 20 minutes to complete and will be included with this invitation letter and sent to you in the form of email.

If you do not feel comfortable answering some of the question, you can stop anywhere and anytime you want to. Although you will not directly benefit from participating in this study, others in our community in general will benefit by making further study or decisions based on the results of this study.

Participation is confidential. Results of the study may be published or presented at professional journals and conferences. But all sensitive information such as school names, school locations, and ages will be substituted with pseudonyms in the study. All digital and physical data will be locked at my office at The University of Southern Mississippi. Only I can access the information produced in the process. I will monitor the whole process and I can be reached at bessiezhonglin@gmail.com and 601-434-6309. If you have questions about your research participant rights, you can contact the Chair of the Institutional Review Board at The University of Southern Mississippi at (601) 266-6820.

Thank you for your consideration. If you decide to participate, please open the survey link at the end of this letter and begin to complete the survey. Please sign the consent form attached in the email and return it to me by email.

With kind regards,

Lin Zhong
Department of Curriculum, Instruction, and Special Education
The University of Southern Mississippi
118 College Drive #5147,
Hattiesburg, MS, 39406

APPENDIX F – IRB Approval Letter for Qualitative Stage

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 15050607
PROJECT TITLE: The effectiveness of digital leadership at K-12 schools in Mississippi regarding communication and collaboration during CCRS (CCSS) implementation
PROJECT TYPE: New Project
RESEARCHER(S): Lin Zhong
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Curriculum, Instruction and Special Education
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 05/11/2015 to 05/10/2016
Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX G – Research Approvals from School Districts

FOREST MUNICIPAL SCHOOL DISTRICT
♦ 325 Cleveland Street ♦ Forest, Mississippi 39074 ♦
♦ Office: (601) 469-3250 ♦ FAX: 601-469-3101 ♦

Dr. Joseph White
Superintendent

October 7, 2015

To Whom It May Concern:

RE: Permission for Lin Zhong to conduct Research Study

Ms. Lin Zhong, a doctoral candidate attending The University of Southern Mississippi has my permission to conduct her research study with the assistance of personnel within the Forest Municipal School District. Ms. Zhong may contact the principals to make any necessary arrangements for teachers to voluntarily participate in her study.

The principal's names and school telephone number are as follows:

- Mrs. Kim Shoemaker, Principal – 601-469-3255
- Mr. Harry Bates, Middle School Principal – 601-469-1474
- Mrs. Stacy Crosby, Elementary School Principal – 601-469-3073

If I can be of further assistance, please feel free to contact my office.

Respectfully,

Joseph White

Joseph White, Ph.D.

Cc: Mrs. Kim Shoemaker; Mr. Harry Bates; Mrs. Stacy Crosby

LCS
LEE COUNTY SCHOOLS
Jimmy Weeks, Superintendent

Lin Zhong
Graduate Assistant
Department of CISE
The University of Southern Mississippi
110 College Drive #5057
Hattiesburg, MS 39406

Lin.zhong@eagles.usm.edu

Dear Ms. Zhong,

Your request for permission to survey some local teachers for your doctoral dissertation research topic, "The effectiveness of digital leadership at K-12 schools in Mississippi regarding Common Core implementation" is approved as submitted.

We appreciate the opportunity to work with you and trust that this will be mutually benefical endeavor.

Sincerely,

Jimmy Weeks
Superintendent
Lee County Schools
Email: jimmy.weeks@leecountyschools.us

1280 College View Drive, Tupelo, Mississippi 38804 • P.O. Box 832, Tupelo, Mississippi 38802-0832
(662) 841-9144 • Fax (662) 680-6012

Rankin County School District

Unleashing the Possibilities

Dr. Lynn Weathersby

Superintendent of Education

POST OFFICE BOX 1359
BRANDON, MS 39043
601-825-5590
FAX 601-825-2618
www.rcsd.ms

Brandon
Rouse Elementary (K-1)
StoneBridge Elementary (2-3)
Brandon Elementary (4-5)
Brandon Middle (6-8)
Brandon High (9-12)
RCSD Learning Center (K-12)

Florence
Steen's Creek Elementary (K-2)
Florence Elementary (3-5)
Florence Middle (6-8)
Florence High (9-12)

McLaurin
McLaurin Elementary (K-6)
McLaurin High (7-12)

Northwest Rankin
Flowood Elementary (K-5)
Highland Bluff Elementary (K-5)
Northshore Elementary (K-5)
Northwest Rankin Elementary (K-5)
Oakdale Elementary (K-5)
Northwest Rankin Middle (6-8)
Northwest Rankin High (9-12)

Pelahatchie
Pelahatchie Elementary (K-6)
Pelahatchie High (7-12)

Pisgah
Pisgah Elementary (K-6)
Pisgah High (7-12)

Puckett
Puckett Attendance Center (K-12)

Richland
Richland Elementary (K-2)
Richland Upper Elementary (3-6)
Richland High (7-12)

October 8, 2015

Lin Zhong
118 College Drive #5147
Hattiesburg, MS 39406

Dear Ms Zhong,

The Rankin County School District will participate in your research study regarding the College and Career Ready Standards.

The district is aware that you will work in full compliance with the guidelines of research as proposed by the Institutional Research Board at The University of Southern Mississippi, and that you will respect and follow the rules and procedures of our school district.

Our district is aware that you will survey teachers within the Rankin County School District. We understand that their participation is voluntary and their identification will remain anonymous throughout the process.

Sincerely,

Lynn Weathersby, Ph.D.
Superintendent
Rankin County School District

LAUREL
SCHOOL DISTRICT
Learning for Life

POST OFFICE BOX 288
LAUREL, MS 39441
PHONE: (601) 649-6391
FAX: (601) 649-6398

October 19, 2015

Dear Lin Zhong,

Ms. Lin Zhong has my permission to conduct a survey with certified personnel of Laurel School District. I understand that Ms. Zhong is a doctoral candidate in Instructional Technology and Design program in the department of Curriculum, Instruction, and Special Education at The University of Southern Mississippi and this is part of her dissertation study.

I understand that Ms. Zhong's study is to investigate the effectiveness of digital leadership in supporting teachers' communication and collaboration at K-12 schools in Mississippi regarding College-and Career Ready Standards implementation.

Your request for permission to survey teachers of the Laurel School District is approved.

Sincerely,

Chuck Benigno Ph.D.

Superintendent

Greenville Public School District
Office of Curriculum & Instruction
556 Bowman Boulevard, Greenville,MS 38701
Office: 662.334.8601 Cellular: 662.820.8605
Mrs. Eddie Mae Springfield, Director
espringfield@gville.k12.ms.us

"Building a Legacy of Excellence, One Student at a Time"

October 7, 2015

Lin Zhong
The University Of Southern Mississippi
Institutional Review Board
118 College Drive #5147
Hattiesburg, MS 39406-0001

Lin Zhong:

Greenville Public School District is pleased to offer you the support and approval to conduct the study regarding College-and Career Ready Standards Implementation at K-12 schools.

You may reach me at espringfield@gville.k12.ms.us or at 662-334-8601 if you require more information. Thank you once again for your support with Greenville Public School teachers.

Yours truly,

Eddie Mae Springfield, Director

CC: Dr. Leeson Taylor, Superintendent

APPENDIX H – IRB Approval Letter for Quantitative Stage

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 15093006
PROJECT TITLE: The Effectiveness of Digital Leadership at K-12 Schools in Mississippi Regarding Communication and Collaboration During Common Core State Standards Implementation
PROJECT TYPE: New Project
RESEARCHER(S): Lin Zhong
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Curriculum, Instruction and Special Education
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 11/11/2015 to 11/10/2016
Lawrence A. Hosman, Ph.D.
Institutional Review Board

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