A CASE STUDY OF HIGH SCHOOL ADMINISTRATORS' SELF-PERCEIVED READINESS TO BE DIGITAL INSTRUCTIONAL LEADERS

by

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ABSTRACT

The purpose of this study was to determine the readiness of an administrative team (N = 7) to provide digital instructional leadership, in the context of one high school, as well as examine possible outcomes related to student achievement, as measured by Florida Standards Assessment English Language Arts scale scores (FSA, 2018). This instrumental case study design (Fraenkel, Wallen, & Hyun, 2015) incorporated mixed-methods data collection and qualitative analysis.

Data were collected from three distinct sources for triangulation: qualitative semi-structured interviews, Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) knowledge and confidence construct participant item selections, and Grade 9 and Grade 10 Florida Standards Assessment (FSA) English Language Arts 2018 student scale scores (FSA, 2018). Administrator perceptions of teachers' integration of technology in instruction were examined via constructs of (a) characteristics of learning and (b) levels of technology integration contained within the Technology Integration Matrix [TIM©] (FCIT, 2018) framework. Findings support administrators' ability to recognize emergent levels of teachers' integration of technology in instruction. Findings also inform professional learning experiences for administrators supporting teachers in one-to-one digital school environments.

Implications for practice include a need for sustained ongoing professional learning for administrators on the selected technology integration framework. School district administrators may seek to ensure that the selected technology integration framework, the TIM© (FCIT, 2018) in this instrumental case study (Fraenkel et al., 2015), is presented as a sustained shared vision (Richardson & Sterrett) for both instructional and administrative personnel within the organization. Recommendations for future research include collecting similar data from multiple schools within a school district and from numerous school districts. Replication of this study is

suggested in various regions of the United States. Also, a longitudinal follow-up study is suggested to examine change in administrator digital instructional leadership over time.

This dissertation is dedicated to Jackson. He is a dearly missed friend.

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CHAPTER 1
INTRODUCTION

Background of the Study

As laptop computers and other electronic devices became more prevalent as learning tools in classrooms, schools, and school districts across the globe, various studies and lines of research were formed to both inform new instructional practices as well as evaluate them (Penuel, 2006). This integration of technology in education has spawned initiatives in which schools and school districts provide a device for each teacher and student, known as one-to-one programs, and new lines of research have emerged to study such implementations. Improving implementation models and informing future professional learning for classroom teachers were themes addressed in findings and suggestions for follow-up research (Lei & Zhao, 2008; Penuel, 2006; Warschauer, Zheng, Niiyam, Cotten, & Farkas, 2016).

With technology use increasing by teachers and students in the classroom, lines of research have expanded to explore teacher readiness for the integration of technology in classroom instruction (Rebora, 2016). However, studies on how teachers are supported by administrators were rather sparse (Shepherd, 2017); this gap has been identified as digital instructional leadership (Anderson & Dexter, 2005; Dexter, 2011; Shepherd, 2017). Further gaps in the knowledge bases exist linking one-to-one initiatives, digital instructional leadership, and student achievement, as measured by standardized assessments (Lei & Zhao, 2008; Leger & Freiman, 2017; Penuel, 2006; Warschauer, Zheng, Niiyam, Cotten, & Farkas, 2016). Specifically, for secondary settings, reports of studies addressing digital implementation outcomes such as student achievement data, content-specific assessments, teacher given grades, and student grade point averages (GPA), are lacking in the literature (Penuel, 2006; Rosen & Beck-Hill, 2012).

Digital instructional leadership warrants investigation due to the movement to leverage technology to support teacher growth in digital integration in instruction and ultimately student achievement (Machado & Chung, 2015). Furthermore, the efforts to infuse technology in instruction represent resource allocations of human and financial capital (Bebell & Kay, 2010). Research bases informing technology use in classrooms have grown considerably (Rebora, 2016).

In Florida, state statute mandated that at least 50% of instruction was to be delivered digitally by the 2015-2016 school year (FLA. STAT. § 314.14(3), 2016). To comply with this statute, many school districts in Florida implemented their own one-to-one initiatives. The school district where the subject of the instrumental case study (Fraenkel et al., 2015) was located, a large urban school district in central Florida, adapted to Florida statute by implementing a one-to-one initiative in staggered stages. Infrastructure planning and enhancement and pilot programs for device selection were conducted. Once pilot programs were completed, implementation of the school district's one-to-one initiative was achieved through the onboarding of selected cohorts; the implementation from one cohort to the next allowed for lessons learned to inform and improve upon the original initiative. (A. Kibbey, personal communication, June 15, 2018).

In 2017, Shepherd conducted dissertation research to address the gap in the literature informing high school administrator readiness to lead in a digital environment (Shepherd, 2017). Shepherd (2017) focused on high school administrators in a large urban school district in central

Florida. Shepherd's research led to the development of the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) which was used to measure high school administrator knowledge and confidence to lead in a digital environment; Shepherd defined this construct as readiness. Shepherd's (2017) research on high school administrator readiness, and construction and use of the DILRI© (Taylor & Shepherd, 2016), addressed digital instructional leadership or the capacity and ability to lead teachers in a digital environment. This study is a follow-up to Shepherd's (2017) research expanding on administrator readiness to lead in a one-to-one environment. Furthermore, this study seeks to explore the digital instructional leadership of an administrative team as well as examine change in administrator readiness over time.

Context of the Study

The high school of study resided within a large urban school district in central Florida that procured and distributed digital devices, laptop computers, to each student and teacher in grades six through 12. During the 2014-2015 school year, all high schools, operating within the boundaries of the selected school district, implemented the school district Digital Classroom Plan. This Digital Classroom Plan addressed one-to-on device implementation rates and goals, professional learning plans, assessment plans, and teacher and student support systems. What was not addressed was administrator digital instructional leadership.

One high school, within the large urban school district that provided the context for a study by Shepherd (2017), where all secondary students were provided a one-to-one digital device, provided the context of this instrumental case study (Fraenkel et al., 2015). This instrumental case study (Fraenkel et al., 2015) sought to build upon the existing knowledge bases of administrator readiness to lead in a digital environment (Shepherd, 2017) and digital instructional leadership. This investigation was accomplished by examining how administrators perceived teachers' technology integration in classroom instruction and what student achievement outcomes, if any, existed from possible relationships between digital instructional leadership and teachers' technology integration in instruction.

Problem Statement

The problem addressed in this study is the lack of research on readiness, knowledge and confidence, of one high school's administrative team, to lead in a large urban high school in a digital one-to-one classroom environment (digital instructional leadership) and possible effects on student achievement. The school district's Digital Classroom Plan did not address the readiness of administrators to provide digital instructional leadership in one-to-one environments.

Purpose of the Study

In 2017, Shepard examined the readiness of one large urban school district's administrators (n = 125) to lead in a digital environment. As a follow-up to Shepherd (2017), the purpose of this study was to determine the readiness of an administrative team to provide digital instructional leadership, in the context of one high school, as well as examine possible outcomes related to student achievement, as measured by 2018 Florida Standards Assessment English Language Arts scale scores (FSA, 2018).

Significance of the Study

The present study was conducted to build on previous work on administrator readiness to lead in a digital school environment (Shepherd, 2017). Specifically, this study sought to examine changes over time in administrator self-perceived readiness to lead in a digital environment. Possible relationships between administrator knowledge of teachers' technology integration in classroom instruction, (i.e., digital instructional leadership) and student achievement were examined. Findings of this instrumental case study (Fraenkel et al., 2015) could assist high school administrators and school district leaders in providing individualized professional learning to enhance the knowledge and behaviors necessary to improve student learning outcomes through feedback to teachers (Hattie, 2009).

Definition of Terms

To provide context and clarity of the various components of this study, pertinent terms were intentionally selected and defined. Terms listed and defined were commonly used in the three distinct lines of research that this study followed: (a) instructional leadership, (b) digital instructional leadership, and (c) teachers' technology integration and student achievement. Following are definitions for key terms pertaining to the research conducted in this study.

Applications – Software programs.

Instrumental Case study – An individual or single group studied extensively and varied data are collected to formulate interpretations and gain insight into specific phenomenon (Frankel, Wallen, & Hyun, 2015).

Digital Platform – A digital space that "enables the teacher to plan and conduct a lesson and receive formative and summative assessment reports during and after the lessons" (Rosen and Beck-Hill, 2012, p. 229).

Digital school environment – "A technology infused classroom which is fully supported by the strategic use of information and communication technology whereby students learn and can interact with their instructors and other peers" (Shepherd, 2017, p. 4).

Florida Standards Assessment – An annual assessment administered to measure student learning (FSA, 2018).

Digital Instructional Leadership – Knowledge of instructional leadership infused with the application of pedagogy of use and infusion of digital technologies in the classroom environment.

One-to-one – Schools that operate in a digital environment where each student is assigned their own tablet or laptop computer to use for instructional purposes (Penuel, 2006).

Information and Communication Technology (ICT) – device hardware and software that can be used to access the internet, access information, and can be used to communicate via chat, audio, video, and social media mediums (Comi, Argentin, Gui, Origo, & Pagani, 2017).

Instructional Leadership – District level and school administrators who focus on creating a disruption-free learning environment, implement and support a system of clear teaching objectives, and possess high expectations for teachers and students (Hattie, 2009).

Readiness – "A coordinated balance of both knowledge and confidence" (Shepherd, 2017, p. 4).

Technology Integration Matrix [TIM©] – A guide for examining, discussing, and observing the interaction between the learning environment and teachers' integration of technology in instruction (FCIT, 2018).

Technology Integration in Instruction – The extent that technology, such as laptops in one-to-one initiatives, is used in instruction.

Research Questions

Three research questions were crafted to understand how administrators perceived teachers' technology integration in classroom instruction and its possible relationship to student achievement. Research Question 1 addressed how high school administrators determined the extent that technology has been infused in instruction. Possible relationships between changes in student achievement and digital instructional leadership were explored in Research Question 2.

Research Question 3 sought to examine how administrator readiness to lead in a digital environment had possibly changed over time.

1. How do high school administrators perceive the extent of technology integration in teacher instruction?
2. What relationship, if any, exists between the extent of administrators' perception of teachers' technology integration in instruction, and student scale scores on the 2018 Florida State Assessment in English Language Arts (FSA ELA)?
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

Conceptual Framework

This study focused on the digital instructional leadership of high school administrators and was a follow-up to Shepherd's (2017) doctoral research on administrator readiness to lead in a digital environment. Along with readiness, the researcher sought to examine administrative instructional leadership and knowledge of teachers' integration of technology in instruction (digital instructional leadership). Finally, the researcher sought to examine possible relationships between knowledge of teachers' integration of technology in instruction, a component of digital instructional leadership, to student achievement.

This conceptual framework is organized into three sections. In the first section, literature on instructional leadership is examined. Digital instructional leadership of administrators is discussed in the second section. The third section contains reports of research on teachers' technology integration in instruction and student achievement.

Instructional Leadership

Instructional leadership has been defined as "the integration of the tasks of direct assistance to teachers, group development, staff development, curriculum development, and action research" (Blase & Blase, 2000, p. 130) and as "administrators who focus on creating a disruption-free learning environment, implement and support a system of clear teaching objectives, and possess high expectations for teachers and students" (Hattie, 2009, p. 83).

This section of the conceptual framework focuses on components of instructional leadership. More specifically, instructional leadership in the secondary setting, grades 6 to grade 12, are discussed. Bendikson, Robinson, and Hattie (2012) posited that instructional leadership consists of two different skill sets: indirect instructional leadership and direct instructional leadership.

Indirect Instructional Leadership

Indirect instructional leadership "creates the conditions for good teaching and teacher learning by ensuring that school policies, routines, resourcing and other management decisions support and require high-quality learning, teaching and teacher learning" (Bendikson et al., 2012, p. 4). Simply put, indirect instructional leadership pertains to setting the environment that is optimal for teaching and learning to occur. Such environmental factors have been traditionally referred to as the management behaviors of administrators (Bendikson et al., 2012). Bendikson et al. (2012) considered management behaviors to include activities such as setting behavioral and cultural norms and routines, maintaining the facilities of the school, setting and allocating budgets, setting goals, vision and mission setting, and ensuring a safe and orderly environment. Though not directly associated with instructional delivery, indirect instructional leadership is comprised of various components that make learning possible (Bendikson et al., 2012).

Direct Instructional Leadership

If indirect instructional leadership focuses on the environment in schools, direct instructional leadership is "focused on the quality of teacher practice, including the quality of the curriculum, teaching and assessment, and the quality of teacher inquiry and teacher learning (Bendikson et al., 2012, p. 4). Direct instructional leadership focuses on the student and variables positively impacting student achievement (Hattie, 2015). More specifically, direct instructional leaders focus on "the teachers' and school's impact on learning, instructional issues, conducting classroom observations, ensuring professional learning that enhances student learning, communicating high academic standards, and ensuring that all school environments are conducive to learning (Hattie, 2015, p. 37).

Digital Instructional Leadership

Building on the research of instructional leadership, digital instructional leadership is a construct blending the traditional notion of instructional leadership of administrators (Bendikson et al., 2012; Blase & Blase, 2000; Fox, Gong, & Attoh, 2015; Orphanos & Orr, 2014) and findings from studies of one-to-one initiatives (i.e., studies on teachers' integration of technology in instruction). Findings have been organized based on having indirect impact on digital instructional leadership and having direct impact on digital instructional leadership. These two constructs form what was considered digital instructional leadership, for the purposes of this study.

Indirect Digital Instructional Leadership

Through examination of literature on indirect digital instructional leadership, three specific themes emerged. School district level and administrators set environmental factors via (a) device selection, (b) software selection, and (c) infrastructure capacity. Warschauer, Zheng, Niiyam, Cotten, and Farkas (2014) conducted a study to examine the implementation of three different one-to-one initiatives in Colorado, California, and Alabama. Warschauer et al. (2014) found that administrator planning and selection of the device, that would be integrated into instruction, impacted the success of the respective initiatives. Software selection also was perceived to impact the success of teachers' integration of technology into instruction (Lei & Zhao, 2008). Lei and Zhao (2008) stated that, "One criticism of sizable expenditures for computers in schools is that computers are often oversold but underused" (p. 105). Furthermore, Warschauer et al. (2014), found that infrastructure variables could limit the teachers' integration of technology in instruction. For instance, limited wireless and bandwidth capabilities could negatively impact teacher and student use of technology (Warschauer et al., 2014).

Direct Digital Instructional Leadership

Direct digital instructional leadership is a construct comprised of administrator practices and behaviors that previous researchers have found to be necessary for teachers' integration of technology in instruction to occur (Dexter, 2008; Garcia Garza, 2015; Machado & Chung, 2015). Just as direct instructional leadership was found to focus on improving curriculum and instruction and improving and building capacity in teachers, direct digital instructional leadership seeks to do the same but considers digital technologies, devices, and matched pedagogical approaches. The need for administrators to be able to demonstrate direct digital instructional leadership is encapsulated in what Machado and Chung found, in their 2015 study: "Any tool is fruitless without proper integration" (p. 43) and "Many teachers do not have the technological fluency to accomplish the goals of the new national standards (p. 43). These findings may be addressed by improving and building technological capacity in teachers.

Teachers' Technology Integration in Instruction and Student Achievement

Penuel's 2006 research synthesis, on the implementation and effects of one-to-one computing initiatives, provided key insight into the state of research on schools and school districts integration of technology into instruction through one-to-one initiatives. Of the literature examined by Leger and Freiman (2017), Lei and Zhao (2008), Penuel (2006), and Warschauer et al. (2014) that attempted to link teachers' technology integration in instruction to student achievement, none presented outcomes measured by student achievement on standardized assessments. The designs of these studies commonly included surveys, focus group interviews, semi-structured interviews, implementation aligned pretest-posttest performance assessments in computer literacy skills and digital writing skills, student grades, and student grade point averages.

Kennedy, Rhodes, and Leu, in their 2016 article, *Online Research and Learning in Science: A One-to-One Laptop Comparison in two States using Performance Based Assessments*, discussed design limitations by stating that "…few quantitative studies have used direct measures of online learning to evaluate the effects of laptop use" (p. 144). Kennedy et al. (2016) also found that "a few studies report more direct measures of offline learning using scores on state assessments, conducted with paper and pencil. These show generally mixed results" (p. 144). These findings support design issues that address limitations in studies attempting to measure the effectiveness of teachers' integration of technology into instruction.

Though Kennedy et al.'s 2016 study addressed a relationship between one-to-one initiatives and student achievement, findings supported a modest negative relationship. This negative relationship between student achievement and a one-to-one initiative was based solely on researcher-designed, measured literacy skills. Kennedy et al. (2016) did not attempt to measure teacher's integration of technology's effects on student achievement, as measured by standardized assessment scores.

Of the seven studies analyzed for teachers' integration of technology in instruction and its effects on student achievement, only one measured the effects that a one-to-one initiative had on student achievement, as measured by standardized assessment scores (Rosen & Beck-Hill, 2012). Rosen and Beck-Hill (2012) found that grade 4 and grade 5 students, assigned to experimental groups in a one-to-one initiative, scored significantly higher on posttest standardized reading and mathematics assessments, $t(179) = 2.7, p < .001$, $t(183) = 3.5, p < .001$, $t(219) = 2.1, p < .05$ and, $t(243) = 2.2, p < .005$ respectively, than that of the other two respective control groups. To achieve this, Rosen and Beck-Hill (2012) set out to control as many variables as possible including the curriculum, the digital platform the one-to-one devices used, the pedagogy, and the technical support protocol. A need exists for studies that demonstrate adequate design and that measure effects of teachers' integration of technology in instruction on student achievement, as measured by standardized test scores, as an outcome.

Methodology

The design that was selected to best address the three research questions was an instrumental case study (Fraenkel et al., 2015). According to Fraenkel et al. (2015), instrumental case study designs allow for individuals or groups to be studied extensively where data can be collected from varied sources to formulate interpretation. Interpretation of analysis could lead to better understanding of a specific phenomenon. Interpretation can then be applied to the specific case or context. The phenomenon that was examined, in this instrumental case study (Fraenkel et al., 2015), was digital instructional leadership. Data were collected from three distinct sources for triangulation: qualitative semi-structured interviews (Fraenkel et al., 2015) guided by concepts contained in the Technology Integration Matrix [TIM©] (FCIT, 2018), Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016), knowledge and confidence construct participant item selections, and grade 9 and grade 10 Florida Standards Assessment [FSA] English Language Arts 2018 student scale scores (FSA, 2018).

Research Question 1

How do high school administrators perceive the extent of technology integration in teacher instruction?

Administrators were asked, in semi-structured interviews, to supply both perceptions of technology integration and average observed technology integration levels, via the Technology Integration Matrix [TIM©] (FCIT, 2018) framework, for instruction observed in grade 9 and grade 10 English and reading departments. Categories and subcategories were teased from interview data using grounded theory methods (Glaser & Strauss, 2008). Categories were considered salient if mentioned by, at least, two of seven unique administrators across all five TIM© (FCIT, 2018) framework levels. Administrator provided observed lessons were scored using a rubric based upon the TIM© (FCIT, 2018). Alignment between administrator perceptions and TIM© (FCIT, 2018) framework descriptions was scored via researcher-created rubric (Appendix B); scores attributed were 0, 3, or 5.

Research Question 2

What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA, 2018)?

Possible relationships, if any, between administrators' assigned perceived teachers' technology integration rubric scores, based on the Technology Integration Matrix [TIM©] (FCIT, 2018), and grade 9 and grade 10 student scale scores on the 2018 Florida Standards English Language Arts assessment (FSA, 2018) were examined. TIM© (FCIT, 2018) placement data were collected in semi-structured interviews. De-identified grade 9 and grade 10 FSA scale scores were collected from the school of study after permission was granted from the school district's Testing, Research, and Accountability department.

Research Question 3

To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

The administrators recruited for this study were asked to participate in an administration of the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) via the online platform, Qualtrics. DILRI© knowledge and confidence construct item selections were compared to the knowledge and confidence construct item selections of similarly matched demographic profiles of administrators contained in archival data from Shepherd's 2017 study on administrator readiness to lead in a digital environment. These initial data and demographic profiles were collected from the first administration of the DILRI© (Taylor & Shepherd, 2016) in September of 2016. The 2016 demographic profiles were matched to those of the seven administrators recruited for this study using the following variables: (a) current role (principal or assistant principal), (b) length of time participant has served in role at current school, (c) length of time participant has been in an administrative position, and (d) length of time participant has been leading in a digital school. Though the administrators recruited for this study were not anonymous, confidentiality was assured by assigning alpha numeric codes such as AP1 and AP2 for data analysis and reporting purposes.

<u>Population and Sample</u>

The population of interest for this study was all administrators in the large urban central Florida school district. A purposive sampling of administrators, at one large urban high school, was selected. This selection was based on study design so that comparisons could be made between DILRI© (Taylor & Shepherd, 2016) knowledge and confidence construct item selections of similarly matched demographic profiles from September of 2016 archival data (Shepherd, 2017) to the knowledge and confidence construct item selections of the administrators recruited for this instrumental case study (Fraenkel et al., 2015). Purposive sampling is selected when there is “previous knowledge of a population and the specific purpose of research” (Fraenkel et al., p. 101). The purposive sample contained six assistant principals and one principal, a total of seven administrators were recruited for this instrumental case study (Fraenkel et al., 2015). Administrators were selected due to (a) the school of study being in its fourth year of one-to-one initiative implementation, (b) administrators were in their position between one to three years, and (c) administrators had a range from 1 to more than 10 years of experience leading in a one-to-one school.

Instrumentation

Technology Integration Matrix for Interviews

The Technology Integration Matrix [TIM©] (Florida Center for Instructional Technology, 2018) is a framework for assessing the extent to which technology is integrated into classroom instruction. The TIM© (FCIT, 2018) consists of five interdependent characteristics of a classroom environment: (a) active learning, (b) collaborative learning, (c) constructive learning, (d) authentic learning, and (e) goal-directed learning. Associated with these characteristics of a classroom environment are five levels of technology integration: (f) entry level, (g) adoption level, (h) adaptation level, (i) infusion level, and (j) transformation level. Together, the five characteristics and five levels create 25 unique levels of technology integration in instruction.

TIM© Scoring Rubric

The TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was constructed based on administrator understanding of the 25 unique levels of technology integration identified on the Technology Integration Matrix [TIM©] (FCIT, 2018) tool. Each of the levels were assigned a point value of 0, 3, or 5. Scores of 0 indicated that the administrator had little to no understanding of a specific TIM© (FCIT, 2018) unique level. If partial understanding of a unique TIM© (FCIT, 2018) level was observed, a score of 3 was assigned. Scores of 5 supported the administrator demonstrating a complete understanding how technology integration should occur at the respective TIM© (FCIT, 2018) level.

The TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was constructed via consultation of two separate panels of doctoral candidates and university faculty. Recommendations were received from the first panel and applied to the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018). The second panel then provided their examination and recommendations. The TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was updated again based on recommendations from the second panel.

TIM© Qualitative Interview Protocol

Semi-structured interview questions were created based on the Technology Integration Matrix's [TIM's©] (FCIT, 2018) five characteristics of the learning environment and five levels of teachers' technology integration. The first five items examined the administrators' knowledge of digital instructional leadership. Item six determined if the administrators supported the English Language Arts and/or reading departments for data analysis purposes.

The last seven items only applied to administrators who supported the English Language Arts and/or reading departments at grade 9 and grade 10 levels. These items elicited perceived mean department and grade level instructional levels on the TIM© (FCIT, 2018). The TIM© (FCIT, 2018), which was presented to each administrator in semi-structured interviews, is presented in Appendix A; the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) is in Appendix B; and the TIM Qualitative Interview Protocol© is in Appendix C.

To strengthen alignment between Research Question 1 and data collected, Items 17 and 18 were added to the TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018) after initial interviews. Items 17 and 18 elicited average administrator TIM© (FCIT, 2018) level ratings for the teachers' integration of technology in instruction for departments supervised; each administrator supplied a TIM© (FCIT, 2018) level rating and an example of observed instruction that supported such a rating. Participant AP7 was not provided Items 17 and 18 because the previous interview led to the collection of associated data.

Semi-structured interview items were created based on the construct of knowledge of digital instructional leadership. The construct of digital instructional leadership has been defined as administrator knowledge of teachers' integration of technology in instruction, as supported by concepts contained within the Technology Integration Matrix [TIM©] (FCIT, 2018). After construction of semi-structured interview items, based on TIM© (FCIT, 2018) levels, items were examined for construct validity via two examinations of item relevancy, clarity, and conciseness; two separate panels of doctoral candidates and university faculty conducted the examinations. Recommendations were received from the first panel and applied to the survey items. The second panel then provided their examination and recommendations. The survey items were updated again based on recommendations from the second panel.

Determining change, if any, in student achievement was measured through collection of grade 9 and grade 10 student Florida Standards Assessment (FSA) English Language Arts scale scores (FSA, 2018). Students' scale scores from the 2017-2018 school year were collected. Reliability and validity measures for FSA scores have been supported and outlined in the 2016-2017 FSA Technical Report (Florida Department of Education, 2017).

Digital Instructional Leadership Readiness Instrument [DILRI©]

The instrument that was used to measure the perceived readiness, knowledge and confidence, of administrators to lead in a digital school environment was the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016). The DILRI© (Taylor & Shepherd, 2016) was created via consultation between the Executive Director for Curriculum, Instruction, and Digital Learning in a large urban central Florida school district, Taylor, and Shepherd. Content validity of the 62-item DILRI© (Taylor & Shepherd, 2016) was conducted through two examinations of item relevancy, clarity, and conciseness; two separate panels of doctoral candidates and university faculty conducted the examinations. Recommendations were received from the first panel and applied to the DILRI© (Taylor & Shepherd, 2016). The second panel then provided their examination and recommendations. The DILRI© (Taylor & Shepherd, 2016) was updated again based on recommendations from the second panel. Finally, the Executive Director for Curriculum, Instruction, and Digital Learning in a large urban school district examined the DILRI© (Taylor & Shepherd, 2016) and provided recommendations; those recommendations were incorporated in the DILRI© (Taylor & Shepherd, 2016). The DILRI© (Taylor & Shepherd, 2016) is presented in Appendix D.

The DILRI© (Taylor & Shepherd, 2016) is comprised of six sections: (a) factors of knowledge and confidence, (b) rank order of knowledge and confidence factors, (c) confidence in recognizing effective technology use, (d) influential school cultural factors, (e) confidence in providing feedback, (f) participant demographics, and (g) other information (Shepherd, 2017). The DILRI© (Taylor & Shepherd, 2016) has been used to assess administrator readiness to lead in a digital school environment.

Administration of the DILRI© was conducted online via Qualtrics. All seven administrators were sent separate email invitations containing the informed consent (Appendix E) with clear and concise instructions on how to navigate the DILRI© (Taylor & Shepherd, 2016) Also contained within the e-mail and informed consent was the researcher's contact information.

Procedures

DILRI©

After approval by the University of Central Florida's Institutional Review Board (Appendix F), the cooperating principal's written approval, and the school district's approval to conduct research were received (Appendix G) the investigation was initiated. In August of 2018, seven high school administrators, located at one large urban high school, were invited to participate in an administration of the DILRI© (Taylor & Shepherd, 2016). The request was sent via-e-mail with a hyperlink to a Qualtrics version of the DILRI© (Taylor & Shepherd, 2016). Located directly above the hyperlink was a sentence, "By clicking on the link provided below you give your informed consent."

After clicking on the hyperlink provided, the administrators were redirected to a Qualtrics website where the DILRI© (Taylor & Shepherd, 2016) was administered. The first item presented to the seven administrators was "I have read the informed consent and agree to participate in this survey." Administrators could either select yes or no. If any administrator selected no, the DILRI© (Taylor & Shepherd, 2016) automatically ended and the website closed. Conversely, if an administrator selected yes, the DILRI© (Taylor & Shepherd, 2016) automatically opened.

Access to take the DILRI© (Taylor & Shepherd, 2016) remained open for three weeks. The informed consent (Appendix E) notified administrators that participation in this study and survey was strictly voluntary; they could withdraw their consent at any time. Furthermore, administrators could choose to skip or not answer any of the items contained within the survey. To facilitate a high response rate, separate survey reminders were sent one week after the initial request was sent. This survey reminder was sent in an e-mail requesting a day and time for an interview. The semi-structured interviews were confidential. To maintain confidentiality and for the purposes of data analyses, alphanumeric codes AP1, AP2, AP3, AP4, AP5, AP6 AP7, and Principal were assigned to each participating administrator.

Seven de-identified similarly matched demographic profiles containing DILRI© (Taylor & Shepherd, 2016) construct item selections were requested from original archival data (Shepherd, 2017). The demographic profiles of the seven administrators who were recruited for this study were similarly matched to archival profiles on the following demographics: (a) current role (principal or assistant principal), (b) length of time participant has served in role at current school, (c) length of time participant has been in an administrative position, and (d) length of time participant has been leading in a digital school.

Semi-Structured Interviews

Separate e-mail invitations to participate in individual audio-recorded and transcribed verbatim interviews were individually sent to all seven administrators who worked at the site of study. The e-mail thanked each administrator for their time and participation and contained the Informed Consent (Appendix E). Directly below the Informed Consent, the e-mail reminded the administrator that "Participation in this audio-recorded interview is strictly voluntary, and the interview will be transcribed verbatim." administrators were reminded, "You may withdraw your consent at any time" at the end of the email.

If the administrators agreed to be interviewed, they were presented with options for dates and times. The e-mail stated that interviews would not exceed 20 minutes in length. If the administrator agreed to the Informed Consent (Appendix E) and to participate in the audio-recorded and transcribed verbatim interview, he or she would then reply to the e-mail with a selected date and time. Interviews were recorded, with administrator consent, on a digital audio recorder. Interviews were then transcribed verbatim. Once transcribed, the audio recordings were deleted from the digital audio recording device.

The researcher, of the study, had familiarity with both the selected school of study as well as many of the faculty and staff who worked at the site. To assure objectivity, the DILRI© (Taylor & Shepherd, 2016) was administered via Qualtrics, an online platform, and individual administrator interview items were presented with consistent language and procedures.

Request for Grade 9 and Grade 10 FSA ELA Scale Scores

Upon approval of this study, grade 9 and grade 10 2018 Florida Standards Assessment (FSA) (FSA, 2018) English Language Arts scale scores were requested from the school district's Research, Accountability, and Grants department. Scores were received after University of Central Florida Institutional Review Board, school district, and principal approval of the study.

Table 1

Research Questions and Data Sources

Research Questions	Data Source
1. How do high school administrators perceive the extent of technology integration in teacher instruction?	Semi-structured interview questions constructed with Technology Integration Matrix [TIM©] components
2. What relationship, if any, exists between the extent of perceived technology integration in instruction, in department and grade level organized teams, and student scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA)?	FSA English Language Arts scale scores for all grade 9 and grade 10 students
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?	DILRI© Archival Data from September, 2016 DILRI© Data August, 2018

<u>Data Analysis</u>

Research Question 1

How do high school administrators perceive the extent of technology integration in teacher instruction?

Research Question 1 was explored using qualitative grounded theory. Constant-comparative methods and analysis of selective coding recommended by researchers (Creswell, Clark, Gutman, & Hanson, 2003; Frankel et al., 2015; Glaser 1998; Glaser & Strauss, 2008) were employed.

Semi-structured interviews were audio recorded digitally. After de-identified audio recorded interviews were transcribed, the verbatim transcripts were coded using selective coding. Selective coding categories were determined based on the constructs of the Technology Integration Matrix [TIM©] (FCIT, 2018). Inter-coder agreement was conducted via consultation with two university faculty researchers who independently selectively coded the transcribed data. Both sets of coding were compared to researcher codes and adjustments were agreed upon. Once inter-coder agreement was reached, emerged categories, subcategories, and themes were agreed upon. Categories and subcategories were considered salient when mentioned by two or more unique administrators one time across all five TIM© (FCIT, 2018) levels. Categories, subcategories, and themes, supported by evidence from the analysis, are presented in Chapter 4.

Administrator responses for each item were analyzed to determine the degree of alignment, if any, between knowledge of teachers' integration of technology in instruction, as supported by the Technology Integration Matrix [TIM©] (FCIT, 2018), and the supplied description of instruction based on each item. Alignment for each item, which corresponded to each of the five levels of technology integration on the TIM© (FCIT, 2018), were rated as either a 0 (No Understanding), 3 (Emerging Understanding), or 5 (Full Understanding). Scores for each administrator ranged from 0 to 5 and were used to answer Research Question 1 regarding high school administrators' perceptions of the extent of technology integration in teacher instruction.

Research Question 2

What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts [FSA] (FSA, 2018)?

Rich qualitative description of the context of the instrumental case study (Fraenkel et al., 2015) and descriptive statistics were used to explore possible relationships, if any, between administrator digital instructional leadership and data collected to answer Research Question 2. Rich description of the context of the instrumental case study (Fraenkel et al., 2015) and descriptive statistics of TIM© (FCIT, 2018) level alignment and grade 9 and grade 10 student English Language Arts Florida Standards Assessment (FSA, 2018) scale scores were presented in what Fraenkel et al. (2015) termed as an instrumental case study. In instrumental case study design, data are collected and analyses conducted so that conclusions do not solely apply to one case (Fraenkel et al., 2015). Qualitative rich description and descriptive statistics were selected based on a limited sample size of seven ($N = 7$) administrators. Analyses are presented via rich description accompanied by tabular displays in Chapter 4.

Research Question 3

To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

Research Question 3 was explored through qualitative analysis. Qualitative description was conducted to determine if the previously collected archival DILRI© (Taylor & Shepherd, 2016) construct selections of knowledge and confidence had changed over time. To achieve this, the knowledge and confidence construct item selections, of seven administrators that were collected in September of 2016 (Shepherd, 2017), were demographically matched to the construct item selections of the seven participants recruited for this instrumental case study (Fraenkel et al., 2015). Once matched, participant item selections were compared and described. Grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008) were used to derive themes from participant open-ended responses. Themes were considered salient if they applied to two unique administrator responses (Corbin & Strauss, 1990, 2008). Description of data and interpretations are presented in Chapter 4.

Description of how the data collected relates to each of the three research questions is presented in Table 2. Research questions and selected data analysis methods are also shown.

Table 2

Research Questions and Data Analysis

Research Questions	Data Analysis
1. How do administrators perceive the extent of technology integration in teacher instruction?	Glaser and Strauss (2008) grounded theory method and selective coding were used to examine themes found within responses
2. What relationship, if any, exists between the extent of perceived technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA)?	Instrumental case study (Fraenkel et al., 2015) with qualitative description. Description of FSA ELA mean scale scores
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?	Qualitative description of similarly matched administrative survey profile data [DILRI©] Grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008)

Delimitations

Certain delimitations existed in this study. The research focused on an instrumental case study (Fraenkel et al., 2015) of the digital instructional leadership of seven administrators at one large urban high school in a large urban central Florida school district. There were no observations of administrator interactions or teacher instruction. Also, 2018 Florida Standards Assessment (FSA) English Language Arts scale scores (FSA, 2018) for grade 9 and grade 10 students were selected to measure student achievement; this selection was made based on a review of the literature and the feasibility of data collection (Penuel, 2006; Kennedy, Rhodes, & Leu 2016). Generalizability of findings was limited to similar contexts such as large urban high schools that have implemented one-to-one initiatives.

Limitations

Limitations existed within this instrumental case study (Fraenkel et al., 2015). Due to recruiting one school of study, and the recruitment of seven administrators at the school of study (*N* = 7), generalizability to other high schools within the same school district or other high schools within other large urban school districts was hindered (Fraenkel et al., 2015). Fraenkel Wallen, and Hyun (2015) state that larger sample sizes are observed to be more representative of their respective populations. The limited sample size of this study (*N* = 7) limits generalizability of findings to the population of high school administrators in one to one environments (Fraenkel et al., 2015). Because participation in this instrumental case study (Fraenkel et al., 2015) was voluntary, generalizability issues may have existed pertaining to administrator digital readiness to lead scores. Furthermore, each administrator exhibited varied experience with supporting teachers in one-to-one digital classroom environments. Finally, other school and school district programs and initiatives, implemented at the same time of this study, may have weakened the generalizability of the results.

Assumptions

The instrumental case study (Fraenkel et al., 2015) was constructed with the following assumptions: (a) the seven high school administrators were honest with their self-perceived ratings on the DILRI© (Taylor & Shepherd, 2016), (b), Technology Integration Matrix [TIM©] (FCIT, 2018) perceived instructional placement was based solely on protocols provided in semi-structured interviews and was not influenced by bias, and (c) data collected on student achievement reflected student achievement on the Florida Standards Assessment for English Language Arts for grade 9 and grade 10 students, respectively and accurately.

Organization of the Study

The report on this instrumental case study (Fraenkel et al., 2015) has been organized into five chapters. Chapter 1 provides a context for the follow-up study, the background of the study, statement of the problem, purpose of the study, significance of the study, definition of terms, conceptual framework, research questions, methodology, and procedures that were used. A review of literature and the conceptual framework is explored in detail in Chapter 2. In Chapter 3, the methodology and procedures that framed this instrumental case study (Fraenkel et al., 2015) are explained. Chapter 4 presents the data analyses and findings for the three research questions which guided this study. Finally, Chapter 5 provides a summary of the instrumental case study (Fraenkel et al., 2015), including discussion of findings and recommendations for follow-up studies and future research.

Summary

The researcher had three goals in conducting this research: to examine (a) how administrators perceived the integration of technology in instruction, (b) how administrator digital instructional leadership may have affected student achievement, and (c) how administrator readiness to lead in a digital environment may have changed over time. The research questions, which sequentially followed each other, set out to examine the impact that administrators may have had on instruction and outcomes measured by standardized assessments. Findings add to the knowledge base on how student achievement may be affected by the integration of technology in instruction.

CHAPTER 2
LITERATURE REVIEW

Introduction

This study was designed to examine possible relationships between digital instructional leadership, teachers' technology integration in instruction, and student achievement. Three research questions were created and refined to determine possible relationships between the integration of technology in instruction and student achievement. Research Question 1 addresses how high school administrators determine the extent that technology has been infused in instruction. Possible relationships, if any, between student achievement and digital instructional leadership are explored through Research Question 2. Research Question 3 sought to examine possible change in high school administrator readiness to lead in a digital environment over time.

1. How do high school administrators perceive the extent of technology integration in teacher instruction?
2. What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts [FSA] (FSA, 2018)?
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

A university library research specialist was utilized to assist in creating the conceptual framework used to frame this study. The following databases were used in the search for peer-reviewed journal articles that supported the conceptual framework: Web of Science, Education Full Text, ERIC – EBSCOhost, Science Direct, Spring Link, Sage Journals, ProQuest, Dissertation and Thesis Full Text, and PsycInfo. The following key words and phrases were used when searching for peer reviewed articles: digital instructional leadership, technology, principals, administrators, administration, academic achievement, leadership, instruction, computer assisted instruction, web-based instruction, academic achievement, and school administration. Additionally, information supporting concepts contained within the conceptual framework found in books and other respected journals have been cited and included in this review of literature.

The organization of Chapter 2 is based on the conceptual framework of this study. The first section examines literature pertinent to instructional leadership. Specifically, the instructional leadership of principals and assistant principals is explored. Research on digital instructional leadership, instructional leadership in schools with computer assisted instruction or schools that have a one-to-one student to computer ratio, are explored in section two. The focus of the final section pertains to possible relationships between the integration of technology in instruction and student achievement.

Instructional Leadership

Blase and Blase (2000) defined instructional leadership as "the integration of the tasks of direct assistance to teachers, group development, staff development, curriculum development, and action research" (p. 130). Hattie (2009) found that instructional leadership, of principals, contained three distinct components: (a) creating a learning environment free of disruption, (b) having a system of clear teaching objectives, and (c) having high expectations for teachers and students (p. 83). Implications from the review of literature grouped administrator actions and decisions within these components: (a) indirectly contributing to conducive instructional leadership through environmental factors (indirect instructional leadership) or (b) directly being observed to have an influence on instructional leadership, such as professional learning coordination (direct instructional leadership) (Kennedy, Rhoads, & Leu, 2016; Leger & Freiman; 2017; Lei & Zhao, 2008; Penuel, 2006; Peterson & Scharber, 2017; Rosen & Beck-Hill, 2012; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2015). The review of literature supported that both indirect instructional leadership and direct instructional leadership factors need be present to facilitate instructional change.

Indirect Instructional Leadership

Indirect instructional leadership of administrators was found to encompass a collection of various skillsets and decision-making processes that were observed to promote a conducive environment to instructional change (Blase & Blase, 2000; Fox, Gong, & Attoh, 2015). Examples of indirect instructional leadership include ensuring an orderly environment, resourcing strategically, and solving complex problems (Bendikson, Robinson, & Hattie, 2012). A primary component of indirect instructional leadership is forming a trusting relationship between administrator and the teacher. Fox et al. (2015) divided necessary "positive and trusting dyadic relationships between principal and teacher" (p. 6) into three factors: (a) the cultural milieu, (b) a call for effective leadership, and (c) the demand for a viable working relationship. Fox et al., (2015) found these three factors, when successfully addressed, facilitated what they termed authentic leadership. Authentic leadership was viewed as observed trust between administrators and the teachers they support (Fox et al., 2015). Fox et al. (2015) found authentic leadership positively impacted follower trust which was also found to be a necessary component of a school culture conductive to teacher learning, i.e., instructional leadership (Fox et al., 2015). Conversely, Pogodozinski (2015) stated, "negative administrator-teacher relations may discourage productive teacher-teacher relations, particularly for formalized relationships such as those seen in mentoring programs" (p. 54) which can be considered a component of direct instructional leadership via professional learning; professional learning is discussed further as it relates to direct instructional leadership.

Along with a focus on relationships, literature reviewed supported indirect instructional leadership to encompass environments that foster teacher learning and instructional change (Bendikson et al., 2012). Specific environmental factors were found to include: (d) setting behavioral and cultural norms and routines, (e) maintaining the facilities of the school, (f) setting and allocating budgets, (g) setting goals, (h) setting school vision and mission, and (i) ensuring a safe and orderly environment. Administrator behaviors and actions that focused on relationship building and maintenance (Blase & Blase, 2000; Fox et al., 2015) and various other environmental factors (Bendikson et al., 2012) were found to be necessary components of indirect instructional leadership for instructional change to occur. Each factor, when addressed by administrators, was reported to contribute to school cultures that fostered teacher learning and instructional change (Blase & Blase, 2000; Fox et al., 2015).

Direct Instructional Leadership

As indirect instructional leadership was found to prime the school environment for instructional change, direct instructional leadership researchers have examined the direct impact that administrators have on instructional change (Bendikson et al., 2012; Hattie, 2015; Pogodzinski, 2015). Direct instructional leadership focuses on teacher and student variables, influenced by administrators, that have been found to positively impact student achievement (Hattie, 2015). Administrator behaviors that were found to encompass components of direct instructional leadership were a (a) focus on teachers' and a schools' impact on learning, (b) conducting classroom observations, (c) setting professional learning systems, and (d) communicating high academic standards (Hattie, 2015). Focusing on teachers' and schools' impact on learning, at its core, occurs when administrators "believe their fundamental task is to evaluate the effect of everyone in their school on student learning" (Hattie, 2015, p. 38).

Hattie's (2015) research on direct instructional leadership supported classroom observations by administrators through feedback, allowing teachers to "welcome errors, share what they learned from their own errors, and create environments in which teachers and students can learn from errors without losing face (p. 38). Administrators establishing professional learning systems were found to understand that "leaders who learn in an environment that privileges high-impact teaching and learning" (Hattie, 2015, p. 38) and exhibited a high effect size of (d = 0.84) (Hattie, 2015). Finally, successful administrators were found to communicate high academic standards by setting "appropriate levels of challenge and who never retreat to just do your best" with an effect size of (d = 0.57) (Hattie, 2015, p. 38).

Pogodzinski (2015) examined administrative focus on teachers' impact on learning via professional learning practices through teacher mentoring. Teacher mentoring programs were viewed as a component of professional learning used to enact instructional change through the shaping of desired teacher behaviors (Pogodzinski, 2015). Through administrator mentor and mentee pairings, and assisting in the directing of mentor mentee interactions, support was found for such interactions affecting teacher attitudes and behavior, thus exhibiting evidence for direct instructional leadership via a form of professional learning.

Digital Instructional Leadership

Expanding on the notion of instructional leadership, digital instructional leadership is a construct that blends supported notions of effective administrator practices (Bendikson et al., 2012; Blasé & Blasé, 2000; Fox et al., 2015; Orphanos & Orr, 2014) in enacting instructional change but with an emphasis on the instructional change occurring in environments where each student receives instruction assisted with the use of a laptop (one-to-one environments). Similar to the previously discussed construct of instructional leadership, the review of literature on digital instructional leadership is presented in separate sections determined by administrator indirect and direct effects on digital instructional leadership.

Indirect Digital Instructional Leadership

In a longitudinal qualitative study on school district technology leadership (digital instructional leadership), Richardson and Sterrett (2018) presented implications from school district superintendents that supported one-to-one initiatives from 2001 to 2014. Findings were generalized from school district superintendents to administrators to further support and inform the current limited research base on technology leadership and digital instructional leadership at the school level. Fostering a shared vision was reported to be a necessary component for first and second order change to occur in a school district pertaining to digital one-to-one initiatives.

Fostering a Shared Vision

Fostering a shared vision (Dexter, 2008, 2011; Richardson & Sterrett, 2018) encompasses administrator advocacy and support for school district "vision for technology rollout in schools" and focus on "buy in from parents and the community about the vision for technology to enhance teaching and learning" (Richardson & Sterrett, 2018, p. 601). Necessity for administrator buy-in to a shared school district vision was further supported by Machado and Chung (2015), in their article focusing on the principal's role in integrating technology. Machado and Chung (2015) found that the integration of technology in instruction was perceived to be stymied "if principals do not place a value on technology in the classroom" (p. 43). Machado and Chung (2015) surveyed principals (n = 42) and reported that in order for the integration of technology in instruction to occur, principals first needed to create and communicate a clear technology vision.

Findings have been replicated internationally as reflected in Ibrahim, Razak, and Kenayathulla's 2013 *Smart Principals and Smart Schools.* Ibrahim et al. (2013) supported fostering a shared vision stating "the principals and the senior management play important roles in building a professional culture of teaching which is responsive to changes" (p. 828). Dexter (2008; 2011) found a shared vision to be a key starting point when implementing and supporting one-to-one initiatives.

Constant Improvement of Infrastructure

Constant improvement of infrastructure (Richardson & Sterrett, 2018) was found to be trait that school district leaders who were successful in school district technology leadership, shared as they supported technological and one-to-one initiatives. Various articles included in the review of literature were what Penuel (2006) coined to be implementation studies (Lei & Zhao, 2008; Tondeur, Braak, Ertmer, & Ottenbreit-Leftwich, 2016; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2016). Implementation studies documented the progress of one-to-one initiatives with the purpose of using the findings to inform future implementations. A common theme among findings were recommendations and suggestions for school and school district infrastructure. Specifically, implementation studies yielded implications for future one-to-one initiative implementation pertaining to (a) one-to-one device selection, (b) infrastructure capacity, and (c) software selection for respective content areas.

Richardson and Sterrett (2018), from a longitudinal qualitative study on school district technology leadership, found that successful school district administrators (n = 25) "focused on ensuring that funding would support and enhance existing technology initiatives" (p. 603). Through personal interviews and phenomenological analysis, Richardson and Sterrett (2018) presented findings for school district and administrators that can be considered relevant when supporting one-to-one initiatives. When generalized to administrator contexts, such a notion ensures that school infrastructure not only supports the selected one-to-one device but exhibits the capacity required by software applications and number of users (Warschauer et al., 2014). Warschauer et al., (2014) found that informed and strategic selection of one-to-one devices, coupled with infrastructure enhancement and maintenance, supported successful one-to-one initiatives.

In their 2014 study, Warschauer et al. examined three different one-to-one initiatives in Colorado, California, and Alabama. Both Colorado and California chose Asus Eee PC© devices due to perceived device familiarity. Alabama chose a lower cost Unix© based laptop device that was unfamiliar to both teachers and students. Warschauer et al., (2014) found that Alabama school personnel and students exhibited reluctance to incorporate the unfamiliar devices into instruction and out-of-school use due to their lack of familiarity and unease of use. Additionally, the one-to-one initiative study in Alabama was the only site of the three that did not allocate funds or implement an infrastructure plan to support the initiative. Findings supported that teachers, who may have embraced the Unix© based devices were not able to incorporate them into daily instruction due to infrastructure limitations and network access and reliability issues (Warschauer et al., 2014). Though the Unix© based devices were unfamiliar to both teachers and students, adoption may have been fostered with improved and consistently stable infrastructure (Warschauer et al., 2014). Ultimately, schools and school districts that did not research rationale for strategic device selection and invest in infrastructure upgrades and maintenance were not able to successfully maintain their one-to-one initiatives (Warschauer et al., 2014).

Expanding on what was found to enhance one-to-one device initiatives though device selection and infrastructure enhancement and maintenance, Lei and Zhao (2008) found that hardware selection and procurement should also be coupled with software (application) selection and use, respective to each content area. Specifically, Lei and Zhao's 2008 study supported the finding that "…what is more important than the quantity of technology use is the quality of technology use, or how technology is used and for what purposes" (p. 106). Lei and Zhao (2006) identified four matched software to instruction outcomes that support successful adoption of one-to-one initiative implementations: (a) laptop use for specific learning tasks with explicit learning goals, (b) laptop use for communication, such as email instant messaging, and online chatting, (c) laptop use for expression, such as writing and publishing, and (d) laptop use for exploration, such as working on multimedia products and playing computer games.

Leo and Zhao's 2008 study supported the finding that each of the four outcomes need be addressed and supported, through strategic software and instructional strategy selection, for teacher and student adoption of digital devices for daily use. Leo and Zhao's (2008) findings support purposeful pairing of device with instructional tools and/or software applications. This strategic pairing is addressed in both infrastructure planning and development as well as professional learning supporting instructional change in one-to-one implementations.

Embrace Dialogue through Modern Communication

Communication avenues between school and home have changed over time (Richardson & Sterrett, 2018). Email and automated recorded phone calls may have been considered modern communication in the past; however, Richardson and Sterrett (2018) posited that modern communication encompasses the use of digital tools such as blogs, social media outlets (Facebook©, Twitter©, etc.), and digital newsletters. Indirect digital instructional leadership informs how administrators enhance and support the classroom environment, allowing for successful one-to-one initiative implementation and maintenance (Bendikson, Robinson, &

Hattie, 2012; Richardson & Sterrett, 2018). Findings on embracing dialogue through modern communication for administrators inform how communication to and with various stakeholders is essential for one-to-one initiative initial success as well as garnering continued support.

Lei and Zhao (2008) and Richardson and Sterrett (2018) found that school district administrator and administrator communication with stakeholders, such as the community and parents fostered engagement and support for one-to-one initiatives. Such communication was able to create meaningful dialogue to address concerns such as increased screen time and other perceived one-to-one initiative effects. Dialogue was accomplished in online spaces such as discussion boards, grouped by content area (Lei & Zhao, 2008), and various social media platforms such as Facebook®, Twitter®, and Instagram® (Richardson & Sterrett, 2018). Being able to embrace dialogue through modern communication methods, other than e-mail, has been found to be an effective practice of school district and administrators when supporting, maintaining, and enhancing one-to-one initiatives.

Accepting the Unknown

Accepting the unknown, a trait that Richardson and Sterrett (2018) presented, defined effective school district superintendents supporting one-to-one initiatives, as being able to create the status quo rather than follow it and "if you are continuing with the status quo, you are probably moving backwards" (p. 608). School district administrators that embrace the unknown tend to take risks through implementing initiatives that may impact stakeholders' day-to-day lives (Richardson & Sterrett 2018). In creating an environment that is conducive to learning in a one-to-one setting, one-to-one initiatives may benefit from superintendents and administrators fostering a risk-free environment that would allow for teachers to experiment with new devices, software (applications), and approaches that may be necessary in one-to-one environments (Richardson & Sterrett, 2018).

Direct Digital Instructional Leadership

Focus on Individualized Development

Implementation studies on one-to-one initiatives (Lei & Zhao, 2008; Penuel, 2006; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2014) supported the necessity of sustained professional learning practices that assist teachers in the use of new technologies and how to apply them in their respective content areas. Initial studied adoptions of one-to-one initiatives were found to have implemented teacher professional learning that focused on relaying to teachers "skills they need to use the technology themselves" (Penuel, 2006, p. 338). As the research base on one-to-one initiatives expanded and matured, the concept of professional learning shifted. One-to-one initiative professional learning findings shifted placing emphasis on the amount of and delivery method of professional learning necessary for observed device integration in instruction to occur.

Penuel (2006) found that "teachers who reported spending nine hours or more in educational technology professional learning activities were more likely than teachers who spent less time in such activities to report feeling well-or very-well prepared to use computers and the Internet for instruction" (p. 333). Dexter (2008) found that for teacher learning to occur in schools supporting one-to-one initiatives, professional learning needed to encompass the following traits. Professional learning had to be (a) learner centered; (b) knowledge centered; (c) assessment centered, with feedback; and (d) community centered, allowing for social processing of information. Machado and Chung (2015) found that administrators considered (a) teacher willingness and (b) professional learning to be the top two rank order variables that determine the success of one-to-one initiatives.

Though Machado and Chung (2015) found strong support for administrator’s one-to-one initiative vision as a strong determinant of success, professional learning was still considered a crucial component. Richardson and Sterrett (2018) supported more individualized approaches to professional learning in one-to-one initiatives and found that “teachers are just like a class of students; they’re all over the place where their learning is” (p. 608).

In an international review of literature on one-to-one initiatives in schools, Islam and Gronlund (2016) found professional learning training to be an issue that was often referenced in studies relevant to laptop or one-to-one programs. These professional learning programs focused on skills teachers should gain, and how to effectively integrate ICTs (information communication technologies) and computers into their instruction. Findings from Islam and Gronlund’s (2016) review of international literature supported professional learning for teachers on the use of the new technologies as well as how to apply the use in instruction in various content areas.

Dexter (2008), Islam and Gronlund (2016), and Richardson and Sterrett (2018) found support for shifting views of successful one-to-one initiative professional learning from having goals that aim to familiarize teachers with new technologies to having teachers adapt and use the technologies, based on technological fluency and pedagogical methods supporting specific content areas. Individualized professional learning would encompass both acquainting teachers with technologies and software (applications) as well as realigning teachers’ pedagogical beliefs (Tondeur, Braak, Ertmer, & Ottenbreit-Leftwich, 2016). In a systematic review of qualitative evidence, Tondeur et al., (2016) found that “teachers with contended traditionalist beliefs” (p. 562) saw no real need to use technology when traditional practices continue to work” (p. 562). Tondeur et al.’s (2016) research supported that pedagogical beliefs, about instruction in one-to-one classroom environments, were found to be stable. For sustained integration of technology in instruction to occur, targeted and sustained individualized professional learning was necessary (Tondeur et al., 2016).

While providing individualized professional learning, Koehler, Mishra, and Cain (2013) proposed that content specific professional learning focusing on the integration of technology in instruction needed to address technological pedagogical content knowledge (TPACK). The TPACK framework (Koehler et al., 2013) addressed "how teacher's understanding of educational technologies and PCK (pedagogical content knowledge) interact with one another to produce effective teaching and learning" (p. 14). When technological content knowledge intercepts with pedagogical content knowledge, TPACK "goes beyond all three "core" components (content, pedagogy, and technology); it is an understanding that emerges from interactions among content, pedagogy, and technology knowledge" (Koehler et al., 2013, p. 16).

Accepting the Unknown

As professional learning programs evolve and adapt to the integration of technology in instruction due to one-to-one initiatives, administrators should embrace change and accept uncertainty (Richardson & Sterrett, 2018). Change in how professional learning is planned for, targeted, implemented, and assessed is necessitated due to factors related to teacher integration of technology in instruction in respective content areas which require specific pedagogical approaches (Machado & Chung, 2015; Penuel, 2006; Richardson & Sterrett, 2018). Richardson and Sterrett (2018) supported accepting the unknown for administrators to embrace uncertainty as to experimenting with new forms of professional learning and then assessing their effectiveness with measurements as individualized as the professional learning plans they seek to measure.

<u>One-to-One Initiatives and Student Achievement</u>

A search through peer reviewed journal articles that examined relationships, if any, between one-to-one initiatives and student achievement was conducted. Studies were eliminated where the impact of one-to-one initiatives on student achievement was not explored. Eliminated studies focused on perceptions of instruction in digital environments, student achievement, and examination of information communication technologies (ICTs) and student achievement. Though some findings from excluded studies may have addressed aspects of Research Question 3, the respective context of each of those studies did not meet one-to-one initiative criteria. Upon application of this exclusionary criteria, five peer reviewed articles were analyzed that explored possible relationships between one-to-one initiatives and student achievement.

Penuel's 2006 research synthesis provided key insight into the state of research on schools and school districts implementing one-to-one initiatives. Penuel (2006) encapsulated the limitations of many of the existing studies by stating "What is less clear from these studies is what the potential for one-to-one initiatives to improve student achievement in core subjects" (2006, p. 341). Such a notion was echoed in later findings from studies on one-to-one initiatives by Shapley, Sheehan, Maloney, and Caranikas-Walker (2010) and Bebell and Kay (2010).

Connecticut and Maine

Kennedy, Rhoads, and Leu (2016) supported what Penuel found in 2008 pertaining to scant instances of empirical studies examining one-to-one initiative effects on student achievement. Kennedy et al. (2016) expanded on the notion of scant evidence by stating, "Few quantitative studies have used direct measures of online learning to evaluate the effects of laptop use" (p. 44). Kennedy et al. (2016) further expanded on the gap in the literature by stating, "A few studies report more direct measures of offline learning using scores on state assessments, conducted with paper and pencil" adding that these "…generally show mixed results" (p. 144).

With respect to effects of one-to-one initiatives on student achievement, Kennedy et al., (2016) found there to be mixed results. Mixed results were also reported in a 2010 study on-to-one initiatives in Texas by Shapley, Sheehan, Maloney, and Caranikas-Walker (2010).

Texas

Shapley et al. (2010) examined researcher-defined indicators of technology immersion, inclusion of technology in instruction, and of one-to-one implementation to student achievement, as measured by the Texas state standardized assessment. Using hierarchical regression models, Shapley et al. (2010) found an implementation factor to be a predictor of Texas State standardized reading assessment scores. However, Shapley et al. (2010) did not explore possible relationships between the integration of technology in instruction and student achievement. Researcher defined indicators of immersion included (a) leadership, (b) teacher support, (c) parent/community support, (d) technical support, (e) professional learning, (f) classroom immersion, and (g) student access and use (Shapley et al., 2010). Shapley et al. (2010) found mixed results when examining immersion indicators as predictors of student achievement as echoed by Kennedy et al. (2016). A possibility presented by Kennedy et al. (2016) was the mismatch between technology integration in instruction and assessments being paper-based.

Rosen and Beck-Hill (2012) measured the effects of one-to-one initiatives on student achievement using a Texas state standardized assessment. Rosen and Beck-Hill (2012) sought to determine if instructional change occurred as a result of one-to-one initiative implementation. They surmised that in order for student achievement to be affected, true observed instructional change in the daily integration of technology in instruction would need to occur. In their study, Rosen and Beck-Hill (2012) instituted control over the curriculum, the digital platform, pedagogical support, and technical support. Rosen and Beck-Hill (2012) found one-to-one initiatives to have a positive effect on student achievement. Ancillary findings reported included observed decreases in student absenteeism and discipline instances.

Massachusetts

As Shapley et al. (2010) examined the effects of a one-to-one initiative on student achievement in Texas, Bebell and Kay (2010) examined the same effects in five western Massachusetts middle schools. While Shapley et al. (2010) examined specific immersion indicators, Bebell and Kay (2010) sought “to determine the efficacy of a one-to-one laptop initiative in transforming teaching and learning in a traditional middle school setting” (p. 7) as well as its effects on student achievement. Bebell and Kay (2010) specifically sought to explore the following initiative objectives: (a) enhanced student achievement, (b) improved student engagement, and (c) fundamental changes in teaching strategies, curriculum delivery, and classroom management. These components were echoed in Shapley et al.’s (2010) immersion indicators.

Ten years of baseline data from Massachusetts standardized state test scores were obtained from the Massachusetts Department of Education, and three years of data after initiative implementation were provided directly from the middle schools of study. Additionally, a researcher-created writing assessment modeled after the Massachusetts state writing assessment was used to examine one-to-one initiative effects on student writing (Bebell & Kay, 2010). Bebell and Kay (2010) reported student achievement was significantly affected through the one-to-one initiative “yet fairly weak” (Bebell & Kay, 2010, p. 37) with reported correlations of English Language Arts and Mathematics Massachusetts assessment scores of .08 and .16 respectively with a 95% confidence interval. Overall, students who participated in the one-to-one initiative, as compared to a control group, exhibited observed trends in net gains in

Massachusetts English Language Arts scores, but statistical significance was not reported (Bebell & Kay, 2010).

Summary

As schools and school districts raise and shift funds to provide laptops to each student and teacher, as well as transform classrooms into digital environments, research has been conducted on these one-to-one initiatives (Bebell & Kay, 2010). One-to-one initiatives present a significant investment by communities and various levels of government. Much of the research reviewed on one-to-one initiatives presented findings that aid in device selection and other processes necessary for successful implementation (Penuel, 2006). However, there was a dearth of research on the effects of such initiatives on student achievement (Bebell & Kay, 2010; Shapley et al., 2010).

Organization of this review of literature was dictated by the lines of research that informed the conceptual framework of this study. The first section addressed instructional leadership. Digital instructional leadership was explored in the second section. Both instructional leadership and digital instructional leadership were organized by either research supported administrator direct or indirect influences. Finally, literature examining one-to-one initiative effects on student achievement was reviewed in the final section.

CHAPTER 3
METHODOLOGY

Introduction

The purpose of this study was to examine administrator perceptions of teachers' integration of technology in instruction. Additionally, possible relationships were explored between digital instructional leadership and student achievement, as measured by 2018 Florida Standards Assessment English Language Arts scale scores (FSA, 2018). Finally, change in administrator readiness to lead in a digital school environment over time was investigated. Chapter 3 presents methodology conducted to complete this study. This chapter is organized in six sections: (a) design of the study, (b) selection of participants, (c) instrumentation, (d) data collection, (e) data analysis, and (f) summary.

Design of the Study

The design of this study was an instrumental case study (Fraenkel, Wallen, & Hyun, 2015) and was constructed with both quantitative and qualitative data collection (Fraenkel et al., 2015). Qualitative analysis methods were used to examine digital instructional leadership, in a one-to-one environment, at one large urban high school. With case studies, "a single individual, group, or important example is studied extensively and varied data are collected and used to formulate interpretations applicable to the specific case, (e.g., a particular school board), or to provide useful generalizations" (Fraenkel et al., 2015, p.14). This instrumental case study (Fraenkel et al., 2015) was guided by three research questions.

Research Questions

Three research questions were crafted to examine the digital instructional leadership of administrators. Specifically, the three research questions addressed the digital instructional leadership of administrators, possible relationships, if any, between teachers' technology integration in instruction and student achievement, and change in administrator readiness, to lead in a digital school environment, over time.

1. How do high school administrators perceive the extent of technology integration in teacher instruction?
2. What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts [FSA] (FSA, 2018)?
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

Selection of Participants

The population of interest consisted of administrators at large urban high schools in large urban school districts in Florida. Purposive sampling, was conducted at one large urban high school in the large urban school district of study. Purposive sampling was used to select the seven participants for this instrumental case study (Fraenkel et al., 2015). Purposive sampling is used in case studies "based on previous knowledge of a population and the specific purpose of the research, investigators use personal judgement to select a sample" (Fraenkel et al., 2015, p. 101). Administrators were selected due to (a) the school of study being in its fourth year of one-to-one initiative implementation, (b) administrators were in their position between one to three years, and (c) administrators had a range from 1 to more than 10 years of experience leading in a one-to-one school.

Participants were purposively selected for this study due to working in a school district where all high schools operated in an environment where students had access to a computer during instruction (one-to-one). Also, a previous study, that utilized the DILRI© (Taylor & Shepherd, 2016; Shepherd, 2017), was conducted in the school district allowing for qualitative comparisons of participant item selections. Purposive sampling allowed for the comparison of instrumental case study (Fraenkel et al., 2015) participant and archival DILRI© (Taylor & Shepherd, 2016) item selections. Thus, each of the seven participants recruited (six assistant principals and one principal), supported teachers and students in a one-to-one digital learning environment and were attributed individual DILRI© (Taylor & Shepherd, 2016) item selection profiles that allowed for comparison and analysis.

Instrumentation

Introduction

Research Questions 1, 2, and 3 necessitated the collection of both qualitative and quantitative data. Qualitative data were collected through two researcher-created instruments. Qualitative interview data were collected using the TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018). During qualitative interviews, average Technology Integration Matrix [TIM©] (FCIT, 2018) ratings were collected and scored using the researcher created TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018).

Quantitative and qualitative data were collected through online administration of the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016). Past DILRI© (Taylor & Shepherd, 2016) administration item responses were also collected for analyses purposes (Shepherd, 2017). Florida Standard Assessment English Language Arts (FSA,

2018) scale scores for all students in grades 9 and 10 were collected from the school of study in CSV format.

TIM Qualitative Interview Protocol© Development

Digital instructional leadership, as defined by the researcher, encompasses knowledge of the 25 possible levels of technology integration in instruction within the TIM© (FCIT, 2018). Semi-structured interview items were created and inspected for construct validity via two examinations of item relevancy, clarity, and conciseness. Interview items were presented to two separate panels comprised of doctoral students and university faculty. Recommendations and revisions were received from the first panel and interview items were updated. Revised interview items were then presented to the second panel where further recommendations were made. The TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018) was then updated.

Consultation with university faculty on study design and implementation yielded the addition of Item 17 and Item 18 to the TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018). Items 17 and 18 elicited average instructional level placement on the Technology Integration Matrix [TIM©] (FCIT, 2018) for departments supervised by each individual administrator. Based on provided ratings, administrators were asked for evidence of observed instruction that supported the supplied rating. Participant 7 was excluded because previously administered items addressed such inquiries.

TIM Qualitative Interview Protocol© Data Collection

Qualitative data were collected via semi-structured interviews. Interview items contained within the TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018) encompassed the following Technology Integration Matrix [TIM©] (FCIT, 2018) constructs: (a) active learning, (b) collaborative learning, (c) constructive learning, (d) authentic learning, (e) goal-directed learning, (f) entry level technology integration, (g) adoption level technology integration, (h) adaptation level technology integration, (i) infusion level technology integration, and (j) transformation level technology integration.

During semi-structured interviews, administrators supplied perceived average grade-level and department-level teachers' integration of technology in instruction observed TIM© (FCIT, 2018) placement levels. Administrators' knowledge of digital instructional leadership was addressed by the first five items. Item 6 determined if the participant being interviewed supported the English language arts and/or reading departments for grades 9 and 10. The TIM (Appendix A) was presented to each participant at the beginning of the interview which was guided by The TIM Qualitative Interview Protocol© (Appendix C).

The TIM© (FCIT, 2018) defines five distinct levels of technology integration: (a) entry level, (b) adoption level, (c) adaptation level, (d) infusion level, and (e) transformation level. Five distinct types of learning are also defined within the TIM© (FCIT, 2018): (a) active learning, (b) collaborative learning, (c) constructive learning, (d) authentic learning, and (e) goal-directed learning (FCIT, 2018). During interviews, participants selected where the level of technology integration intersected the type of learning, yielding an observed level of teachers' technology integration in instruction. Presented within the TIM© (FCIT, 2018) are 25 possible levels of technology integration in instruction.

TIM© Scoring Rubric Development

A TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was created by a university faculty member and the researcher to collect data during qualitative semi-structured interviews. The TIM© Scoring Rubric (Appendix B) was constructed based on the 25 identified levels of teachers' technology integration in instruction presented via Technology Integration Matrix [TIM©] (FCIT, 2018) constructs. The TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was constructed via consultation with two separate panels consisting of doctoral students and university faculty. Recommendations were made after the first panel and the scoring rubric was adjusted. The second panel then examined the updated scoring rubric and provided further recommendations. Recommendations were incorporated, and a revised scoring rubric was compiled.

TIM© Scoring Rubric Data Collection

The TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was created to evaluate administrator perceptions of unique Technology Integration Matrix [TIM©] (FCIT, 2018) levels of teachers' integration of technology in instruction. Administrator responses were coded with a 0, 3, or 5. Scores of 0, 3, or 5 were researcher selected values that did not correspond to each of the five TIM© (FCIT, 2018) levels. A score of 0 indicated little to no understanding of the identified unique TIM© (FCIT, 2018) level. Partial understanding of unique TIM© (FCIT, 2018) levels were coded with scores of 3. Administrator perceptions that were found to support a complete understanding of unique TIM© (FCIT, 2018) levels were coded with a score of 5. Interview participants were asked to select where the level of teachers' technology integration in instruction and characteristics of the learning environment intersected. The responses that followed these items were coded as either supporting a score of 0, 3, or 5.

Digital Instructional Leadership Readiness Instrument [DILRI©] Development

The DILRI© (Taylor & Shepherd, 2016) was constructed to measure the readiness, knowledge and confidence, of administrators to lead in a digital school environment (Shepherd, 2017). Consultation between a school district Executive Director for Curriculum, university faculty, and doctoral student led to the construction of the DILRI© (Shepherd, 2017).

The 62-item DILRI© (Taylor & Shepherd, 2016) was presented for content validity via two examinations of item relevancy, clarity, and consciousness (Shepherd, 2017).

Recommendations were received from the first panel and incorporated. The revised DILRI© (Taylor & Shepherd, 2016) was presented to the second panel and further recommendations were presented. Revisions were made a third time. The revised DILRI© (Taylor & Shepherd, 2016) was then presented to the Executive Director for Curriculum, Instruction, and Digital Learning in a large urban school district. Final recommendations were made and incorporated. The DILRI© (Taylor & Shepherd, 2016) is presented in Appendix D.

Digital Instructional Leadership Readiness Instrument [DILRI©] Data Collection

Digital Instructional Leadership Readiness Instrument DILRI© (Taylor & Shepherd, 2016) archival survey data from 2016 were collected. DILRI© (Taylor & Shepherd, 2016) 2018 survey data were collected via Qualtrics online survey software. Informed Consent (Appendix E) was presented to the seven high school administrators serving at the school of study. Participants were sent the Informed Consent via individual emails which also contained a link to the survey. If participants agreed to participate, the survey would open. Participants were able to skip items as well as withdraw consent at any time.

Florida Standards Assessment English Language Arts Scale Scores

Florida Standards Assessment English Language Arts (FSA ELA) scale scores for the 2017-2018 school year were collected from the central Florida school district in which the school of study resided. The FSA ELA (FSA, 2018) is a standardized assessment that is administered from grade 3 to grade 10. The purpose of the FSA ELA (FSA, 2018) is to measure student achievement on Florida standards in the English language arts content area.

Reliability of the FSA ELA (FSA, 2018) is assured via tests of internal consistency and marginal reliability. The Cronbach alpha, stratified alpha, and Feldt-Raju coefficients were used to measure internal consistency (Florida Department of Education, 2017).

The FSA ELA (FSA, 2018) is a mixed-item test. Test items are presented in multiple choice, short response, and extended response formats (Florida Department of Education, 2017). Due to these characteristics and being a mixed item assessment, the Cronbach alpha

$$\alpha = \frac{n}{n-1}\left[1 - \frac{\sum_{i=1}^{n} \sigma_i^2}{\sigma_x^2}\right] \tag{1}$$

was used to measure the internal consistency of the FSA ELA (Florida Department of Education, 2017). The Florida Department of Education (2017) found the FSA ELA (FSA, 2018) to have the following reliability values for the online assessment: (a) Cronbach alpha = 0.93, (b) stratified alpha = 0.93, and (c) Feldt-Raju = 0.91. The FSA ELA (FSA, 2018) version with accommodations was found to have the following reliability statistics: (d) Cronbach alpha = 0.92, (e) stratified alpha = 0.92, and (f) Feldt-Raju = 0.90 (FLDOE, 2017).

Cohen's kappa (Cohen, 1968) was used to measure validity of the FSA ELA (FSA, 2018). Cohen's kappa is a statistical measure of inter-rater agreement for categorical items (Cohen, 1968). The following validity coefficients were reported for the FSA ELA (FSA, 2018) categories: (a) Purpose, Focus, and Organization = 90, (b) Evidence an Elaboration = 89, and (c) Conventions = 88.

University Protocol

An application to University of Central Florida's Institutional Review Board was submitted, outlining the limits of the study, prior to data collection. The application submitted contained study characteristics listed in Chapter 1. Additionally, the institutional review board required the completion of ethical research modules accessible on the CITI site. These modules were completed in the summer of 2018. A completed application was submitted on July 30, 2018; Institutional Review Board approval to conduct research was received August 7, 2018. University of Central Florida Research Notice Approval is in Appendix F.

Large Urban School District Protocol

Upon receiving approval for data collection from University of Central Florida's Institutional Review Board, an application to conduct research in the selected large urban school district was submitted on August 11, 2018, to the Research, Accountability, and Grants office. The application contained sections of Chapter 1 that outlined the study design. Additionally, the large urban school district required instrumentation, consent forms, and potential benefits and risks to both the school district and participants recruited for the study. The application to collect data was approved on October 4, 2018.

Quantitative Data Collection

De-identified archival Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) data were collected. Archival DILRI© (Taylor & Shepherd, 2016) data were collected that reported the following item selections for administrators in the school district of study: (a) factors of knowledge and confidence, (b) rank order of knowledge and confidence factors, (c) confidence in recognizing effective technology use, (d) influential school cultural factors, (e) confidence in providing feedback, (f) participant demographics, and (g) other information (Shepherd, 2017).

Florida Standard Assessment English Language Arts [FSA ELA] (FSA, 2018) scale scores for all students enrolled in grades 9 and 10 were collected from the large urban school district for the 2017-2018 school year. The large urban school district provided the researcher a file containing de-identified grades 9 and 10 FSA ELA (FSA, 2018) scale scores for each student.

Qualitative Interview Data Collection Procedures

During individual semi-structured interviews, the following steps were taken for data collection at the school site of study.

1. Administrators (*N* = 7) were contacted after institutional review board (Appendix F) approval was received from both the University of Central Florida and the large urban school district (Appendix G).
2. Administrators (*N* = 7) were presented with the Informed Consent to participate in the research (Appendix E).
3. Dates and times were selected by participants for individual semi-structured interviews.
4. Before interviews commenced, participants were asked for permission to digitally audio record the interview. If permission was granted, two recordings were made.
5. A Technology Integration Matrix (FCIT, 2018) paper copy was presented to each participant to review prior to the interview and for reference throughout the interview process (Appendix A).
6. Interview items (Appendix D) were presented to participants orally one at a time; selective probing, based on participant responses to each item, was conducted by the researcher.
7. Participant responses were digitally recorded, and notes were made on individual printed copies of the TIM© Qualitative Interview Protocol (Taylor & Sanchez Corona, 2018) presented in Appendix C.
8. Recordings were transcribed verbatim after participants were given pseudonyms to protect identities.

9. Once transcribed, each of the seven interview audio recordings were permanently deleted from the digital recording device.

Data Analysis Procedures

In addition to the analysis of quantitative data, qualitative data analysis methods were applied in this study. The three research questions guided selection of method of analyses. Explanation of qualitative methodologies used for this study are explained in the following section.

Qualitative Data Analysis

Research Question 1: How do high school administrators perceive the extent of technology integration in teacher instruction?

Data to respond to Research Question 1 were used to analyze how high school administrators perceived the extent of technology integration in teacher instruction. Transcripts were coded using selective coding (Glaser & Strauss, 2008). Selective coding categories were determined based on the constructs identified and defined in the Technology Integration Matrix [TIM©] (FCIT, 2018). Inter-coding agreement was conducted for procedural and analyses fidelity. For inter-coding agreement, two university faculty researchers were consulted to independently code transcribed data. Upon inter-coder agreement, emergent themes were agreed upon. The grounded theory method and selective coding (Glaser & Strauss, 2008) were used to examine themes found within responses recorded during individual semi-structured interviews. Grounded theory (Glaser & Strauss, 2008), an exploratory method, was used to develop a theory based on the data collected. Individual de-identified semi-structured interview responses were transcribed verbatim and were first examined superficially.

The constant comparative method (Glaser & Strauss, 2008) was then applied to thematic analyses. According to Glaser and Strauss (2008), the constant comparative method generates theory through a growing process (p. 105). This method is employed via four stages (Glass & Strauss, 2008): (a) comparing incidents applicable to each category, (b) integrating categories and their properties, (c) delimiting the theory, and (d) writing the theory. Analysis "provides continuous development to its successive stage until the analysis is terminated" (Glaser & Strauss, 2008, p. 105). Derived categories and subcategories were agreed upon through inter-coding agreement methods (Glaser & Strauss, 2008). Researcher-derived coding was compared to the coding of two university faculty researchers. Categories were derived from participant words and phrases. Categories were considered salient when mentioned by two or more unique administrators one time across all five TIM© (FCIT, 2018) technology integration levels. Subcategories were considered salient when mentioned once by two or more unique administrators one time across all five TIM© (FCIT, 2018) technology integration levels. Inter-coding agreement was conducted via three distinct coding agreement sessions. Research Question 1 and supporting data determined when analysis was terminated. Only then was a theory finalized.

Interview item responses, for each administrator, were analyzed for alignment to each corresponding Technology Integration Matrix [TIM©] (FCIT, 2018) level of teachers' technology integration in instruction. Degree of alignment was attributed a score of 0 = No Understanding, 3 = Emerging Understanding, or 5 = Full Understanding for each TIM© (FCIT, 2018) identified level of teachers' integration of technology in instruction. Total Scores for administrators could range from 0 to 5. Scores from this level of analysis were added to findings from grounded theory analysis to support the response to Research Question 1.

Research Question 2: What relationship, if any, exists between the extent of perceived technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA)?

Research Question 2 focused on the relationship, if any, that existed between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA, 2018). Data were analyzed through what Fraenkel et al. (2015) described as rich qualitative description of the context of the instrumental case study. Descriptive statistics were used to describe the context of the study and explore possible relationships, if any, between administrator digital instructional leadership and collected grades 9 and 10 Florida Standards Assessment English Language Arts [FSA ELA] (FSA, 2018) scale scores. Through analyses, a rich description of the context was presented with descriptive statistics of administrator perceived Technology Integration Matrix [TIM©] (FCIT, 2018) level rubric scores and grades 9 and 10 FSA ELA (FSA, 2018) scale scores. Due to a small sample size (*N* = 7), analyses were conducted via qualitative rich description and descriptive statistics (Fraenkel et al., 2015).

Research Question 3: To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

Data to respond to this research question were analyzed via qualitative description of item selections and participant open responses. The descriptions were rooted in qualitative data collection and analyses supported by instrumental case study methods (Fraenkel et al., 2015). Construct item selections, of the seven recruited participants, were matched to seven demographically similar archival administrator item selections. Instrumental case study (Fraenkel et al., 2015) participant item selections from 2016 were not available thus the necessity to match to archival data based on demographic variables. Matches were based upon: (a) current role (principal or assistant principal), (b) length of time participant has served in role at current school, (c) length of time participant has been in an administrative position, and (d) length of time participant has been leading in a digital school. For open ended response items, grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008) were used to identify themes. Themes were considered salient if they applied to two unique administrator responses (Corbin & Strauss, 1990, 2008). Table 3 contains the research questions which guided the study, the sources of data and the data analysis used to respond to the questions.

Table 3

Research Questions, Data Sources, and Data Analysis

Research Questions	Data Source	Data Analysis
1. How do high school administrators perceive the extent of technology integration in teacher instruction?	Qualitative Interviews	Glaser and Strauss (2008) grounded theory method and selective coding to examine themes found within responses
2. What relationship, if any, exists between the extent of perceived technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA)?	FSA ELA Scale Scores	Instrumental case study (Fraenkel et al., 2015) with qualitative description
	TIM Scoring Rubric Scores	Qualitative Description: Means
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?	DILRI© Archival Item Selections	Qualitative description of similarly matched administrative survey profile data [DILRI©]
	Participant DILRI© Item Selections	Grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008)

Procedural Fidelity

Steps were taken to assure procedural fidelity, objectivity, and generalizability of results. For qualitative analysis, two university faculty researchers were consulted for inter-rater coding agreement as well as grounded theory development consensus (Glaser & Strauss, 2008).

Summary

The purpose of this research, research questions, data collection methods, and methods of analyses were presented in this chapter. A qualitative approach was used to explore the data to respond to the three research questions. Data were collected via individual semi-structured interviews and from the Large Urban School District's database for school year 2017-2018. Analyses were conducted using selective coding, the constant comparative method, grounded theory analysis (Glaser & Strauss, 2008), thematic analysis methods (Corbin & Strauss, 1990, 2008), rich qualitative description, and descriptive statistics (Fraenkel et al., 2015). Finally, procedural fidelity was discussed through inter-coding agreement and consensus on grounded theory formation with an independent researcher. Data analyses are presented in the following chapter.

CHAPTER 4
ANALYSIS OF DATA

Introduction

The purpose of this study was to examine the digital instructional leadership of administrators at the high school level. Three research questions were created to explore digital instructional leadership, possible relationships between digital instructional leadership and student achievement scores, and possible change in administrator readiness, to lead in a digital school environment, over time. Research questions that guided this study were as follows.

1. How do high school administrators perceive the extent of technology integration in teacher instruction?
2. What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA, 2018)?
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

Qualitative and quantitative data collection methods were used to answer all three research questions; qualitative data analysis methods were used in the analyses of data to respond to the three research questions. Grounded theory and constant comparative methods (Glaser & Strauss, 2008) were used in the data analysis for Research Question 1. Inter-coding agreement

(Glaser & Strauss, 2008) was also used to ensure grounded theory categories and subcategories were supported by data and objectivity of qualitative description for Research Question 1.

Categories and subcategories were derived from participant words and were considered salient when referenced by two or more unique administrators one time across all five Technology Integration Matrix [TIM©] (FCIT, 2018) levels. Data were independently coded by the researcher and two university faculty researchers. Categories and subcategories were discussed and agreed upon through consensus on three distinct occasions. Qualitative description and descriptive statistics were used to respond to Research Question 2. Research Question 3 was answered via qualitative description of similarly matched administrator item selections on the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) and grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008).

Results in this chapter are organized into five sections. The first section sets the context of the instrumental case study (Fraenkel, Wallen, & Hyun, 2015). Findings associated with the three research questions are presented in the next three sections. The final section contains a summary of this chapter.

Context of High School of Study (CFHS)

The large urban high school of study (CFHS) is the largest high school, based on student population, within the large urban school district of study, with 3,930 students enrolled at the time of the study. The demographic variables of the student population were: White = 9%, Black = 10%, Hispanic = 62%, Asian = 6%, and Multi-Racial = 2%. English learners comprised 21% of the student population, and 6% of students received Exceptional Student Education services. CFHS was reported to have a 13% mobility rate. CFHS' student population contained 15% less

Black students than the school district average but conversely was made up of 19% more Hispanic students than the school district average. Student demographic variables are presented in Table 4.

Table 4

CFHS Student Variables School Year 2018-2019 (N = 3,930)

Variable	CFHS (%)	School District (%)	Difference (%)
Race			
White	9	5	4
Black	10	25	-15
Hispanic	62	43	19
Asian	6	5	1
Multi-racial	2	2	0
English Learners	21	16	5
Poverty Rate	60	66	-6
Students with Disabilities	6	11	-5
Mobility	13	17	-4

Qualitative interviews were conducted with six assistant principals and one principal (*N* = 7). Three of the assistant principals were male and three were female. The principal was female. Four of seven administrators (57%) served in an administrative capacity for less than five years. Two of seven administrators (29%) served in an administrative capacity between 11 to 15 years, and one of seven administrators (14%) served in an administrative capacity between 21 to 25 years. Examining years in a one-to-one school environment, three of seven administrators (43%) were found to have between one to three years of experience. Three of seven administrators (43%) were found to have between four to six years of experience in a one-to-one environment. One of seven administrators (14%) was found to have more than 10 years of experience in a one-to-one school environment. All seven administrators served in their current position three years or less. A summary of CFHS administrator characteristics is presented in Table 5.

Table 5

CFHS Administrator Characteristics in October of 2018

Participant	Years in Administrative Position	Years in One-to-One Environment	Years in Current Position
AP1	<5	1-3	1-3
AP2	11-15	1-3	<1
AP3	<5	1-3	1-3
AP4	<5	4-6	1-3
AP5	<5	4-6	<1
AP6	21-25	>10	<1
Principal	11-15	4-6	<1

Data Analysis: Research Question 1

How do high school administrators perceive the extent of technology integration in teacher instruction?

Administrator Perceptions of Teachers' Integration of Technology in Instruction

Interview transcripts were analyzed using the grounded theory method (Glaser & Strauss, 2008). Primary analysis was conducted with the intent of deriving categories based on participant responses across all items. Secondary analysis was conducted to determine possible subcategories (Glaser & Strauss, 2008). Categories and subcategories were considered salient when mentioned once by two or more unique administrators one time across all five TIM© (FCIT, 2018) levels (Glaser & Strauss, 2008). Inter-coding agreement (Glaser & Strauss, 2008) was conducted via three distinct coding agreement sessions with two university faculty researchers. Derived salient categories were (a) Interaction with Technology, (b) Collaboration, (c) Student Selection, (d) Direct Instruction, (e) Student Production, and (f) Application. The next six sections expand on each salient category.

Interaction with Technology

Present at each of the five TIM© (FCIT, 2018) levels, the category, Interaction with Technology, was coded 38 times in interview transcriptions. Majority of the mentions occurred at the Entry ($n = 5$, $f = 13$), Adoption ($n = 5$, $f = 11$), and Adaptation ($n = 4$, $f = 11$) levels. Mentions of the category, Interaction with Technology ($f = 38$), were observed to decrease as technology integration in instruction increased in complexity along the TIM© (FCIT, 2018) continuum.

Secondary analysis yielded the formation of Interaction with Technology ($f = 38$) subcategories Applications ($f = 23$), Device ($f = 8$), and Digital Platforms ($f = 7$). Installed software programs and internet-based application mentions were grouped under the subcategory of Applications ($f = 23$). The subcategory, Applications ($f = 23$), was mentioned at the levels of Entry ($n = 3$, $f = 7$), Adoption ($n = 5$, $f = 8$), Adaptation ($n = 4$, $f = 7$), and Transformation ($n = 1$, $f = 1$). The subcategory, Device ($f = 8$), included mentions of hardware such as Smart Boards®, Lenovo® laptop computers, and document cameras. Mentions of subcategory, Device ($f = 8$), were present at the TIM© (FCIT, 2018) Entry ($n = 3$, $f = 3$), Adoption ($n = 1$, $f = 1$), and Adaptation ($n = 2$, $f = 4$) levels. Finally, mentions of online platforms, that provided a digital space for teaching and assessment to occur, were attributed the subcategory label of Digital Platforms ($f = 7$). The subcategory, Digital Platforms ($f = 7$), was present the levels of Entry ($n = 3$, $f = 3$), Adoption ($n = 2$, $f = 2$), and Infusion ($n = 1$, $f = 2$).

Collaboration

Present at all five TIM© (FCIT, 2018) levels was the category Collaboration ($f = 11$). At the Entry level, Collaboration ($n = 1$, $f = 1$) was mentioned to not be present. The majority of participant mentions were observed at the Adoption (n = 2, f = 3) and Adaptation (n = 1, f = 4) levels.

Secondary analysis yielded the formation of Collaboration subcategories Students (f = 7) and Students and Teachers (f = 3). The subcategory, Students (f = 7) which included mentions of digital and non-digital collaboration between students, was mentioned at the TIM© (FCIT, 2018) Adoption (n = 2, f = 3) and Adaptation (n = 1, f = 4) levels. Digital and non-digital collaboration between students and teachers, Students and Teachers (f = 3), was mentioned at the Infusion (n = 1, f = 2) and Transformation (n = 1, f = 1) levels.

Student Selection

The category, Student Selection (f = 7), was coded at the TIM© (FCIT, 2018) levels of Adaptation, Infusion, and Transformation. The majority of the mentions occurred at the Adaptation (n = 3, f = 3) and Infusion (n = 3, f = 3) levels.

Secondary analysis led to the creation of Student Selection (f = 7) subcategories Demonstration of Learning (f = 4) and Applications (f = 3). The subcategory, Demonstration of Learning (f = 4) included mentions of student selection of options available to demonstrate their learning. Demonstration of Learning (f = 4) was present at the TIM© (FCIT, 2018) Infusion (n = 3, f = 3) and Transformation (n = 1, f = 1) levels. Student self-selection of applications to be used during instruction, Applications (f = 3), was mentioned only at the Adaptation (n = 3, f = 3) level.

Direct Instruction

The category, Direct Instruction (f = 5), was mentioned at TIM© (FCIT, 2018) levels of Adaptation (n = 1, f = 1), Infusion (n = 2, f = 2), and Transformation (n = 2, f = 2). Mentions of category, Direct Instruction (f = 5), included references to the presence of or decreasing the amount of teacher-led direct instruction at respective TIM© (FCIT, 2018) levels. Mentions of the category, Direct Instruction (*f* = 5), were observed to increase as technology integration in instruction increased in complexity along the TIM© (FCIT, 2018) continuum.

<u>Student Production</u>

The category, Student Production (*f* = 4), was mentioned at TIM© (FCIT, 2018) levels of Adaption (*n* = 1, *f* = 1), Infusion (*n* = 1, *f* = 1), and Transformation (*n* = 2, *f* = 2). Student Production (*f* = 4) mentions referenced students producing products or learning such as modules and various projects. Though only mentioned once by one administrator (*n* = 1) at both the Adaption and Infusion levels, Student Production (*f* = 4) was mentioned twice by two administrators (*n* = 2) at the Transformation level.

<u>Application</u>

The category, Application (*f* = 3), was mentioned at the TIM© (FCIT, 2018) Transformation (*n* = 3, *f* = 3) level only. Application (*f* = 3) mentions referenced students applying knowledge and skills in various situations both inside and outside the confines of the classroom. It is of note that Application (*f* = 3) was mentioned once by three separate administrators (*n* = 3) at the Transformational level.

<u>Summary of Categories and Subcategories across TIM© Levels</u>

Grounded theory method analysis (Glaser & Strauss, 2008) of transcribed semi-structured interviews yielded six categories, across all five TIM© (FCIT, 2018) levels, that were derived from participant words: (a) Interaction with Technology, with subcategories Device, Applications, and Digital Platform, (b) Collaboration, with subcategories Students and Students and Teachers (c) Student Selection, with subcategories Demonstration of Learning and Applications, (d) Direct Instruction, (e) Student Production, and (f) Application.

The category, Interaction with Technology (*f* = 38), was referenced the most across all five TIM© (FCIT, 2018) levels. Student Production (*f* = 4) and Application (*f* = 3) were referenced four and three times respectively across all five TIM© (FCIT, 2018) levels. Though referenced at a lower rate than Interaction with Technology (*f* = 38), Collaboration (*f* = 11) was the only other category that was mentioned at each of the five TIM© (FCIT, 2018) levels. A summary of CFHS administrator perceptions of teachers' integration of technology in instruction, across all TIM© (FCIT, 2018) levels, is presented in Table 6.

Table 6

Summary Categories and Subcategories of 2018 CFHS Administrator TIM© Perceptions (N = 7)

Category Subcategory	Entry	Adoption	Adaptation	Infusion	Transformation
Interaction with Technology	*n* = 5 (*f* = 13)	*n* = 5 (*f* = 11)	*n* = 4 (*f* = 11)	*n* = 1 (*f* = 2)	*n* = 1 (*f* = 1)
Applications	*n* = 3 (*f* = 7)	*n* = 5 (*f* = 8)	*n* = 4 (*f* = 7)	*n* = 0 (*f* = 0)	*n* = 1 (*f* = 1)
Device	*n* = 3 (*f* = 3)	*n* = 1 (*f* = 1)	*n* = 2 (*f* = 4)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)
Digital Platform	*n* = 3 (*f* = 3)	*n* = 2 (*f* = 2)	*n* = 0 (*f* = 0)	*n* = 1 (*f* = 2)	*n* = 0 (*f* = 0)
Collaboration	*n* = 1 (*f* = 1)	*n* = 2 (*f* = 3)	*n* = 1 (*f* = 4)	*n* = 1 (*f* = 2)	*n* = 1 (*f* = 1)
Students	*n* = 0 (*f* = 0)	*n* = 2 (*f* = 3)	*n* = 1 (*f* = 4)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)
Students and Teachers	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 1 (*f* = 2)	*n* = 1 (*f* = 1)
Student Selection	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 3 (*f* = 3)	*n* = 3 (*f* = 3)	*n* = 1 (*f* = 1)
Demonstration of Learning	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 3 (*f* = 3)	*n* = 1 (*f* = 1)
Applications	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 3 (*f* = 3)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)
Direct Instruction	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 1 (*f* = 1)	*n* = 2 (*f* = 2)	*n* = 2 (*f* = 2)
Student Production	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 1 (*f* = 1)	*n* = 1 (*f* = 1)	*n* = 2 (*f* = 2)
Application	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 0 (*f* = 0)	*n* = 3 (*f* = 3)

To examine how administrators perceived the extent of technology integration in teacher instruction, participants were presented with five items from the Technology Integration Matrix [TIM©] Qualitative Interview Protocol; see Appendix D for the complete protocol. Protocol items 1 to 5 queried each administrator on their perceptions of each of the five TIM© (FCIT, 2018) levels: Entry, Adoption, Adaptation, Infusion, and Transformation (FCIT, 2018).

Primary examination of administrator perceptions, of TIM© (FCIT, 2018) levels, was conducted through grounded theory analysis using the Glaser and Strauss (2008) method. Analysis yielded categories, across all items, which explored participant knowledge of each of the five unique TIM© (FCIT, 2018) levels. Categories and subcategories (Glaser & Strauss, 2008) were derived from participant words. Categories and subcategories were considered salient when referenced by two or more unique administrators one time across all five TIM© (FCIT, 2018) levels. Inter-coding agreement (Glaser & Strauss, 2008) was conducted via consultation with two university faculty researchers to assure category and subcategory saliency.

Entry Level

Examination of Item 1 data supported two distinct categories that administrators associated with teachers' technology integration in instruction at the Entry level on the TIM© (FCIT, 2018): (a) Interaction with Technology ($n = 5$, $f = 13$) and (b) Collaboration ($n = 1$, $f = 1$). Examination of administrator transcripts pertaining to teacher interaction with technology yielded subcategories of use of Applications, ($n = 3$, $f = 7$), Device ($n = 3$, $f = 3$), and Digital Platforms ($n = 3$, $f = 3$). Teacher use of Applications was observed to be the most mentioned subcategory ($n = 3$, $f = 7$).

Through grounded theory analysis (Glaser & Strauss, 2008) on Item 1 administrator responses, the category Interaction with Technology, with subcategories Applications ($n = 3$, $f =$

7), Device (*n* = 3, *f* = 3), and Digital Platforms (*n* = 3, *f* = 3), was found to be observed in three of the seven (*n* = 3, 43%) participant responses. The category of Collaboration, but not its subcategories, was referenced by one of seven (*n* = 1, 14%) administrators.

The most salient category for Item 1, teachers' integration of technology in instruction at the Entry level, was teachers' Interaction with Technology (*n* = 5). Statements coded (Glaser & Strauss, 2008) addressed teacher use of Applications (*n* = 3, *f* = 7). Participant Principal mentioned Applications when stating "On the Entry level, teachers would be using technology solely to possibly present information at a very basic level using maybe a PowerPoint® to present basic knowledge of information." Teacher use of a Device (*n* = 3, *f* = 3), such as Smartboards® , was be highlighted by AP3's statement "I think that the teacher would probably be using the Smart Board®, but there wouldn't be a whole lot of students interacting with that Smart Board®." A Digital Platform, Canvas®, was mentioned a total of three times by three separate administrators (*n* = 3, *f* = 3). AP3 provided the following statement regarding a Digital Platform (*n* = 3, *f* = 3): "Canvas is our course app that we have on our laptops for our students where teachers upload the lessons and the curriculum that they want the students to focus on for the week." Though the category Collaboration was mentioned (*n* = 1, *f* = 1), administrator perceptions supported that student collaboration was not present at the Entry level. For example, AP1 stated "There's no collaboration and there's nothing else that's going on."

Also, though the threshold of being considered a category or subcategory was not observed, at least two mentions by two or more unique administrators one time across all five TIM© (FCIT, 2018) levels, the following mentions were observed at the entry level: teachers were perceived to use these tools to present information (*n* = 1, *f* = 1), differentiation was perceived to not occur at this level of teachers' integration of technology in instruction (*n* = 1, *f* =

1), student cognitive demand was perceived to be rather low (*n* = 1, *f* = 1), and teacher frustration with new technological tools was perceived to be present (*n* = 1, *f* = 1). Qualitative analysis of Item 1, instruction at the Entry level, is presented in Table 7.

Table 7

Perception of Integration Categories and Subcategories: TIM© Entry Level (N = 7)

Category Subcategory	AP1	AP2	AP3	AP4	AP5	AP6	Principal	Total *n* *f*
Interaction with Technology	*n* = 0 *f* = 0	*n* = 1 *f* = 4	*n* = 1 *f* = 2	*n* = 1 *f* = 3	*n* = 0 *f* = 0	*n* = 1 *f* = 2	*n* = 1 *f* = 2	*n* = 5 *f* = 13
Applications	*f* = 0	*f* = 2	*f* = 0	*f* = 3	*f* = 0	*f* = 0	*f* = 2	*f* = 7
Device	*f* = 0	*f* = 1	*f* = 1	*f* = 0	*f* = 0	*f* = 1	*f* = 0	*f* = 3
Digital Platform	*f* = 0	*f* = 1	*f* = 1	*f* = 0	*f* = 0	*f* = 1	*f* = 0	*f* = 3
Collaboration	*n* = 1 *f* = 1	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1
Students	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0
Students and Teachers	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0

Adoption Level

Grounded theory methods analysis (Glaser & Strauss, 2008), supported two categories associated with Item 2: Interaction with Technology (*n* = 5, *f* = 11) and Collaboration (*n* = 2, *f* = 3). The most salient category for Item 2, Interaction with Technology (*n* = 5, *f* = 11) at the Adoption level, was found to encompass teachers instructing students how to use technology within the lessons The category was coded in five of the seven (*n* = 5, 71%) administrator responses. Student Collaboration, via applications such as Google Documents®, was coded a total of three times in two unique (29%) administrator responses (*n* = 2, *f* = 3).

The most salient category for Item 2, teachers' integration of technology in instruction at the Adoption level, was teachers teaching students how to use technology within the lesson

(Interaction with Technology, *n* = 5, *f* = 11). Within the category Interaction with Technology (*n* = 5, *f* = 11), transcribed qualitative interview data supported the formation of the following subcategories: Applications (*n* = 5, *f* = 8), Digital Platforms (*n* = 2, *f* = 2), and Device (*n* = 1, *f* = 1). For subcategory Applications (*n* = 5, *f* = 8), at the Adoption level, AP3 stated "That would be more of the teacher, I would say, actually teaching the students how to use the technology that she's using in the classroom." AP4 referenced using a Digital Platform (*n* = 2, *f* = 2) to illicit "…written responses to questions…" and to provide "…individualized or group feedback in response to written responses." Highlighting teacher use of Devices (*n* = 1, *f* = 1), AP6 stated that students would be "…using something like a tablet, but again, maybe not completely throughout their lesson."

The category Collaboration followed (*n* = 2, *f* = 3) with a total of two unique administrators of seven (29%) providing mentions at the Adoption level. Administrators perceived that student Collaboration (*n* = 2, *f* = 3), at the TIM© (FCIT, 2018) Adoption level, occurred through subcategory Students (*n* = 2, *f* = 3), via student use of applications such as Google Documents®.

Though the following mentions did not meet the criteria to be considered a category or subcategory, they did emerge via grounded theory methods analysis (Glaser & Strauss, 2008) of data at the Adoption level: teacher-led instruction was perceived to occur through the use of new hardware and software as new instructional approaches were attempted (*n* = 1, *f* = 1), perceptions also included the presence of teacher frustration with hardware and software (*n* = 1, *f* = 1), buy-in from teachers was considered achieved, and an administrator referred to technology integration at this level as a done deal. Also mentioned, at the Adoption level was the perception that software tools would be differentiated based on student learning experiences (*n* = 1, *f* = 1).

Results of qualitative analysis for Item 2, instruction at the Adoption level, are presented in Table 8.

Table 8

Perceptions of Integration Categories and Subcategories: TIM© Adoption Level (N = 7)

Category Subcategory	AP1	AP2	AP3	AP4	AP5	AP6	Principal	Total *n* *f*
Interaction with Technology	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 3	*n* = 1 *f* = 3	*n* = 1 *f* = 1	*n* = 1 *f* = 2	*n* = 1 *f* = 2	*n* = 5 *f* = 11
Applications	*f* = 0	*f* = 0	*f* = 2	*f* = 2	*f* = 1	*f* = 1	*f* = 2	*f* = 8
Digital Platform	*f* = 0	*f* = 0	*f* = 1	*f* = 1	*f* = 0	*f* = 0	*f* = 0	*f* = 2
Device	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 1	*f* = 0	*f* = 1
Collaboration	*n* = 1 *f* = 2	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 2 *f* = 3
Students	*f* = 2	*f* = 0	*f* = 0	*f* = 0	*f* = 1	*f* = 0	*f* = 0	*f* = 3
Students and Teachers	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0

Adaptation Level

Five categories were observed via grounded theory analysis methods (Glaser & Strauss, 2008) from administrator responses: Interaction with Technology (n = 4, f = 11), Student Selection (n = 3, f = 3), Collaboration (n = 1, f = 4), Direct Instruction (n = 1, f = 1), and Student Production (n = 1, f = 1).

Of the six total salient categories across all five TIM© (FCIT, 2018), levels five (83%) were found to be supported by data at the Adaption level. Teacher and student Interaction with Technology (n = 4, f = 11), with subcategories of Applications (n = 4, f = 7) and Device (n = 2, f = 4), was coded in four of the seven (57%) administrator responses. Three of the seven (43%) administrator responses supported the coding of Student Selection (n = 3, f = 3). Categories Collaboration (n = 1, f = 4), Direct Instruction (n = 1, f = 1), and Student Production (n = 1, f = 1) were each coded in one of seven (14%) unique administrator item responses at the Adaptation level.

The most salient category for Item 3, teachers' integration of technology in instruction at the Adaptation level, was observed to consist of teachers and students interacting with technology (Interaction with Technology, $n = 4$, $f = 11$); subcategories were found to mention Applications ($n = 4$, $f = 7$), perceived as tools for experimentation, and the use of Devices ($n = 2$, $f = 4$). The category Student Selection ($n = 3$, $f = 3$), and subcategory Applications ($n = 3$, $f = 3$), followed addressing student choice in type of technology used in the lesson. Student Selection ($n = 3$, $f = 3$) was perceived to encompass student selection of applications for use during a lesson. Mentions of use of Applications ($n = 4$, $f = 7$), subcategory of Interaction with Technology, AP3 stated "Students give ideas about what kind of apps or programs they want to use to be able to maybe present content in the classroom or even be taught content in the classroom." AP3 also mentioned Devices ($n = 2$, $f = 4$) by stating "they have to use a digital device where they do recordings, so some of the teachers will use maybe an MP3, or maybe another kid likes to use Zoom." Finally, when mentioning Student Selection ($n = 3$, $f = 3$), via subcategory Applications ($n = 3$, $f = 3$), AP5 stated "I believe that would be where a task is presented and the students have more flexibility and choice in what digital tool could be used on their behalf to accomplish that specific goal."

Though not meeting the criteria to be considered a category or subcategory, being mentioned twice by at least two or more unique administrators one time across all five TIM© (FCIT, 2018) levels, the following mentions were supported by analysis at the Adaptation level: teacher learning was perceived to be job-embedded through experimentation with new technologies ($n = 1$, $f = 1$), teachers were expected to be experimenting with various digital tools

(n = 1, f = 1), and it was perceived that digital tools would be pedagogically selected based on task and content (n = 1, f = 1). Qualitative analysis of Item 3 responses, instruction at the Adaptation level, is presented in Table 9.

Table 9

Perceptions of Integration Categories and Subcategories: TIM© Adaptation Level (N = 7)

Category Subcategory	AP1	AP2	AP3	AP4	AP5	AP6	Principal	Total *n* *f*
Interaction with Technology	n = 1 f = 1	n = 1 f = 1	n = 1 f = 5	n = 0 f = 0	n = 0 f = 0	n = 1 f = 4	n = 0 f = 0	n = 4 f = 11
Applications	f = 1	f = 1	f = 2	f = 0	f = 0	f = 3	f = 0	f = 7
Device	f = 0	f = 0	f = 3	f = 0	f = 0	f = 1	f = 0	f = 4
Digital Platform	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0
Student Selection	n = 0 f = 0	n = 0 f = 0	n = 1 f = 1	n = 0 f = 0	n = 1 f = 1	n = 0 f = 0	n = 1 f = 1	n = 3 f = 3
Applications	f = 0	f = 0	f = 1	f = 0	f = 1	f = 0	f = 1	f = 3
Demonstration of Learning	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0
Collaboration	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 1 f = 4	n = 1 f = 4
Students	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 4	f = 4
Students and Teachers	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0	f = 0
Direct Instruction	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 1 f = 1	n = 1 f = 1
Student Production	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 0 f = 0	n = 1 f = 1	n = 0 f = 0	n = 1 f = 1

Infusion Level

Via grounded theory analysis methods (Glaser & Strauss, 2008), five categories were observed to be present at the TIM© (FCIT, 2018) Infusion Level: Student Selection (n = 3, f = 3), Direct Instruction (*n* = 2, *f* = 2), Interaction with Technology (*n* = 1, *f* = 2), Collaboration (*n* = 1, *f* = 2), and Student Production (*n* = 1, *f* = 1).

The most salient categories, from Item 4 response analysis, were Student Selection (*n* = 3, *f* = 3), which was coded in three of the seven (43%) unique administrator responses and Direct Instruction (*n* = 2, *f* = 2), which was coded in two of the seven (29%) unique administrator responses. Less salient were Interaction with Technology (*n* = 1, *f* = 2), Collaboration (*n* = 1, *f* = 2), and Student Production (*n* = 1, *f* = 1) which were each coded in one of the seven (14%) administrator responses. Five out of the six salient categories (83%) were observed at the TIM© (FCIT, 2018) Infusion level.

The most salient category for Item 4, teachers' integration of technology in instruction at the Infusion level, was Student Selection (*n* = 3, *f* = 3) with the subcategory Demonstration of Learning (*n* = 3, *f* = 3). AP6 mentions subcategory Demonstration of Learning (*n* = 3, *f* = 3) by stating "... I mean, this is sometimes the teacher gives them options, sometimes they don't, and the students have the ability to kind of choose the right tools to show their outcome." Teacher reduction in Direct Instruction (*n* = 2, *f* = 2) followed and was supported by AP4's statement "I want you to show me three different ways in which you understand quadratic equations." Both Interaction with Technology (*n* = 1, *f* = 2), via subcategory Digital Platforms, (*n* = 1, *f* = 2) and Collaboration (*n* = 1, *f* = 2), with subcategory Students and Teachers, followed (*n* = 1, *f* = 2). When mentioning a Digital Platform (*n* = 1, *f* = 2), AP2 stated "So we're using the Canvas® platform; they have the links, and it's basically used in the lesson." In reference to Collaboration (*n* = 1, *f* = 2) between Students and Teachers (*n* = 1, *f* = 2), AP2 stated "It would be a collaborative lesson where the students are digitally provided feedback and digitally reflect."

Though the following mentions did not meet the criteria to be considered a category or subcategory, requiring at least two mentions by two or more unique administrators one time across all five TIM© (FCIT, 2018) integration levels, but they did emerge from data analysis of Item 4: instructional strategies being fully implemented digitally with ease (n = 1, f = 1), teachers would differentiate lessons based on learner needs (n = 1, f = 1), and the cognitive demand for students would be high (n = 1, f = 1). Qualitative analysis of Item 4, administrator perceptions of instruction at the Infusion level, is presented in Table 10.

Table 10

Perceptions of Integration Categories and Subcategories: TIM© Infusion Level (N =7)

Category Subcategory	AP1	AP2	AP3	AP4	AP5	AP6	Principal	Total *n* *f*
Student Selection	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1	*n* = 1 *f* = 1	*n* = 3 *f* = 3
Demonstration of Learning	*f* = 0	*f* = 0	*f* = 1	*f* = 0	*f* = 0	*f* = 1	*f* = 1	*f* = 3
Applications	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0
Direct Instruction	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1	*n* = 1 *f* = 1	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 2 *f* = 2
Interaction with Technology	*n* = 0 *f* = 0	*n* = 1 *f* = 2	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 2
Digital Platform	*f* = 0	*f* = 2	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 2
Device	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0
Application	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0
Collaboration	*n* = 0 *f* = 0	*n* = 1 *f* = 2	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 2
Students and Teachers	*f* = 0	*f* = 2	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 2
Students	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0	*f* = 0
Student Production	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 0 *f* = 0	*n* = 1 *f* = 1

Transformation Level

Administrator responses were analyzed via grounded theory analysis methods (Glaser & Strauss, 2008) at the TIM© (FCIT, 2018) Transformation level. Of note, six of the six salient categories (100%), across all five TIM© (FCIT, 2018) levels, were present at the Transformation level: Application (n = 3, f = 3), Direct Instruction (n = 2, f = 2), Student Production (n = 2, f = 2), Student Selection (n = 1, f = 1), Collaboration (n = 1, f = 1), and Interaction with Technology (n = 1, f = 1).

Application (n = 3, f = 3) was the most salient category being coded in three of the seven (43%) administrator responses. Direct Instruction (n = 2, f = 2) was less salient, having been coded in two of seven (29%) administrator responses. Student Production (n = 1, f = 1) Student Selection (n = 1, f = 1), Collaboration (n = 1, f = 1), and Interaction with Technology (n = 1, f = 1), were each coded in one of seven (14%) administrator responses.

The most salient category for Item 5, teachers' integration of technology in instruction at the Transformation level, was Application (n = 3, f = 3). Administrator perceptions highlighted extending beyond respective content curricula and students participating in community-based activities as supported by AP2's statement "I think it's a complete extension of not just learning but actually incorporating, almost like a real world type use of digital technology." Participant Principal further supported the category Application (n = 3, f = 3) through the statement "I think this is where students and teachers tend to go above and beyond what's taught in the standard curriculum."

Also mentioned at the Transformation level was Student Production (n = 2, f = 2) which included students producing modules of content, presenting information, and producing differentiated products based on various activities and community based projects. AP1's statement supported the category Student Production (*n* = 2, *f* = 2) via the statement “they're creating something together, and it's something created in the moment that wasn't actually planned out, but it had to have been done using technology…” AP2 further stated “So in my opinion, I think it's a complete extension of not just learning but actually incorporating, almost like a real world type use of digital technology.”

Student Selection (*n* = 1, *f* = 1), via subcategory Applications (*n* = 1, *f* = 1), Collaboration (*n* = 1, *f* = 1), via subcategory Students and Teachers (*n* = 1, *f* = 1), and Interaction with Technology (*n* = 1, *f* = 1), via subcategory Applications (*n* = 1, *f* = 1), were each mentioned once by one unique administrator at the Transformation level. Student Selection (*n* = 1, *f* = 1), via subcategory Applications (*n* = 1, *f* = 1) was mentioned in AP3’s statement “They would go and do the research and come back and provide whatever apps or technology they're using to deliver that piece of information.” Collaboration (*n* = 1, *f* = 1), via subcategory Students and Teachers (*n* = 1, *f* = 1), was mentioned in AP1’s statement “…students are collaborating with the teacher, and they're creating something together…” AP6 mentioned Interaction with Technology (*n* = 1, *f* = 1), via subcategory Applications (*n* = 1, *f* = 1) by stating “Instead of necessarily doing a PowerPoint® or doing something visual they were able to show it in a way that was kind of unconventional compared to what the other kids were doing.”

Though it did not meet the threshold to be considered a category or subcategory, requiring at least two mentions by two or more unique administrators one time across all five TIM© (FCIT, 2018) integration levels, the mention of students teaching content using external resources such as an authority in a respective field (*n* = 1, *f* = 1) was observed in qualitative interview data. Findings from qualitative analysis of Item 5 are presented in Table 11.

Table 11

Perceptions of Integration Categories and Subcategories: TIM© Transformation Level (N =7)

Category Subcategory	AP1	AP2	AP3	AP4	AP5	AP6	Principal	Total *n* *f*
Application	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 3$ $f = 3$
Direct Instruction	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 2$ $f = 2$
Student Production	$n = 1$ $f = 1$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 2$ $f = 2$
Student Selection	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 1$ $f = 1$
Applications	$f = 0$	$f = 0$	$f = 1$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 1$
Demonstration of Learning	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$
Collaboration	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 1$ $f = 1$
Students and Teachers	$f = 1$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 1$
Students	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$
Interaction with Technology	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 0$ $f = 0$	$n = 1$ $f = 1$	$n = 0$ $f = 0$	$n = 1$ $f = 1$
Applications	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 1$	$f = 0$	$f = 1$
Device	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$
Digital Platform	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$	$f = 0$

Administrator Knowledge of Integration of Technology in Instruction

Seven administrators' knowledge on how teachers integrate technology in instruction was explored via qualitative interviews (*N* = 7). Administrators were presented with Items 17 and 18 from the TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018) which is presented in Appendix D. Item 17 prompted administrators to provide the average TIM© (FCIT, 2018) level for teachers' integration of technology in instruction that had been observed in the departments they supervised. Item 18 prompted administrators to provide an example of a lesson, which was observed, supporting the supplied rating.

Transcripts of interviews, which consisted of detailing observed lessons, were analyzed using the TIM© (FCIT, 2018) level descriptors. Administrator provided observations and TIM© (FCIT, 2018) levels were scored a 0, 3, or 5 based upon the researcher created TIM Scoring Rubric© (Taylor & Sanchez Corona, 2018) presented in Appendix B. Scores of 0, 3, or 5 were researcher selected values that did not correspond to each of the five TIM© (FCIT, 2018) levels. Supplied ratings, with observation descriptions used for TIM© (FCIT, 2018) descriptor placement that displayed administrators' perceptions, that demonstrated little to no knowledge of provided TIM© (FCIT, 2018) level were scored at a 0. Supplied ratings, with supporting observation evidence, that demonstrated partial understating of the supplied TIM© (FCIT, 2018) level were scored at 3. A score of 5 was given to supplied TIM© (FCIT, 2018) levels, supported by evidence from supplied observation, that demonstrated complete understanding of the level of teachers' technology integration in the observed lesson.

<u>Adoption Level</u>

Four of seven (n = 4, 57%) administrators provided observations perceived to be at the TIM© Adoption level (FCIT, 2018). Of those four observations, all four administrators (100%) referenced the category Interaction with Technology (n = 4, f = 10) via evidence supporting teacher and student Interaction with Technology (n = 4, f = 10). Subcategories of Interaction with Technology (n = 4, f = 10) that were present were Applications (n = 3, f = 7), Device (n = 1, f = 2), and Digital Platforms (n = 1, f = 1).

At the Adoption level, four of four (100%) unique observations provided by four of the seven (n = 4, 57%) administrators were found to demonstrate a complete understanding of the teachers' integration of technology in instruction at the Adoption level. Evidence from administrator responses that supported a complete understanding, TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) rating of 5, at the Adoption level included: (a) teacher used technology to model proper and procedural use of digital tools in conventional ways, (b) students used digital tools in conventional ways, (c) students were guided in digital tool use through modeling and procedural instruction, (d) students used digital tools, in conventional ways collaboratively, with teacher guidance, and (e) little to no student digital tool choice existed at this level due to teacher modeling (FCIT, 2018).

According to the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018), administrators displayed complete understanding of: (a) appropriate teacher use of technology, (b) appropriate student use of technology, (c) gradual release model of instruction, (d) cooperative learning, and (e) student choice of technology tools used at the Adoption level. Table 12 presents administrator observation level and evidence for observed teachers' technology integration in instruction at the Adoption level.

Table 12

Ratings of Teachers' Integration of Technology at TIM© Adoption Level (N = 7)

Category: Interaction with Technology Subcategory	*n*	*f*	Participant Quotes	Rating
Applications	1	4	Things are used, embedded in programs like Pear Deck® (AP4).	5
Digital Platform	1	1	Most lessons involve some form of using Launch Pad® and Canvas® (AP4).	
Applications	1	2	During this lesson, all teachers in the PLC [professional learning community] of United States History were utilizing Nearpod® (AP5).	5
Applications	1	1	They might have some conversation or standard-based question type conversation, where they record their responses in a Google Doc® (AP6).	5
Device	1	2	Students would individually walk up to the Smart Board® and, with assistance from the technology, read through the article (Principal).	5

Adaptation Level

Three of the seven (n = 3, 43%) administrators provided observations at the TIM© Adaptation level (FCIT, 2018). Of those three observations, all three administrators (100%) supplied evidence supporting the category Interaction with Technology (n = 3, f = 4). Subcategories Applications (n = 3, f = 3) and Device (n = 1, f = 1) were present within the category Interaction with Technology (n = 3, f = 4). One of the three (33%) of administrators referenced the category Collaboration (n = 1, f = 1) and subcategory Students (n = 1, f = 1) and one administrator (33%) referenced the category Student Production (n = 1, f = 1).

Evidence from administrator responses supported a partial understanding for all three administrators (100%). TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) ratings of 3, at the Adaptation level included: (a) teacher used technology to model proper and procedural use of digital tools in conventional ways when, at this level, teachers would be observed facilitating students exploring independent technology use, (b) students used digital tools in conventional ways but lacked student digital tool choice and exploration, (c) independent student use of technology to construct some knowledge was lacking, (d) students used digital tools, in conventional ways collaboratively with teacher guidance but lacked student choice, and (e) little to no student digital tool choice existed to construct some knowledge independently (FCIT, 2018).

All three observations (100%), with administrators supplied TIM© (FCIT, 2018) level, were coded as a three for partial understanding. According to the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018), administrators displayed partial understanding of: (a) appropriate teacher use of technology, (b) appropriate student use of technology, (c) gradual release model of instruction, (d) cooperative learning, and (e) student choice of technology tools used. Analysis is presented in Table 13.

Table 13

Ratings of Teachers' Integration of Technology at TIM© Adaptation Level (N = 7)

Category: Subcategory	*n*	*f*	Participant Quotes	Rating
Interaction with Technology	1	2		3
Applications			They were using a Near Pod® (AP1).	
Device			The teacher was pulling out their submissions and bringing them up on the Smart Board® (AP1).	
Collaboration	1	1		
Students			The students were doing that, and it was very collaborative and interactive (AP1).	
Interaction with Technology	1	1		3
Applications			It then went to a Near Pod® lesson where Near Pod® was utilized to basically have students rate themselves on a scale of knowledge, interact with an activity, and participate in the culminating task (AP2).	
Interaction with Technology	1	1		3
Applications			The students used those annotations to then fill in the chart that was on a Google Doc® and then discussed it while changing their answers independently on a chart (AP6).	
Student Production	1	1	The students used those annotations to then fill in the chart that was on a Google Doc® and then discussed it while changing their answers independently on a chart (AP6).	3

<u>Infusion Level</u>

One of the seven (*n* = 1, 14%) administrators provided an observation at the TIM© level of Infusion (FCIT, 2018). Categories observed were Student Selection (*n* = 1, *f* = 1), with subcategory Demonstration of Learning (*n* = 1, *f* = 1), Interaction with Technology (*n* = 1, *f* = 1), with subcategory Applications (*n* = 1, *f* = 1), and Direct Instruction (*n* = 1, *f* = 1).

The administrator supplied TIM© (FCIT, 2018) level and evidence from observation were analyzed with the researcher created TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) which yielded a rating of 3. Evidence from administrator response that supported a partial understanding, TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) rating of 3, at the Infusion level included: (a) teacher provided the learning context and dictated digital tools to be used (b) students used digital tools in conventional ways but lacked regular choice and exploration (c) independent student choice in and use of technology to regularly construct knowledge was lacking, (d) students used digital tools, in conventional ways collaboratively with teacher guidance but lacked regular student independent choice, and (e) little to no self-directed student digital tool choice existed to regularly construct knowledge (FCIT, 2018).

This particular administrator, coded as AP3 for data analysis purposes, was found to exhibit a partial understanding of teachers' integration of technology in instruction at the Infusion level. According to the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018), the administrator displayed partial understanding of: (a) appropriate teacher use of technology, (b) appropriate student use of technology, (c) gradual release model of instruction, (d) cooperative learning, and (e) student choice of technology tools used. Analysis is presented in Table 14.

Table 14

Ratings of Teachers' Integration of Technology at TIM© Infusion Level (N = 7)

Category Subcategory	*n*	*f*	Participant Quotes (AP3)	Rating
Student Selection	1	1		3
Demonstration of Learning			One of my teachers allowed students to choose a topic that they wanted based on several given.	
Interaction with Technology	1	1		
Applications			But, it was just another resource, and then they used a Padlet® to create high-order thinking questions related to that particular topic that students were going to have to eventually answer in another class period.	
Direct Instruction	1	1	She gave them a rubric that said task one, complete this this; task two, complete this. It was also visible on the board. Groups had to rotate. So, in other words, once they were done, group A went to group B's to answer those questions and then gave feedback to find loopholes in questions.	

Administrator Scored TIM© Observations

Six of the seven (*n* = 6, 86%) administrators, who are employed at the school of study CFHS), presented one observation that detailed teachers' integration of technology in instruction and associated TIM© (FCIT, 2018) levels. One of the seven administrators (*n* = 1, 14%), AP6, supported both the English Language Arts (ELA) and Reading departments and thus provided three different observations and associated TIM© (FCIT, 2018) levels. ELA department classes consisted of students in grade 9 and grade 10 scheduled separately thus prompting two observations. Reading department classes consisted of grade 9 and grade 10 students scheduled within classes together thus prompting one observation. These additional ELA and Reading observations were collected to answer Research Question 2.

Administrators rated four of the nine observations (44%), at the TIM© Adoption level (FCIT, 2018). When the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was applied to both the observation descriptions and administrator supplied TIM© (FCIT, 2018) level, all four (100%) administrator observations were found to support complete understanding of teachers' technology integration in instruction at the Adoption level.

Administrators rated four of the nine (44%) unique observations at the TIM© (FCIT, 2018) Adaptation level. When the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was applied to both the observation descriptions and administrator supplied TIM© (FCIT, 2018) level, all 4 (100%), administrator observations were found to support partial understanding of teachers' technology integration in instruction at the Adaptation level.

One administrator (*n* =1, 14%) rated one of the nine (11%) observations at the TIM© (FCIT, 2018) Infusion level. When the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) was applied to both the observation description and administrator supplied TIM© (FCIT, 2018) level, the administrator was found to exhibit partial understanding of teachers' technology integration in instruction at the Infusion level. Analyses on administrator observed lessons and supplied levels are presented in Table 15.

Table 15

Administrator Rated TIM© Observations of Teachers' Integration of Technology: Adoption to Infusion (N = 7)

TIM© Level	Rating	Participant Quotes
Adoption	5	For example, the teacher had the students reading a chunk of text on a Google Doc®, and then they were responding to questions on that Google Doc® that kind of helped them to make inferences (AP6).
Adoption	5	Most lessons involve some form of using Launch Pad® and Canvas® and then some type of third integration of either a program or a digital book. They may even use a social media version of some sort of example, whether it's a YouTube© video or a Khan Academy® activity or other programs (in Pear Deck® and things, AP4).
Adoption	5	During this lesson all teachers, in the PLC of United States History, were using Near Pod® and digital platforms to deliver instruction (AP5).
Adoption	5	…the teacher was using an active reading lesson, where the students would individually walk up to the board and, with assistance from the technology, read through the article (Principal).
Adaptation	3	They were using a Near Pod®. The students were doing that, and it was very collaborative and interactive, where they were having to pull different things out...(AP1).
Adaptation	3	…Nearpod® was utilized to basically have the student's rate themselves on a scale with knowledge, interact with an activity, and work on a culminating task which was just basically sharing out what they had learned within the lesson…(AP2).
Adaptation	3	I was in a classroom today where the students had read a text the day before and they had annotated for specific things in different colors. So, like purpose in one color and annotations for rhetorical devices in another color. That would be an example (AP6).
Adaptation	3	…they record their responses in a Google Doc®, but they're not necessarily interacting with it; it's just a place to kind of dump in what they're doing that day...(AP3).
Infusion	3	…and then use a Padlet© to create high-order thinking questions that they would create related to that particular topic…(AP3).

Data Analysis: Research Question 2

What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts [FSA] (FSA, 2018)?

Research Question 2 was crafted to explore possible relationships between digital instructional leadership and student achievement, as measured by Florida Standards Assessment (FSA) English Language Arts (ELA) scale scores (FSA, 2018). Due to the small sample size of administrators in this instrumental case study (Fraenkel et al., 2015), $N = 7$ with five degrees of freedom (*df*), correlational findings may not be representative of the overall population (Steinberg, 2011). Instead, qualitative description and descriptive statistics of range, mean, and standard deviation of scale and achievement level scores were conducted to provide context for this instrumental case study (Fraenkel et al., 2015). Analysis was intended to build upon existing knowledge and inform future quantitative studies examining possible relationships between digital instructional leadership, one to one initiatives, and student achievement. Grade 9 (n = 967) and Grade 10 (n = 929) FSA (2018) ELA scale and achievement level scores were examined yielding a total N = 1896.

Digital Instructional Leadership and Grade 9 FSA ELA Scores

Grade 9 (n = 967) Florida Standards Assessment (FSA) English Language Arts (ELA) scale and achievement level scores (FSA, 2018) were analyzed using SPSS®. Descriptive statistics analysis was also conducted. Exploring digital instructional leadership, in one-to-one environments, and student achievement was initiated through analysis of unique administrator grounded theory (Glaser & Strauss, 2008) analysis categories, unique administrator supplied observation and TIM© (FCIT, 2018) levels, TIM© Qualitative Interview Protocol (Taylor & Sanchez Corona, 2018) ratings, and 2018 FSA ELA student scale and achievement level score (FSA, 2018) descriptive statistics. Only one of the seven (n = 1, 14%) administrators, AP6, supported both the English Language Arts and Reading content area departments; thus, analyses was conducted with data collected solely from participant AP6. Analyses were conducted examining data at the grade 9 ELA level, the grade 10 ELA level, and the combined grades 9 and 10 Reading levels. Examination of separate grade 9 and grade 10 Reading department levels was not conducted due to the school of study electing to combine grade 9 and grade 10 students in reading classes for the 2018-2019 school year.

Analysis at the grade 9 English Language Arts (ELA) level was conducted using the 2018 FSA ELA student (*n* = 967) scale and achievement level scores (FSA, 2018). Perceived categories, from AP6, were compared to the observed the TIM© (FCIT, 2018) level of teachers' integration of technology in instruction and with researched coded TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) rating. AP6 supplied an observation at the TIM© (FCIT, 2018) Adaptation level. At the Adaptation level, AP6 perceived that students would be producing products of knowledge and interacting with new technology using tools such as Power Point®, Google Documents®, and other tools. Applying the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) to AP6's supplied observation and TIM© (FCIT, 2018) level yielded a rating of a 3 (partial understanding) for Adaptation.

Student developmental scale scores ranged from 276 to 401 on the 2018 FSA ELA. The 2018 FSA ELA student mean scale score was found to be 338.29 with a standard deviation of 25.46. Students earning a mean scale score of 343 are considered proficient in grade 9 ELA Florida Standards (FSA, 2018). Students' achievement level scores ranged from 1 to 5. Percentages of students scouring at each respective level were found to be the following: 28% at level 1, 22% at level 2, 23% at level 3, 19% at level 4, and 9% at level 5. Teachers' integration of technology in instruction, at the grade 9 level, and 2018 FSA ELA score analysis is presented in Table 16.

Table 16

Perceptions, Observed Ratings, and FSA ELA Student Scores of Grade 9 ELA Students: AP6

TIM Level Rating	Category Subcategory	FSA ELA Scores
Adaptation	Interaction with Technology	*n = 967*
3	Applications	
		Developmental Scale Scores
	Student Production	Minimum = 276.00
		Maximum = 401.00
		Mean = 338.29
		Standard Deviation = 25.46
		Achievement Level Scores %
		Level 1 = 28
		Level 2 = 22
		Level 3 = 23
		Level 4 = 19
		Level 5 = 9

Digital Instructional Leadership and Grade 10 FSA ELA Scores

Analysis at the grade 10 English Language Arts (ELA) level was conducted using (*n* = 929) student Florida Standards Assessment (FSA, 2018) ELA scale and achievement level scores. Perceived categories of AP6 were compared to observed TIM© (FCIT, 2018) level of teachers' integration of technology in instruction and TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) assigned knowledge rating. AP6 supplied an observation at the TIM© (FCIT, 2018) Adaptation level. At that level, AP6 perceived that students would be producing products of knowledge and interacting with new technology using tools such as Power Point®, Google Documents®, tablet computers, and other tools. Applying the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) to AP6's supplied observation and TIM© (FCIT, 2018) level yielded a rating of a 3 (partial understanding) for Adoption.

Student developmental scale scores range from 276 to 412 on the 2018 FSA ELA. The 2018 FSA ELA student mean scale score was found to be 348.20 with a standard deviation of 25.65. Students earning a mean scale score of 350 are considered proficient in grade 10 ELA Florida Standards (FSA, 2018). Students' achievement level scores ranged from 1 to 5. Percentages of students scouring at each respective level were found to be the following: 25% at level 1, 21% at level 2, 22% at level 3, 21% at level 4, and 10% at level 5. Teachers' integration of technology in instruction, at the grade 10 level, and 2018 FSA ELA score analysis are presented in Table 17.

Table 17

Perceptions, Observed Ratings, and FSA ELA Student Scores in Grade 10 ELA: AP6

TIM Level Rating	Category Subcategory	FSA ELA Scores
Adaptation 3	Interaction with Technology Applications	*n* = 929
		Developmental Scale Scores
	Student Production	Minimum = 276.00
		Maximum = 412.00
		Mean = 348.20
		Standard Deviation = 25.65
		Achievement Level Scores %
		Level 1 = 25
		Level 2 = 21
		Level 3 = 22
		Level 4 = 21
		Level 5 = 10

Digital Instructional Leadership and Grades 9 and 10 FSA ELA Scores

Analyses at the grades 9 and 10 English Language Arts (ELA) and Reading department levels were conducted using student (*N* = 1896) 2018 FSA ELA scale and achievement level scores. Perceived categories of AP6 were compared to observed (FCIT, 2018) level of teachers' integration of technology in instruction and TIM© Scoring Rubric (Taylor & Sanchez Corona,

2018) assigned knowledge rating. AP6 supported both the English Language Arts (ELA) and Reading departments and thus provided two different observations and associated TIM© (FCIT, 2018) levels.

AP6 supplied an observation at the TIM© (FCIT, 2018) Adaptation level. At that level, AP6 perceived that students would be producing products of knowledge, interacting with new technology using tools such as Power Point®, Google Documents® and other tools, and interacting with tools and tablet computers. AP6 also mentioned that teachers' integration of technology in instruction was complete at the Adoption level (FCIT, 2018). Applying the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) to AP6's supplied observations: one at the Adoption (FCIT, 2018) level yielded a rating of a 5 (complete understanding), and one at the Adaptation TIM© (FCIT, 2018) level yielded a rating of a 3 (partial understanding).

The 2018 FSA ELA student mean scale score was found to be 343.15 with a standard deviation of 26.02. Student scale scores ranged from 276-412 on the 2018 FSA ELA. Students' achievement level scores ranged from 1 to 5. Percentages of students scouring at each respective level were found to be the following: 27% at level 1, 21% at level 2, 23% at level 3, 20% at level 4, and 10% at level 5. Teachers' integration of technology in instruction, at grades 9 and 10 levels, and the 2018 FSA ELA score analyses are presented in Table 18.

Table 18

Perceptions, Observed Ratings, and FSA ELA Student Scores in Grades 9 and 10: AP6

TIM Levels Ratings	Category Subcategory	FSA ELA Scores
Reading Observation	Interaction with Technology	*n* = 1896
Adoption	Device	
5	Applications	Developmental Scale Scores
		Minimum = 276.00
		Maximum = 412.00
	Interaction with Technology	Mean = 343.15
ELA Observation	Applications	Standard Deviation = 26.02
Adaptation		
3		Achievement Level Scores %
	Student Production	Level 1 = 27
		Level 2 = 21
		Level 3 = 23
		Level 4 = 20
		Level 5 = 10

Data Analysis: Research Question 3

To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

To examine to the extent, if any, administrators' self-perceived readiness to lead in a digital environment changed over time, the seven CFHS administrators (*N* = 7) were administered the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016). The seven administrators were matched to the profiles of seven administrators who were administered the DILRI© (Taylor & Shepherd, 2016) in 2016 (MHS). Administrators were matched on the following variables: (a) current position, (b) years in current position, (c) years in administrative position, and (d) years in one-to-one environments. A summary of these four variables for CFHS administrators, who participated in this study, and MHS administrator profiles (Shepherd, 2017) are presented in Table 19.

Table 19

CFHS (2018) and MHS (2016) Administrator Experience in Years (N = 14)

Participant	Administrator	One-to-One Environment	Current Position
AP1	<5	1-3	1-3
AP2	11-15	1-3	<1
AP3	<5	1-3	1-3
AP4	<5	4-6	1-3
AP5	<5	4-6	<1
AP6	21-25	>10	<1
Principal	11-15	4-6	<1
MAP1	<5	1-3	1-3
MAP2	5-10	1-3	4-6
MAP3	<5	1-3	1-3
MAP4	<5	1-3	<1
MAP5	5-10	1-3	1-3
MAP6	5-10	1-3	4-6
MPrincipal	21-25	4-6	<1

Factors Which Have Influenced Knowledge to Lead in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 1 prompted participants to select all the factors that had influenced their knowledge to lead in a digital environment. Options presented to participants were: (a) Colleagues, (b) Experience Supervising Others, (c) Graduate Coursework, (d) Instructional Coaches, (e) Professional Conferences, (f) Professional Development in Leading in a Digital School Environment, (g) Professional Practice, (h) Readings, (i) Supervisors, (j) Workshops, and (k) Others (Taylor & Shepherd, 2016). Item 1, select all factors that apply which have influenced your knowledge to lead in a digital school environment (Taylor & Shepherd, 2016) for each respective group of administrators, was analyzed by calculating the selection percentage of each variable, by group, to determine possible change, if any, in factors that influenced knowledge to lead in a digital school environment.

Colleagues, Experience Supervising Others, Instructional Coaches, and Professional Development were the factors selected by the majority of CFHS administrators, with six of seven participants (*n* = 6, 86%) selecting these variables as having influence on their knowledge to lead in a digital environment. Professional Practice, Supervisors, and Workshops were selected by five of the seven (*n* = 5, 71%) administrators at CFHS. Readings and Conferences were reported to be influential by four of seven (*n* = 4, 57%) and two of seven (*n* = 2, 29%) administrators respectively. Graduate Courses was selected by one of seven (*n* = 1, 14%) administrators. No other variables (*n* = 0, 0%), that were perceived to have influenced knowledge to lead in a digital school environment, were provided by CFHS administrators. CFHS administrator variable selections and percentages are presented in Table 20.

Table 20

CFHS (2018) Influence on Knowledge in Leading a Digital School (N = 7)

Factor	*f*	% of Administrators
Colleagues	6	86
Experience Supervising Others	6	86
Instructional Coaches	6	86
Professional Development	6	86
Professional Practice	5	71
Supervisors	5	71
Workshops	5	71
Readings	4	57
Conferences	2	29
Graduate Courses	1	14
Other	0	0

All (*N* = 7, 100%) MHS administrators selected the variable, Colleagues, as having influenced their knowledge to lead in a digital school environment. Experience Supervising Others and Instructional Coaches were selected as being influential variables by five of seven (*n* = 5, 71%) of the MHS administrators. Professional Practice (*n* = 4, 57%) and Conferences (*n* = 3, 43%) were selected by four and three MHS administrators respectively. Two of the seven (*n* = 2, 29%) MHS administrators selected Readings, Supervisors, and Workshops as influential followed by one of seven (*n* = 1, 14%) who selected Professional Development. None (*n* = 0, 0%) of the MHS administrators selected Graduate Courses or supplied other variables that were perceived to influence their knowledge to lead in a digital school environment. MHS administrator variable selections and percentages are presented in Table 21.

Table 21

MHS (2016) Influence on Knowledge in Leading a Digital School for (N = 7)

Factor	*f*	% of Administrators
Colleagues	7	100
Experience Supervising Others	5	71
Instructional Coaches	5	71
Professional Practice	4	57
Conferences	3	43
Reading	2	29
Supervisors	2	29
Workshops	2	29
Professional Development	1	14
Graduate Courses	0	0
Other	0	0

Analysis of the differences between the 2016 and 2018 administrations of MHS responses to those of CFHS administrators, using Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) data, was conducted to determine the change in percentage of participants who selected each variable perceived to influence knowledge to lead in a digital school environment. The variable, Professional Development, increased the most at, 71% (*n* = 5). Participant-selected variables, Supervisors and Workshops, followed with an increase of 43% (*n* = 3). Readings increased 29% (*n* = 2). Increasing by 14% (*n* = 1) were Experience Supervising Others, Graduate Courses, Instructional Coaches, and Professional Practice. Decreasing in selection from the 2016 administration to the 2018 administration, at -14% (*n* = 1), were Colleagues and Conferences. Percentage changes from the 2016 to the 2018 DILRI© (Taylor & Shepherd, 2016) administrations are presented in Table 22.

Table 22

MHS (2016) and CFHS (2018) Influence on Knowledge in Leading a Digital School (N = 14)

Factor	MHS		CFHS		Difference	
	n	(%)	*n*	(%)	*n*	(%)
Professional Development	1	(14)	6	(86)	5	(71)
Supervisors	2	(29)	5	(71)	3	(43)
Workshops	2	(29)	5	(71)	3	(43)
Readings	2	(29)	4	(57)	2	(29)
Experience Supervising Others	5	(71)	6	(86)	1	(14)
Graduate Courses	0	(0)	1	(14)	1	(14)
Instructional Coaches	5	(71)	6	(86)	1	(14)
Professional Practice	4	(57)	5	(71)	1	(14)
Others	0	(0)	0	(0)	0	(0)
Colleagues	7	(100)	6	(86)	1	(-14)
Conferences	3	(43)	2	(29)	1	(-14)

Factors Which Have Influenced Confidence to Lead in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 2 prompted participants to select all the factors that had influenced their confidence to lead in a digital environment. Options presented to participants were: Colleagues, Experience Supervising Others, Graduate Coursework, Instructional Coaches, Conferences, Professional Development, Professional Practice, Readings, Supervisors, Workshops, and Others (Taylor & Shepherd, 2016). Item 2 was analyzed by calculating the selection percentage of each variable, for each respective group of administrators, to determine possible change, if any, in factors that influenced confidence to lead in a digital school environment.

Professional Practice was determined to influence confidence to lead in a digital school environment by all seven (*N* = 7, 100%) of CFHS administrators followed by Colleagues by six of seven (*n* = 6, 86%) administrators. The variables, Experiencing Supervising Others, Instructional Coaches, Professional Development, and Workshops were selected by four of seven (*n* = 4, 57%) administrators as being influential. Conferences, Readings, and Supervisors were selected by two of seven (*n* = 2, 29%) administrators as having influenced their confidence to lead in a digital school environment. The variable, Graduate Courses, was selected by one of the seven (*n* = 1, 14%) CFHS administrators. None (*n* = 0, 0%) of the administrators supplied other factors that were perceived to influence confidence to lead in a digital school environment. CFHS administrator variable selections and percentages are presented in Table 23.

Table 23

CFHS (2018) Influence on Confidence in Leading a Digital School (N = 7)

Factor	*f*	% of Administrators
Professional Practice	7	100
Colleagues	6	86
Experience Supervising Others	4	57
Instructional Coaches	4	57
Professional Development	4	57
Workshops	4	57
Conferences	2	29
Readings	2	29
Supervisors	2	29
Graduate Courses	1	14
Others	0	0

For MHS administrators, the variable, Colleagues, was observed to be the most influential for confidence to lead in a digital school environment, with six of seven (n = 6, 86%) administrators selecting it in the 2016 Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) administration (Shepherd, 2017). Experience Supervising Others, Instructional Coaches, and Professional Practice were selected by 4 of the seven (n = 4, 57%) MHS administrators. The variables, Supervisors and Others, were both selected by two of seven (n = 2, 29%) MHS administrators as having influenced their confidence to lead in a digital school environment, followed by one of seven (n = 1, 14%) MHS administrators selecting Conferences and Workshops. No MHS administrators (n = 0, 0%) selected the variables, Graduate Courses, Professional Development, or Readings, as influential variables to their confidence to lead in a digital school environment. MHS administrator variable selections and percentages are presented in Table 24.

Table 24

MHS (2016) Influence on Confidence in Leading a Digital School (N = 7)

Factor	*f*	% of Administrators
Colleagues	6	86
Experience Supervising Others	4	57
Instructional Coaches	4	57
Professional Practice	4	57
Supervisors	2	29
Others	2	29
Conferences	1	14
Workshops	1	14
Graduate Courses	0	0
Professional Development	0	0
Readings	0	0

Analysis of the differences between the 2016 and 2018 administrations, MHS administrators to CFHS administrators, on the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) was examined via change in percentage of participants who selected each variable perceived to influence confidence to lead in a digital school environment. The variable, Professional Development, increased the most at 57% (n = 4). Participant selected variables, Professional Practice and Workshops, followed with an increase of

43% (*n* = 3). Readings increased 29% (*n* = 2). Increasing by 14% (*n* = 1) were Graduate Courses and Conferences. Colleagues, Experience Supervising Others, Instructional Coaches, and Supervisors were observed to have no change from the 2016 administration to the 2018 administration. Decreasing in selection from the 2016 administration to the 2018 administration, at -29% (*n* = 2), were participant supplied Other variables perceived to influence confidence to lead in a digital school environment. Percentage changes from the 2016 to the 2018 DILRI© (Taylor & Shepherd, 2016) administrations are presented in Table 25.

Table 25

MHS (2016) and CFHS (2018) Influence on Confidence in Leading a Digital School (N = 14)

Factor	MHS		CFHS		Difference	
	n	(%)	*n*	(%)	*n*	(%)
Professional Development	0	(0)	4	(57)	4	(57)
Professional Practice	4	(57)	7	(100)	3	(43)
Workshops	1	(14)	4	(57)	3	(43)
Readings	0	(0)	2	(29)	2	(29)
Graduate Courses	0	(0)	1	(14)	1	(14)
Conferences	1	(14)	2	(29)	1	(14)
Colleagues	6	(86)	6	(86)	0	(0)
Experience Supervising Others	4	(57)	4	(57)	0	(0)
Instructional Coaches	4	(57)	4	(57)	0	(0)
Supervisors	2	(29)	2	(29)	0	(0)
Others	2	(29)	0	(0)	2	(-29)

Ranked Factors Which Have Influenced Knowledge and Confidence to Lead in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Items 3-13 prompted participants to rank order, from 1-11, all the factors that had influenced their knowledge and confidence to lead in a digital environment. The lowest ranked factor, perceived to be the most influential, was attributed a one. As perceived factor value decreased, rank order increased up to 11. A value of zero was attributed to factors that did not apply to the participant. Factors presented to participants were: Colleagues, Experience Supervising Others, Graduate Coursework, Instructional Coaches, Conferences, Professional Development, Professional Practice, Readings, Supervisors, Workshops, and Others (Taylor & Shepherd, 2016). Items 3-13, for each respective group of administrators, were analyzed by calculating the mean of each variable, by group, to determine possible change, if any, in factors that influenced knowledge and confidence to lead in a digital school environment.

From the 2018 Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) administration to CFHS administrators, the variable, Professional Practice (3.00), displayed the lowest ranked mean being perceived as the most valuable variable. The other ranked means followed: Colleagues (3.29), Experience Supervising Others (3.57), Professional Development (4.57), Workshops (4.71), Instructional Coaches (5.86), Readings (6.00), Conferences (6.29), Supervisors (8.14), Graduate Courses (9.57), and Others (11.00). Ranked order means of factors that influenced CFHS administrator knowledge and confidence to lead in a digital school environment are presented in Table 26.

Table 26

CFHS (2018) Rank Order of Factor Means Influencing Knowledge and Confidence (N = 7)

Rank	Factor	Mean	AP1	AP2	AP3	AP4	AP5	AP6	Principal
1	Professional Practice	3.00	5	3	1	5	1	3	3
2	Colleagues	3.29	4	7	2	3	5	1	1
3	Experience Supervising Others	3.57	9	5	4	1	2	2	2
4	Professional Development	4.57	1	6	3	9	4	4	5
5	Workshops	4.71	3	1	9	4	3	6	7
6	Instructional Coaches	5.86	6	4	5	2	8	8	8
7	Readings	6.00	7	2	8	8	6	5	6
8	Conferences	6.29	2	8	10	6	7	7	4
9	Supervisors	8.14	8	9	6	7	9	9	9
10	Graduate Courses	9.57	10	10	7	10	10	10	10
11	Others	11.00	11	11	11	11	11	11	11

Analysis of data from the 2016 Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) administration to MHS administrators yielded the following. The variable, Experience Supervising Others (2.14), displayed the lowest ranked mean and was observed to be the most valuable variable for knowledge and confidence in leading in a digital school. The other ranked means followed respectively: Colleagues (2.86), Instructional Coaches (4.00), Professional Practice (4.29), Supervisors (4.86), Professional Development (6.29), Readings (7.57), Conferences (7.71), Workshops (7.86), Graduate Courses (8.43), and Others (10.00). Ranked order means of factors that influenced match administrator knowledge and confidence to lead in a digital school environment are presented in Table 27.

Table 27

MHS (2016) Rank Order of Factor Means Influencing Knowledge and Confidence (N = 7)

Rank	Factor	Mean	MAP1	MAP2	MAP3	MAP4	MAP5	MAP6	MPrincipal
1	Experience Supervising Others	2.14	2	1	1	4	5	1	1
2	Colleagues	2.86	3	2	2	5	1	3	4
3	Instructional Coaches	4.00	1	3	4	2	10	6	2
4	Professional Practice	4.29	5	6	6	3	2	5	3
5	Supervisors	4.86	6	5	9	1	6	2	5
6	Professional Development	6.29	8	11	5	7	3	4	6
7	Readings	7.57	9	7	8	9	4	8	8
8	Conferences	7.71	7	9	7	6	8	10	7
9	Workshops	7.86	4	8	10	8	7	9	9
10	Graduate Course	8.43	10	10	3	10	9	7	10
11	Others	10.00	11	4	11	11	11	11	11

Change in Means of Ranked Factors Influencing Knowledge and Confidence to Lead in a Digital School Environment Comparing MHS (2016) and CFHS (2018) Administrators

Analysis of differences of rank order means between the 2016 and 2018 administrations, MHS administrators to CFHS administrators, on the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) was examined via change in ranked order means of participant selected variables perceived to influence knowledge and confidence to lead in a digital school environment. The variable, Workshops (-3.15), displayed the highest perceived value increase. The other ranked means followed respectively: Professional Development (-1.72), Readings (-1.57), Conferences (-1.42), Professional Practice (-1.29), Colleagues (0.43), Others (1.00), Graduate Courses (1.14), Experience Supervising Others

(1.43), Instructional Coaches (1.86), and Supervisors (3.28). Ranked order mean changes of factors that influenced administrator knowledge and confidence to lead in a digital school environment are presented in Table 28.

Table 28

Ranked Comparison of Factor Means Influencing Knowledge and Confidence (N = 14)

Rank	Factor	2016 MHS Mean	2018 CFHS Mean	Mean Difference
1	Workshops	7.86	4.71	-3.15
2	Professional Development	6.29	4.58	-1.72
3	Readings	7.57	6.00	-1.57
4	Conferences	7.71	6.29	-1.42
5	Professional Practice	4.29	3.00	-1.29
6	Colleagues	2.86	3.29	0.43
7	Others	10.00	11.00	1.00
8	Graduate Courses	8.43	9.57	1.14
9	Experience Supervising Others	2.14	3.57	1.43
10	Instructional Coaches	4.00	5.86	1.86
11	Supervisors	4.86	8.14	3.28

Note. Decrease in rank means indicated increase in perceived value of factor to participants.

Level of Knowledge to Recognize Instructional Factors in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Items 14-24 prompted participants to select the level of knowledge, Not Knowledgeable, Somewhat Knowledgeable, Knowledgeable, and Extremely Knowledgeable, to recognize instructional factors within a digital environment. Variables presented to participants were: (a) Student Engagement, (b) Student Problem Solving, (c) Student Multimedia Projects, (d) Student Collaboration, (e) Student Writing, (f) Student Use of Digital Resources, (g) Teacher Use of Digital Resources, (h) Teacher's Construction of Standards-based Instructional Plans, (i) Teacher Feedback, (j) Formative Assessment via Digital Tools, and (k) Differentiated Instruction (Taylor & Shepherd, 2016). Items 14-24, for each respective group of administrators, were analyzed by calculating the group mean score, via a four point Likert Scale based on administrator level of knowledge, 1 (Not Knowledgeable), 2 (Somewhat Knowledgeable), 3 (Knowledgeable), and 4 (Extremely Knowledgeable), to recognize instructional factors within a digital environment. Score changes from the 2016 administration to the 2018 administration of the DILRI© (Taylor & Shepherd, 2016) were calculated by subtracting the 2016 group mean scores from the 2018 group mean scores for each respective construct.

Data analysis from the 2016 administration and the 2018 administration of the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) administrations yielded the following knowledge mean changes: Student Engagement (M = 0.29) , Student Collaboration Engagement (M = 0.29), Teacher Use of Digital Resources Engagement (M = 0.29), Student Writing Engagement (M = 0.28), Formative Assessment via Digital Tools Engagement (M = 0.28), Differentiated Instruction Engagement (M = 0.28), Student Problem Solving Engagement (M = 0.15), Teacher's Construction of Standards-based Instructional Plans Engagement (M = 0.14), Teacher Feedback Engagement (M = 0.14), Student

Multimedia Projects Engagement (*M* = 0.00), and Student Use of Digital Resources Engagement (*M* = 0.00). CFHS and MHS administrator mean scores and mean score changes, of the level of knowledge to recognize instructional factors within a digital environment, are presented in Table 29.

Table 29

Comparison of Factor Means of Knowledge Recognizing Instructional Factors (N = 14)

Factor	2016 MHS Mean	2018 CFHS Mean	Mean Difference
Student Engagement	3.14	3.43	0.29
Student Collaboration	3.14	3.43	0.29
Teacher Use of Digital Tools	3.00	3.29	0.29
Student Writing	2.86	3.14	0.28
Digital Formative Assessment	2.86	3.14	0.28
Differentiated Instruction	2.43	2.71	0.28
Student Problem Solving	2.71	2.86	0.15
Standards-based Instructional Plans	3.00	3.14	0.14
Teacher Feedback	2.86	3.00	0.14
Student Multi-Media Projects	2.71	2.71	0.00
Student Use of Digital Tools	3.00	3.00	0.00

Level of Confidence to Recognize Instructional Factors in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Items 25-35 prompted participants to select the level of confidence, Not Confident, Somewhat Confident, Confident, and Extremely Confident, to recognize instructional factors within a digital environment. Variables presented to participants were: (a) Student Engagement,

(b) Student Problem Solving, (c) Student Multimedia Projects, (d) Student Collaboration, (e) Student Writing, (f) Student Use of Digital Resources, (g) Teacher Use of Digital Resources, (h) Teacher's Construction of Standards-based Instructional Plans, (i) Teacher Feedback, (j) Formative Assessment via Digital Tools, and (k) Differentiated Instruction (Taylor & Shepherd, 2016). Items 25-35, for each respective group of administrators, were analyzed by calculating the group mean score, via a four point Likert Scale based on administrator level of confidence, 1 (Not Confident), 2 (Somewhat Confident), 3 (Confident), and 4 (Extremely Confident), to recognize instructional factors within a digital environment. Score changes from the 2016 administration to the 2018 DILRI© (Taylor & Shepherd, 2016) administrations were calculated by subtracting the 2016 group mean scores from the 2018 group mean scores for each respective construct.

Data analysis from the 2016 administration and the 2018 administration of the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) yielded the following confidence mean changes: Teacher Feedback Engagement (M = 0.72), Student Collaboration Engagement (M = 0.71), Student Engagement (M = 0.57), Differentiated Instruction Engagement (M = 0.57), Teacher's Construction of Standards-based Instructional Plans Engagement (M = 0.43), Student Multimedia Projects Engagement (M = 0.43), Formative Assessment via Digital Tools Engagement (M = 0.43), Student Problem Solving Engagement (M = 0.29), Student Writing Engagement (M = 0.28), Teacher Use of Digital Resources Engagement (M = 0.28), and Student Use of Digital Resources Engagement (M = 0.00). CFHS and MHS administrator mean scores and mean score changes, of the level of confidence to recognize instructional factors within a digital environment, are presented in Table 30.

Table 30

Comparison of Factor Means of Confidence Recognizing Instructional Factors (N = 14)

Factor	2016 MHS Mean	2018 CFHS Mean	Mean Difference
Teacher Feedback	2.71	3.43	0.72
Student Collaboration	2.86	3.57	0.71
Student Engagement	2.86	3.43	0.57
Differentiated Instruction	2.29	2.86	0.57
Standards-based Instructional Plans	2.71	3.14	0.43
Student Multi-Media Projects	2.57	3.00	0.43
Digital Formative Assessment	2.57	3.00	0.43
Student Problem Solving	2.57	2.86	0.29
Student Writing	2.86	3.14	0.28
Teacher Use of Digital Tools	2.86	3.14	0.28
Student Use of Digital Tools	2.86	2.86	0.00

Level of Knowledge of Factors for Developing School Culture in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Items 36-45 prompted participants to select the level of knowledge, Not Knowledgeable, Somewhat Knowledgeable, Knowledgeable, and Extremely Knowledgeable, to ascertain administrator level of knowledge of factors for developing school culture in a digital school environment. Variables presented to participants were: (a) Community Support, (b) Motivating Stakeholders, (c) Resource Allocation, (d) Learning Communities, (e) Leadership Teams, (f) School Improvement Teams, (g) Knowledge of Technology, (h) Leading by Example, (i) Empowering Teachers, and (j) Shared Vision (Taylor & Shepherd, 2016). Items 36-45, for each respective group of administrators, were analyzed by calculating the group mean score, via a four point Likert Scale based on administrator level of knowledge, 1 (Not Knowledgeable), 2 (Somewhat Knowledgeable), 3 (Knowledgeable), and 4 (Extremely Knowledgeable), to recognize instructional factors within a digital environment. Score changes from the 2016 administration to the 2018 administration of the DILRI© (Taylor & Shepherd, 2016) were calculated by subtracting the 2016 group mean scores from the 2018 group mean scores for each respective construct.

Data analysis from the 2016 administration and the 2018 administration of the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) yielded the following knowledge mean changes: Leadership Teams (*M* = 0.72), Motivating Stakeholders (*M* = 0.57), Community Support (*M* = 0.57), Knowledge of Technology (*M* = 0.43), Empowering Teachers (*M* = 0.43), Leading by Example (*M* = 0.43), Resource Allocation (*M* = 0.42), Shared Vision (*M* = 0.28), School Improvement Teams (*M* = 0.15), and Learning Communities (*M* = -0.15). CFHS and MHS administrator mean scores and mean score changes, of the level of knowledge to recognize instructional factors within a digital environment, are presented in Table 31.

Table 31

Comparison of Factor Means of Knowledge Developing Digital School Culture Factors (N = 14)

Factor	2016 MHS Mean	2018 CFHS Mean	Mean Difference
Leadership Teams	2.57	3.29	0.72
Motivating Stakeholders	2.29	2.86	0.57
Community Support	2.14	2.71	0.57
Knowledge of Technology	2.14	2.57	0.43
Empowering Teachers	2.86	3.29	0.43
Leading by Example	2.57	3.00	0.43
Resource Allocation	2.29	2.71	0.42
Shared Vision	2.86	3.14	0.28
School Improvement Teams	2.71	2.86	0.15
Learning Communities	2.86	2.71	-0.15

Level of Confidence of Factors for Developing School Culture in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Items 46-55 prompted participants to select the level of confidence, Not Confident, Somewhat Confident, Confident, and Extremely Confident, to ascertain administrator level of knowledge of factors for developing school culture in a digital school environment. Variables presented to participants were: (a) Community Support, (b) Motivating Stakeholders, (c) Resource Allocation, (d) Learning Communities, (e) Leadership Teams, (f) School Improvement Teams, (g) Knowledge of Technology, (h) Leading by Example, (i) Empowering Teachers, and (j) Shared Vision (Taylor & Shepherd, 2016). Items 46-55, for each respective group of administrators, were analyzed by calculating the group mean score, via a four point Likert Scale based on administrator level of confidence, 1 (Not Confident), 2 (Somewhat Confident), 3 (Confident), and 4 (Extremely Confident), to recognize instructional factors within a digital environment. Score changes from the 2016 administration to the 2018 administration of the DILRI© (Taylor & Shepherd, 2016) were calculated by subtracting the 2016 group mean scores from the 2018 group mean scores for each respective construct.

Data analysis from the 2016 and 2018 Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) administrations yielded the following confidence mean changes: Motivating Stakeholders (*M* = 0.86), Resource Allocation (*M* = 0.71), Community Support (*M* = 0.60), Knowledge of Technology (*M* = 0.42), Leadership Teams (*M* = 0.29), School Improvement Teams (*M* = 0.14), Leading by Example (*M* = 0.14), Empowering Teachers (*M* = 0.00), Shared Vision (*M* = -0.14), and Learning Communities (*M* = -0.14). CFHS and MHS administrator mean scores and mean score changes, of the level of confidence for developing instructional factors within a digital environment, are presented in Table 32.

Table 32

Comparison of Factor Means of Confidence Developing Digital School Culture (N = 14)

Factor	2016 MHS Mean	2018 CFHS Mean	Mean Difference
Motivating Stakeholders	2.14	3.00	0.86
Resource Allocation	2.29	3.00	0.71
Community Support	2.29	2.86	0.60
Knowledge of Technology	2.29	2.71	0.42
Leadership Teams	2.71	3.00	0.29
School Improvement Teams	2.57	2.71	0.14
Leading by Example	2.86	3.00	0.14
Empowering Teachers	3.00	3.00	0.00
Shared Vision	3.14	3.00	-0.14
Learning Communities	2.71	2.57	-0.14

Knowledge and Confidence in Providing Coaching Feedback to Teachers in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 56 addressed administrator knowledge and confidence in providing feedback to teachers regarding their use of technology in standards-based instructional practice and assessment. Participants were prompted to supply an example that demonstrated their knowledge and confidence on feedback and assessment in digital school environments.

CFHS administrator responses for Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) to Item 56 were analyzed via grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008). Themes were labeled to align with [DILRI©] (Taylor & Shepherd, 2016) constructs, if applicable. Themes were considered salient if they applied to two unique administrator responses (Corbin & Strauss, 1990, 2008). Two distinct themes emerged from analysis of CFHS administrator responses: CFHS administrators provided (a) Specific Feedback (*n* = 4, *f* = 4) and provided (b) General Feedback (*n* = 2, *f* = 2). One administrators provided examples of reflective questioning (*n* = 1, *f* = 1); however, one mention did not meet the threshold of being mentioned by two unique administrators to become a theme. CFHS administrator responses and themes, teased from data, are presented in Table 33.

Table 33

CFHS (2018) Coaching Feedback Item Responses (N = 7)

Participant Response	Theme
Utilize a modality that will allow you to monitor cognitive engagement. Through PearDeck®, students can quickly be monitored regarding the understanding of content and be provided immediate feedback on misconceptions regarding the content (AP1).	Specific Feedback
An example may be students engaged in a close read strategy with an article directly aligned to the standard. In this process, the document can be done via Google Docs® to where students jigsaw the reading and annotate text. Text-dependent questions would follow where students digitally collaborate to complete those questions (AP3).	Specific Feedback
Perhaps, in the future, you could you use a Google Doc® with multiple fields in it to encourage collaboration? Once each student has completed their field, they could then do a digital gallery walk and provide comments for their partners' fields before then formulating a single unified answer (AP4).	Specific Feedback
Today's lesson focused on RI.1.2. Students were asked to conduct an independent first read and annotate the text for topics that develop the theme. Think about how you will monitor student annotations to ensure they are identifying the correct topics and tracing the development of the central idea. Consider how utilizing digital tools could help to deepen student understanding of the standard. An example might be chunking the text and using Padlet® to have students classify their topics by chunk; then, they come to a consensus using the voting feature on the most accurate topic to represent the chunk (AP5).	Specific Feedback
Please, use your most recent assessment results to conduct an item analysis on all of your students' over-all and each class section through the all of the prescribed demographic groups. Use the curriculum resource materials to determine when the re-teaching of that standard will be best applied. Assign students individualized remediation learning in the meantime on the most needed elements of the standard (AP6).	General Feedback
When I provide teachers with coaching feedback as to the use of technology in standards-based instructional practices and assessment, feedback is focused on how the use influenced the learning environment and how it was authentically integrated into the lesson (Principal).	General Feedback

MHS 2016 administrator responses to Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 56, were analyzed via grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008). Themes were labeled to align with DILRI© (Taylor & Shepherd, 2016) constructs, if applicable. One theme emerged from analysis: MHS administrators provided Specific Feedback (n = 5, f = 5). One administrator mentioned a list of professional experiences (n = 1, f = 1), however, one mention did not meet the threshold of being mentioned by two unique administrators to become a theme. MHS administrator responses and themes, teased from data, are presented in Table 34.

Table 34

MHS (2016) Coaching Feedback Item Responses (N = 7)

Participant Response	Theme
When performing an observation where a teacher was not adequately monitoring student understanding, I was able to give her multiple ways to monitor in real time using technology (MAP1).	Specific Feedback
I can suggest some digital tools to deliver instruction, but I am extremely limited in my knowledge. I wish that I would have tools to help teachers identify digital tools and strategies to effectively use each of the Marzano® elements (MAP2).	Specific Feedback
While students were utilizing Kahoot® to respond to questions about the content, there were opportunities for them to explain their reasoning behind their responses to specific questions. Include opportunities for students for students to write a brief statement about why they selected a particular response (MAP5).	Specific Feedback
Provide feedback to teachers on what tools to use and provide an example on how to monitor different engagement strategies (MAP6).	Specific Feedback
During observations, if I know of a method to do something better via a digital platform, I share that knowledge (MPrincipal).	Specific Feedback

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 56 addressed administrator knowledge and confidence in providing feedback to teachers regarding their use of technology in standards-based instructional practice and assessment. Participants were prompted to supply an example that demonstrated their knowledge and confidence on feedback and assessment in digital school environments. Grounded theory (Glaser & Strauss, 2008) and thematic analysis (Corbin & Strauss, 1990, 2008) methods were employed to tease out themes from participant responses. Themes were considered salient if they applied to two unique administrator responses (Corbin & Strauss, 1990, 2008).

Themes teased from the 2016 administration of the DILRI© (Taylor & Shepherd, 2016) to MHS administrators were compared to themes teased from the 2018 administration to CFHS administrators. Based on the comparison, shifts in administrator knowledge and confidence in providing feedback to teachers regarding their use of technology in standards-based instructional practice and assessment were observed. Shifts observed were: (a) increase in General Feedback ($n = 2$, $f = 2$) and (b) decrease in Specific Feedback ($n = 1$, $f = -1$). Comparison of 2016 and 2018 themes and observed shifts are presented in Table 35.

Table 35

Comparison of Themes: Coaching Feedback Item Responses (N = 14)

2016 MHS Themes	2018 CFHS Themes	Theme Shifts
Specific Feedback ($n = 5$, $f = 5$)	Specific Feedback ($n = 4$, $f = 4$)	Specific Feedback ($n = 1$, $f = -1$)
	General Feedback ($n = 2$, $f = 2$)	General Feedback ($n = 2$, $f = 2$)

Plan for Continuing to Build Confidence and Expertise in Providing Feedback to Teachers in Digital School Environments

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 57 addressed administrator plans for continuing to build confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment. Participants were prompted to supply their plans via open-ended item response.

CFHS 2018 administrator responses, for Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 57, were analyzed via grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008). Themes were considered salient if they applied to two unique administrator responses (Corbin & Strauss, 1990, 2008). Five distinct themes emerged from analysis of CFHS administrator responses: CFHS administrators proposed building confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment via: (a) Professional Development (n = 3, f = 3), (b) Professional Practice (n = 3, f = 3), (c) Colleagues (n = 3, f = 3), (d) Job-embedded Professional Development (n = 2, f = 2), and (e) Readings (n = 2, f = 2). CFHS administrator responses and themes, teased from data, are presented in Table 36.

Table 36

CFHS (2018) Plans for Building Confidence and Expertise in Providing Feedback (N = 7)

Participant Example	Themes
I plan to continue attending professional development courses that focus on digital schools (AP1)	Professional Development
I can work with my colleagues (AP2).	Colleagues
I will take part in continual and ongoing job-embedded experiences (AP3).	Job-embedded Professional Development
Each year, the returning teachers should be encouraged to mentor the new teachers in digital instructional strategies. On top of that, new strategies should be incorporated through voluntary professional development, or the Department Heads get trained and then take the new skill back to their department (AP4).	Colleagues, Professional Development, Job-embedded Professional Development
I will continue walking classrooms to gain an understanding of potential focus areas and work with colleagues to research potential solutions or resources that can help to bridge these gaps (AP5).	Professional Practice
Examples: Professional readings, compliance with district expectations, and gathering of evidence of the usefulness, success, and non-success of learners and teachers (AP6).	Readings, Colleagues, Professional Practice
I plan to continue attending professional learning opportunities, read articles related, and to continue to work with teachers to make sure that my feedback is actionable (Principal).	Professional Development, Readings, Professional Practice

MHS 2016 administrator responses, for Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 57, were analyzed via grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008). Themes were considered salient if they applied to two unique administrator responses (Corbin & Strauss, 1990, 2008). Two distinct themes emerged from analysis: MHS administrators responses proposed building confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment via: (a) Professional Practice (*n* = 5, *f = 5*) and (b) Job-embedded Professional Development (*n* = 1, *f = 1*). One participant, MAP3, did not provide a response for Item 57. MHS administrator responses and themes, teased from data, are presented in Table 37.

Table 37

MHS (2016) Plans for Building Confidence and Expertise in Providing Feedback (N = 7)

Participant Example	Themes
I need to continue to increase my knowledge (and the knowledge of our support staff) so that I feel more confident with the feedback we are giving teachers. This is a process that will never end (MAP1).	Professional Practice
I try to learn, on my own, different uses of technology to deliver standards-based instruction, but that is extremely time consuming to do on my own (MAP2).	Professional Practice
I have been a digital curriculum leader for the past couple of years. I continue to lead our team of digital leaders and consistently walk classrooms to provide teachers feedback on digital integration (MAP4).	Professional Practice
Examples: participating in coaching and calibration observations, focusing specifically on the use of instructional technology, and giving teachers specific actionable feedback. I will also solicit feedback for myself in relation to the feedback I provide to teachers (MAP5).	Professional Practice, Job-embedded Professional Development
I will have continued exposure to different classrooms and attend professional development on my own (MAP6)	Professional Practice

Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) Item 57 addressed administrator plans for continuing to build confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment. Participants were prompted to supply plans that addressed administrators continuing to build confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment. Grounded theory and thematic analysis methods (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 2008) were employed to tease out themes from participant responses.

Themes teased from the 2016 administration of the DILRI© (Taylor & Shepherd, 2016) to MHS administrators were compared to themes teased from the 2018 administration to CFHS administrators. Based on the comparison, shifts in administrator plans for continuing to build confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment were observed. Shifts observed were: (a) increase in Professional Development (n = 3, f = 3), (b) increase in Colleagues (n = 3, f = 3) (c) increase in Readings (n = 2, f = 2), (d) increase in Job-embedded Professional Development (n = 1, f = 1) and (e) decrease in Professional Practice (n = 2, f = -2). Comparison of 2016 and 2018 themes and observed shifts are presented in Table 38.

Table 38

Comparison of Themes: Building Confidence and Expertise in Providing Feedback (N = 14)

2016 MHS Themes	2018 CFHS Themes	Theme Shifts
Professional Practice (f = 5)	Professional Practice (f = 3)	Professional Practice (f = -2)
Job-embedded Professional Development (f = 1)	Job-embedded Professional Development (f = 2)	Job-embedded Professional Development (f = 1)
	Professional Development (f = 3)	Professional Development (f = 3)
	Colleagues (f = 3)	Colleagues (f = 3)
	Readings (f = 2)	Readings (f = 2)

Summary

An introduction and context, of the instrumental case study (Fraenkel et al., 2015), was provided regarding the analysis presented in this chapter. Analyses and findings were organized by research question.

Research Question 1 examined how high school administrators perceived the extent of technology integration in teacher instruction. Administrator Technology Integration Matrix [TIM©] (FCIT, 2018) level perceptions were compared to participant supplied TIM© observation levels (FCIT, 2018). Administrators supplied levels were analyzed via the TIM© Qualitative Interview Protocol (Taylor & Sanchez Corona, 2018). Administrators demonstrated complete understanding at the Adoption level but partial understanding at Adaptation and Infusion levels.

Research Question 2 explored possible relationships between digital instructional leadership and student achievement, as measured by Florida Standards Assessment (FSA) English Language Arts (ELA) scale scores (FSA, 2018). Administrator TIM© (FCIT, 2018) supplied observations and accompanying TIM© (FCIT, 2008) levels were described within specific grade-level and content area contexts.

Research Question 3 examined the extent, if any, that high school administrators' self-perceived readiness to lead in a digital environment changed over time. Analysis of change was explored through item responses, on the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor, & Shepherd, 2016) administrations from 2016 and 2018. CFHS 2018 administrator item responses were compared to MHS administrator item responses collected in 2016 (Shepherd, 2017). Findings depicted shifts in administrator knowledge and confidence in leading in a digital school environment.

Professional Development was observed to increase the most for both administrator Knowledge (71%) and Confidence (57%) to lead in a digital school environment. Workshops followed for both administrator Knowledge (43%) and Confidence (43%) to lead in a digital school environment. The variable, Workshops (-3.15), increased the most for ranked importance for influencing knowledge and confidence to lead in a digital school environment, from the 2016 administration to the 2018 administration, followed by Professional Development (-1.72), Readings (-1.57), and Conferences (-1.29). Student Engagement (0.29), Student Collaboration (0.29), Teachers Use of Digital Tools (0.29), Student Writing (0.28), Digital Formative Feedback (0.28), and Differentiated Instruction (0.28) exhibited the greatest shifts in knowledge to recognize instructional factors within a digital school. Administrator level of confidence to recognize instructional factors in digital environments shifted the most, from the 2016 administration to the 2018 administration, for the variables Teacher Feedback (0.72) and Student Collaboration (0.71). Administrator level of knowledge, of factors in developing school culture, shifted the most in Leadership Teams (0.72), Motivating Stakeholders (0.57), and Community Support (0.57). Administrator level of confidence, of factors for developing school culture in digital school environments, was observed to shift the most for the variables, Motivating Stakeholders (0.86), Resource Allocation (0.71), and Community Support (0.60).

In regard to administrator knowledge and confidence in providing feedback to teachers, regarding their use of technology in standards-based instructional practice and assessment, observed findings from Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor, & Shepherd, 2016) 2016 administration and the 2018 administration indicated continued themes of Specific Feedback and the inclusion of General Feedback, as observed in 2018 DILRI© (Taylor & Shepherd, 2016) item responses. Finally, pertaining to plans for continuing to build confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment, from the 2016 administration and the 2018 administration of the DILRI© (Taylor & Shepherd, 2016), shifts were observed to move from themes of Professional Practice to those of Professional Development, Colleagues, Readings, and Job-embedded Professional Development.

Chapter 5 contains a discussion of the findings and implications for administrators in one-to-one environments. Also discussed in Chapter 5 are suggestions for future studies on digital instructional leadership, effects of digital instructional leadership on student achievement, and change in administrator readiness, to lead in a digital school environment, over time.

CHAPTER 5
SUMMARY, DISCUSSION, AND CONCLUSIONS

Introduction

In Chapter 4, qualitative and quantitative data were analyzed to answer the three research questions that were used in crafting the design of this instrumental case study (Fraenkel, Wallen, & Hyun, 2015). Included within Chapter 5 is a summary of the instrumental case study (Fraenkel et al., 2015), a discussion of the findings organized around the three research questions, recommendations for future research, implications for practice, and concluding final thoughts. Chapter 5 expands on findings related to digital instructional leadership, possible relationships, if any, between digital instructional leadership and student achievement, and change in administrator readiness, to lead in a digital school environment, over time.

Summary of the Study

The beginning of this chapter presents the instrumental case study (Fraenkel et al., 2015) summary, purpose, and organization. Findings on the digital instructional leadership of seven administrators, serving in one large urban high school, in a large urban school district are then presented. Following findings on digital instructional leadership are findings on possible relationships between digital instructional leadership and student achievement. Finally, findings on change in administrator readiness to lead in a digital school environment, over time, are presented.

The purpose of this study was to determine the readiness of an administrative team to provide digital instructional leadership, in the context of one high school, as well as examine possible outcomes related to student achievement, as measured by Florida Standards Assessment English Language Arts scale scores (FSA, 2018). Additionally, the researcher sought to determine how the readiness, of administrators, to lead in a one-to-one environment may have changed over time.

The following three research questions were crafted, based on a review of the literature on digital instructional leadership, one-to-one environments, and one-to-one environments and student achievement. These questions were used to structure and guide this instrumental case study (Fraenkel et al., 2015):

1. How do high school administrators perceive the extent of technology integration in teacher instruction?
2. What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts [FSA] (FSA, 2018)?
3. To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

Research Question 1 explored high school administrator perceptions of teachers' integration of technology in instruction as defined by Technology Integration Matrix [TIM©] (FCIT, 2018) levels. The TIM© (FCIT, 2018) is presented in Appendix A. Administrator perceptions were compared to supplied observations and accompanying TIM© (FCIT, 2018) administrator perceived levels. Research Question 2 explored possible relationships between digital instructional leadership, teachers' integration of technology in instruction, and student achievement. Due to the small sample size of administrators in this instrumental case study (Fraenkel et al., 2015), $N = 7$ with five degrees of freedom (*df*), correlational findings may not be representative of the overall population (Steinberg, 2011). Therefore, collected data were explored and described qualitatively. Research Question 3 explored how, if any, high school administrator readiness to lead in a digital school environment, as measured by the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016), had changed over time. Administrator DILRI© (Taylor & Shepherd, 2016) item response were qualitatively compared to demographically similar administrator item responses from a 2016 administration of the [DILRI©] (Shepherd, 2017; Taylor & Shepherd, 2016).

This instrumental case study (Fraenkel et al., 2015) employed both qualitative and quantitative data collection methods to examine the phenomenon of digital instructional leadership. Data collection methods included qualitative interviews, structured after the TIM© Qualitative Interview Protocol (Taylor & Sanchez Corona, 2018), ratings from researcher created TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018), Florida Standards Assessment [FSA] (FSA, 2018) English Language Arts (ELA) scale and achievement level scores, and archival and participant item responses on the DILRI© (Taylor & Shepherd, 2016). The TIM© Qualitative Interview Protocol (Taylor & Sanchez Corona, 2018) is presented in Appendix C, the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) is presented in Appendix B, and the DILRI© (Taylor & Shepherd, 2016) is presented in Appendix D.

Qualitative description (Fraenkel et al., 2015), grounded theory and constant comparative methods (Glaser & Strauss, 2008), and thematic analysis methods (Corbin & Strauss, 1990, 2008) were used for qualitative data analysis of data collected to answer the three research questions which guided this instrumental case study (Fraenkel et al., 2015). Results from the analyses were reported in Chapter 4.

Discussion of the Findings

The goal of this instrumental case study (Fraenkel et al., 2015) was to examine administrator digital instructional leadership. The researcher also sought to add to the literature insights on digital instructional leadership, in one-to-one environments, and possible relationships to student achievement. Findings for individual research question are reviewed and analyzed in the following sections.

Research Question 1

How do high school administrators perceive the extent of technology integration in teacher instruction?

To answer Research Question 1, administrators participated in audio recorded interviews, guided by the researcher created TIM© Qualitative Interview Protocol (Taylor & Sanchez Corona, 2018), and administrator supplied observations with accompanying perceived TIM© levels (FCIT, 2018) were collected and analyzed. Administrator ratings were evaluated using the researcher created TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018). Derived grounded theory categories (Glaser & Strauss, 2008), supplied observations, and generated ratings were examined.

Nine observations were provided by seven (*N* = 7) administrators. AP6 supervised both the English Language Arts and Reading departments and thus provided three observations while the other six administrators provided one observation. AP6 was prompted for the two additional observations to answer Research Question 2. Administrators perceived four observations to support teachers' integration of technology in instruction at the TIM© (FCIT, 2018) Adoption level. At the Adoption level, four of four (*n* = 4, 100%) administrators were found to demonstrate complete understanding of the level of teachers' integration of technology in instruction. Administrators supplied four observations at the perceived TIM© (FCIT, 2018) level of Adaptation. At the Adaptation level, four of four (*n* = 4, 100%) administrators demonstrated partial understanding of the level of teachers' integration of technology in instruction. One administrator (*n* = 1, 14%), AP3, supplied an observation at the perceived TIM© (FCIT, 2018) level of Infusion. At the Infusion level, AP3, demonstrated partial understanding of the level of teacher integration of technology in instruction.

Findings for Research Question 1 indicated that administrator understanding of TIM© (FCIT, 2018) defined levels were complete at lower levels such as Entry and Adoption. However, as instruction progressed to higher levels of technology integration, such as Adaptation, Infusion, and Transformation, administrator understanding of integration factors including (a) appropriate teacher use of technology, (b) appropriate student use of technology, (c) gradual release model of instruction, (d) cooperative learning, and (e) student choice of technology use, were observed to be less than complete, as supported by the TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) ratings. After four complete years of digital one-to-one implementation, administrator knowledge of teachers' integration of technology in instruction was observed to be incomplete, thus possibly affecting the digital instructional leadership of the administrators of study.

Administrator incomplete understanding of level of teachers' integration of technology in instruction could be due to two factors: (a) lack of fostering a shared vision for technology integration in instruction (Dexter, 2008, 2011; Richardson & Sterrett, 2018) and (b) lack of focusing on individualized development (Lei & Zhao, 2008; Penuel, 2006; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2014). The school district Digital Classroom Plan supported the use of a shared framework, the Technology Integration Matrix [TIM©] (FCIT, 2018) for the large urban school district and school of study. Data suggested that administrator perceptions and understanding of the framework were complete at lower levels but not at middle to high levels of observed teachers' integration of technology in instruction.

A shared vision (Richardson & Sterrett, 2018) of using the TIM© (FCIT, 2018), as a framework for administrator digital instructional leadership, could strengthen administrator understating of teachers' integration of technology in instruction at each of the five TIM© (FCIT, 2018) levels. Findings from Richardson and Sterrett (2018), on shared vision, informed that school district superintendents, who were deemed successful in one-to-one environments, implemented and maintained a shared vision for successful transformation to digital instruction in such environments. This shared vision (Richardson & Sterrett, 2018) could encompass a shared framework for teachers' integration of technology in instruction (FCIT, 2018; Koehler, Mishra, & Cain, 2013). An implemented and maintained framework, such as the TIM (FCIT, 2018), would inform administrators and teachers of desired instructional changes on the continuum of teachers' integration of technology in instruction. Such an implementation would necessitate extensive investments in administrator and teacher learning experiences guided by the selected framework (Penuel, 2006). Penuel (2006) found that teachers who were offered nine hours or more of professional learning on digital instruction were more likely to report feeling prepared to integrate technology in instruction. Administrator professional learning experience needs may be similar to those of teachers, if not more, when accounting for administrator digital instructional leadership guided by the selected framework.

When examining the notion of lack of focusing on individualized professional development, it is of note that four of nine observations (44%) were found to be at the Adoption level; four of nine observations (44%) were at the Adaptation level, and one of nine observations (11%) was at the Infusion level. These data revealed that the majority of observed teachers' integration of technology in instruction took place at the lower to middle levels of the TIM© (FCIT, 2018). According to the school district of study's Digital Classroom Plan, lessons were to be implemented once a year at the Transformation level. A lack of alignment was observed between the District Classroom Plan, administrator provided observations, and associated TIM© (FCIT, 2018) levels. A lack of sustained and individualized professional learning for both administrators and teachers, as well as a possibility of a lack of a maintained shared vision (Richardson & Sterrett, 2018) via the TIM© (FCIT, 2018), could be contributing to the lack of diversity of observed TIM© (FCIT, 2018) levels (Lei & Zhao, 2008; Penuel, 2006; Warschauer et al., 2014).

Research Question 2

What relationship, if any, exists between the extent of perceived teachers' technology integration in instruction, in department and grade level organized teams, and scale scores on the 2018 Florida Standards Assessment in English Language Arts (FSA, 2018)?

To answer Research Question 2, grounded theory (Glaser & Strauss, 2008) yielded categories, TIM© (FCIT, 2018) observed levels, and TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) ratings were examined in the context of grade level and content area Florida Standards Assessment (FSA, 2018) English Language Arts (ELA) scale and achievement level score descriptive statistics. These data were examined in grade 9, grade 10, and grades 9 and 10 combined level contexts for the ELA and Reading departments. Due to the constraints of case studies and limited sample size of administrators ($N = 7$) and observations ($N = 9$), relationships were not able to be established between administrator digital instructional leadership, teachers' integration of technology in instruction, and student achievement in a one-to-one digital environment.

The 2008 FSA ELA (FSA, 2018) mean scale scores (348.20) and achievement level (2.70) scores were observed to be higher in the grade 10 analysis context with an observed TIM©

(FCIT, 2018) level of Adaptation, for teacher's integration of technology in instruction, and accompanying TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) rating of 3. Findings from analysis of the grade 9 context yielded a 2018 FSA ELA mean scale score (338.29) and achievement level score (2.59) to be somewhat lower with observed TIM© (FCIT, 2018) level of Adaptation, for teacher's integration of technology in instruction, along with an accompanying TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) rating of 3. Findings from analysis of data in the combined grades 9 and 10 level context yielded a 2018 FSA ELA mean scale score (343.15) and achievement level score (2.64) with observed TIM© (FCIT, 2018) levels of Adoption and Adaptation, for teacher's integration of technology in instruction, and accompanying TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018) ratings of 5 and 3 respectively.

Findings in the present study built on several researchers' evidence of a link between one-to-on initiatives and student achievement (Kennedy, Rhoads, & Leu, 2016; Penuel, 2008). Empirical research on one-to-on initiatives and student achievement was found to be rather scant (Kennedy et al., 2016; Penuel, 2006). Furthermore, empirical studies examining digital instructional leadership in one-to-one environments and possible relationships to student achievement were found to be non-existent. However, research conducted by Rosen and Beck-Hill (2012) informed future studies examining digital instructional leadership through findings on teachers' integration of technology in instruction. Rosen and Beck-Hill (2012) found that student achievement was impacted when teachers' integration of technology in instruction occurred daily. Sustained instructional change could occur through effective digital instructional leadership practices (Lei & Zhao; Penuel, 2006; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2014).

This study sought to add to the scant evidence via introducing the third variable of administrator digital instructional leadership to future quantitative studies on one-to-one initiative effects on student achievement. Administrator digital instructional leadership could be found to be a variable that mediates possible relationships between one-to-one initiatives and student achievement.

Research Question 3

To what extent, if any, have high school administrators' self-perceived readiness to lead in a digital environment changed over time?

To answer Research Question 3, the Digital Instructional Leadership Readiness Instrument [DILRI©] (Taylor & Shepherd, 2016) was used to determine CFHS administrator knowledge and confidence to lead in a digital school environment or a component of digital instructional leadership. Research on digital school environments and one-to-one initiative implementations have tended to focus on initiative implementation and teacher and stakeholder perceptions; however, a dearth of research existed concerning the roles of administrator digital instructional leadership in one-to-one environments (Kennedy, Rhoads, & Leu, 2016; Penuel, 2006; Richardson & Sterrett, 2018; Shepherd, 2017).

DILRI© (Taylor & Shepherd, 2016) archival data was requested and obtained from 2016 (Shepherd, 2017). Archival DILRI© (Taylor & Shepherd, 2016) participants' profiles were demographically matched (MHS) to CFHS administrator profiles. Once matched, item responses were compared to determine change, if any, in administrator readiness (knowledge and confidence to lead in a digital school environment), over time from September 2016 to October 2018.

Change in Factors which have Influenced Knowledge and Confidence to Lead in a Digital School Environment

The results of the 2016 DILRI© (Taylor & Shepherd, 2016) administration to MHS administrators was compared to those in the 2018 administration to CFHS administrators. The variable, Professional Development selection, as a factor which influenced administrator knowledge to lead in a digital school environment, was observed to increase by 71%. Variables, Supervisors and Workshops, demonstrated increases of 43%.

The larger increase of Professional Development could be due to the school district of study's Digital Classroom Plan. This plan outlined how the high school of study, supported by the school district of study, would implement the one-to-one initiative, and it addressed professional learning throughout. During 2016, the initial administration of the DILRI© (Taylor & Shepherd, 2016), the Digital Classroom Plan was based on the timeline contained within it and supported only partial implementation of professional development to administrators and teachers. At the time of the October 2018 DILRI© (Taylor & Shepherd, 2016) administration to CFHS administrators, the Digital Classroom Plan for high school would have been more fully implemented. This could explain, in part, the increase in Professional Development (71%). This could also account for the increase in the variable Workshops (43%). Such alignment is also reflected in research by Tondeur, Braak Ertmer, and Ottenbreit-Leftwich (2016) which supported sustained integration of technology in instruction which was aided through sustained professional learning experiences. Emphasis on professional learning for administrators, as well, may be a plausible rationale for increases in the variables Professional Development and Workshops. The variable, Supervisors, could have been positively impacted through school district level administrators' coaching and mentoring of high school administrators. Such evidence was not, however, explicitly stated in the school district's Digital Classroom Plan (2014).

Larger observed changes in administrator selected factors influencing confidence to lead in a digital school environment from the 2016 DILRI© (Taylor & Shepherd, 2016) administration to 2018 administration were also observed. Increases were observed in Professional Development (57%), Professional Practice (43%) and Workshops (43%). Workshop (43%) increase in confidence could possibly be accounted for by to the school district's Digital Classroom Plan (2014) and the resultant administrator changes in knowledge to lead in a digital school environment. Increase in the variable, Professional Practice (43%), could be due to routine instructional rounds and observations (Shepherd, 2017) that were conducted in 2018 during a more fully implemented Digital Classroom Plan (2014).

Change in Means of Ranked Factors that Influenced Knowledge and Confidence to Lead in a Digital School Environment

The DILRI© (Taylor & Shepherd, 2016) was used to examine changes in means of ranked factors that influenced administrators' knowledge and confidence to lead in a digital school environment. The ranked means that were observed to change the most from the 2016 administration to the 2018 administration were for the following variables: Workshops (-3.15), Professional Development (-1.72), Readings (-1.57), Conferences (-1.42) and Professional Practice (-1.29). Ranked means allowed for measurement of perceived impact each variable had on administrator knowledge and confidence to lead in a digital school environment.

The increase of ranked means of the variables Workshops (-3.15), Professional Development (-1.72), Readings (-1.57), Conferences (-1.42) and Professional Practice (-1.29) could support fostering of a shared vision of more individualized professional learning experiences (Dexter, 2008, 2011; Richardson & Sterrett, 2018). At the same time that administrators are fostering a shared vision of the digital one-to-one initiative implementation, with school district leaders, they may support implementation of individualized professional learning experiences for both teachers and administrators. The decrease in Supervisors (3.28) and Instructional Coaches (1.86) may be due to sustained and more fully implemented individualized professional learning experiences, due to further implementation of the school district's 2014 Digital Classroom Plan, and emphases placed on instructional progression toward the TIM© transformation level (FCIT, 2018) level. Such a shift would support administrators placing more emphasis on teacher learning via more sustained and individualized professional learning delivery models (Koehler, Mishra, & Cain, 2013; Tondeur, Braak, Ertmer, & Ottenbreit-Leftwich, 2016).

Change in Level of Knowledge and Confidence to Recognize Instructional Factors in a Digital School Environment

The DILRI© (Taylor & Shepherd, 2016) was used to measure changes in the level of knowledge and confidence to recognize instructional factors in a digital school environment from the 2016 administration to the 2018 administration. The variables, Student Engagement (0.29), Student Collaboration (0.29), Teachers Use of Digital Tools (0.29), Student Writing (0.28), Digital Formative Feedback (0.28), and Differentiated Instruction (0.28) exhibited the greatest shifts in knowledge to recognize instructional factors within a digital school environment. Teacher Feedback (0.72) and Student Collaboration (0.71) shifted the most for administrator confidence to recognize instructional factors in a digital school environment.

Shifts in administrator knowledge and confidence to recognize instructional factors in a digital school environment aligned with Hattie's (2015) notions of high impact leadership: (a) focus on teacher's and school's impact on learning, (b) conducting classroom observations, (c) setting professional development systems, and (d) communicating high academic standards. As the school district of study implemented its Digital Classroom Plan, administrator instructional leadership may have been focused on the goals of growing administrator digital instructional leadership, paralleling digital one-to-one implementation. However, missing from collected data was an articulated plan or framework to bridge instructional leadership to digital instructional leadership such as technological pedagogical content knowledge (TPACK) (Koehler et al., 2013). Though the Technology Integration Matrix [TIM©] (FCIT, 2018) served as a framework for teachers' integration of technology in instruction, as defined in the Digital Classroom Plan, the TIM© (FCIT, 2018) did not explicitly address administrator digital instructional leadership.

Level of Knowledge and Confidence of Factors for Developing School Culture in a Digital School Environment

The DILRI© (Taylor & Shepherd, 2016) was also used to measure the level of knowledge and confidence of factors for developing school culture in a digital environment. The largest shifts were observed in the administrator level of knowledge of Leaderships Teams (0.72) and confidence in Motivating Stakeholders (0.86).

Knowledge of using of Leaderships Teams (0.72) and confidence in Motivating Stakeholders (0.86) were identified school superintendent traits found necessary for successful one-to-one initiative implementations addressed by Richardson & Sterrett (2018). Knowledge of using of Leaderships Teams (0.72) and confidence in Motivating Stakeholders (0.86) were traits identified in successful school district superintendents supporting one-to-one school district implementations; it can be argued that administrators may want to mirror such traits as they lead in their one-to-one school buildings. The increase in knowledge of Leaderships Teams (0.72) and confidence in Motivating Stakeholders (0.86) could be due to school district administrators implementing evidence-based practices, similar those presented by Richardson and Sterrett (2018). Thus school-based administrators may be influenced via exposure to such practices.

Knowledge and Confidence in Providing Coaching Feedback

The DILRI© (Taylor & Shepherd, 2016) was also used to measure change, between the 2016 administration and the 2018 administration, in administrators' levels of knowledge and confidence in providing coaching feedback to teachers regarding the use of technology in standard-based instructional practices and assessment.

From analyses, participant responses provided continued examples of specific feedback and the inclusion of general feedback. What is of interest is that prior findings from studies of one-to-one implementation supported the necessity for sustained individualized professional learning (Lei & Zhao, 2008; Penuel, 2006; Warschauer, Zheng, Niiya, Cotten, & Farkas, 2014); however, administrator feedback in the present study shifted to more general in nature. Administrator feedback examples, based on a more fully implemented school district Digital Classroom Plan (2014) and findings from studies on-to-one implementations (Lei & Zhao, 2008; Penuel, 2006; Warschauer et al., 2014), would be expected to be specific to the teacher, content, and technology used. However, consistent and sustained use of the TIM© (FCIT, 2018) or technological pedagogical content knowledge (TPACK) (Koehler et al., 2013) frameworks could address observed trends in administrator feedback to teachers.

Plan for Continuing to Build Confidence and Expertise in Providing Feedback

The DILRI© (Taylor & Shepherd, 2016) was also used to measure the change between 2016 administration and the 2018 administration in plans for continuing to build confidence and expertise in providing feedback to teachers, staff, and other administrators within a digital school environment. Decreases were observed in Professional Practice and increases were observed in Professional Development and Job-embedded Professional Development. Unlike plans supplied in the 2016 administration of the DILRI© (Taylor & Shepherd, 2016), 2018 administration supplied plans incorporated Colleagues and Readings.

If aligned with literature on one-to-one initiatives, plans would be observed to be more individualized and tailored to each administrator (Koehler et al., 2013; Tondeur et al., 2016). As such, plan increases might have been expected to include more Job-embedded Professional development and Readings. Though both variables increased, Professional Development, in general, increased the most. Reliance on general professional development could provide insight as to why CFHS administrator TIM© (FCIT, 2018) Adoption level knowledge and understanding was the only level found to be at complete understanding. Higher levels of integration of technology in instruction require the marrying of content specific activities and instructional approaches to specific technologies (FCIT, 2018; Koehler et al., 2013). This integration of technology in instruction, at complex levels, may not easily be conveyed or learned in generalized professional learning sessions.

Implications for Practice

From analysis of findings and discussion, implications for practice were identified. Implications for practice are presented for both administrators and school district administrators.

Administrators

Findings from data collected and analyzed in this instrumental case study (Fraenkel et al., 2015) revealed that administrators, in the context of this case study, did not demonstrate complete understanding of the Technology Integration Matrix [TIM©] (FCIT, 2018) to guide teachers' integration of technology in instruction. In fact, administrator knowledge, of the TIM© (FCIT, 2018), was observed to be more complete only at lower levels of teachers' integration of technology in instruction. Administrators, as digital instructional leaders, should exhibit a complete understanding of the TIM© (FCIT, 2018) or other selected framework for integration of technology in instruction. By doing so, administrators would be able to more effectively provide feedback to assist with teacher navigation of the selected framework.

Data collected and analyzed for change in administrator digital instructional leadership, over time, provided insight on how digital instructional leadership, at the high school level in one large urban central Florida school district, may be evolving. Though many of the changes in administrator knowledge and confidence were aligned with the findings from studies on one-to-one initiative implementations, division between observed change and literature was found in shifts of teacher feedback and administrator plans to build confidence and expertise in providing feedback. Administrators' complete understanding of a selected framework, the TIM© (FCIT, 2018) for this study, is suggested to mitigate such disconnects between research and practice.

School District Administrators

Based on data and analysis from this instrumental case study (Fraenkel et al., 2015), school district administrators could best foster integration of technology in instruction through a selected framework. The selected framework should then be infused to both teachers and administrators through individualized content-specific professional learning experiences (Koehler, Mishra, & Cain, 2013). Though a framework was implemented by the school district, the Technology Integration Matrix [TIM©] (FCIT, 2018) was observed as the framework in place for CFHS in this instrumental case study (Fraenkel et al., 2015), it was not observed to be a part of daily practice.

Disconnect from intention to practice could have resulted in administrators demonstrating only partial understanding of various levels of the selected framework. To ensure complete administrator understanding, and thus teacher understanding, of the selected framework for integration of technology in instruction, school district administrators should select and implement a framework that supports the integration of technology in instruction. The sustained implementation of the framework is paramount to complete understanding of administrators to recognize and understand digital instructional factors and provide feedback to teachers in their integration of technology in instruction. Without a shared framework, for teachers' integration of technology in instruction, administrator knowledge of integration of technology in instruction and digital instructional leadership may be incomplete school district-wide. To expand on this study, implications for administrators and school district administrators are presented:

1. Provide sustained professional learning experiences for administrators on the selected framework.
2. A component of professional learning experiences should encompass teacher coaching and feedback on teachers' integration of technology in instruction.
3. Regularly calibrate administrator perceived observed technology integration progression at both school and school-district levels.
4. Record and disseminate school site trends of teachers' instructional progression along the selected framework to examine school-district level implementation of teachers' integration of technology in instruction.
5. School district administrators may seek to evaluate framework implementation annually.
6. Possibly incorporate the selected framework into existing teacher feedback and evaluation frameworks.

Recommendations for Future Research

Recommendations for additional research following this instrumental case study (Fraenkel et al., 2015) are based on (a) limitations and suggested replication studies and (b) research topics related to this instrumental case study (Fraenkel et al., 2015). Future research can build on this instrumental case study (Fraenkel et al., 2015), and findings can lead to increased generalizability to other high school contexts and school districts implementing one-to-one initiatives.

Replication Studies

This instrumental case study (Fraenkel et al., 2015) was successful in examining the digital instructional leadership of seven administrators at one large urban high school in a large urban school district. However, based on the delimitations of this instrumental case study (Fraenkel et al., 2015), generalizability of findings were limited to the specific context of the school of study. To expand on the study, researchers should:

1. Collect similar data from multiple high schools within the school district of study.
2. Collect similar data from elementary and middle school levels.
3. Replicate this study at multiple school sites, at primary and secondary levels, in multiple school districts within and outside the state of Florida.
4. Conduct a longitudinal, follow-up study on tracked administrators, examining change in administrator readiness to be digital instructional leaders.

Potential Research Topics Related to the Case Study

Potential research topics related to this instrumental case study (Fraenkel et al., 2015) were identified based upon findings and discussions. Possible relationships between administrator digital instructional leadership and student achievement warrants investigation. Examination of such relationships was not possible in this instrumental case study (Fraenkel et al., 2015) due to a limited sample size ($N = 7$) of administrators and limited student achievement data. Additional research topics warrant exploration of administrator digital instructional leadership as observed through lesson observation and feedback according to a framework. Possible relationships between administrator digital instructional leadership and student achievement, as measured through various content areas, could then be explored. Such a study should be scaled to include multiple schools, at both primary and secondary levels, in multiple school districts.

Conclusions

Results of this instrumental case study (Fraenkel et al., 2015) identified the development of digital instructional leadership of an administrative team, at one large urban high school, in a large urban school district. Administrators demonstrated partial understanding of the TIM© (FCIT, 2018) framework used to guide teachers' integration of technology in instruction. Administrators also demonstrated growth in readiness to lead in a digital school environment that aligned with research on the implementation on one-to-one initiatives.

Summary

Findings from this study indicate that a framework for teachers' integration of technology in instruction should to be implemented with fidelity and sustained. Furthermore, if the TIM© (FCIT, 2018) or other selected framework is sustained over time, administrator digital instructional leadership and readiness to lead in a digital environment should improve.

Grounded theory analysis (Glaser & Strauss, 2008) and qualitative description yielded administrator partial understanding of the TIM© (FCIT, 2018) which guided teachers' integration of technology in instruction. If administrator understanding of the TIM© (FCIT, 2018) framework were strengthened to demonstrate complete understanding, teacher feedback and thus administrator digital instructional leadership may improve. Current literature on one-to-one initiative implementations and technology integration in instruction frameworks, and qualitative analysis of this study, support the results of this instrumental case study (Fraenkel et al., 2015).

APPENDIX A
TECHNOLOGY INTEGRATION MATRIX [TIM©]

(Florida Center for Instructional Technology, 2018)

TIM: Table of Summary Descriptors

This table contains the summary descriptors for each cell of the Technology Integration Matrix (TIM).

The Technology Integration Matrix (TIM) provides a framework for describing and targeting the use of technology to enhance learning. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, constructive, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. Together, the five characteristics of meaningful learning environments and five levels of technology integration create a matrix of 25 cells, as illustrated below.

LEVELS OF TECHNOLOGY INTEGRATION → / CHARACTERISTICS OF THE LEARNING ENVIRONMENT ↓	**ENTRY LEVEL** The teacher begins to use technology tools to deliver curriculum content to students.	**ADOPTION LEVEL** The teacher directs students in the conventional and procedural use of technology tools.	**ADAPTATION LEVEL** The teacher facilitates the students' exploration and independent use of technology tools.	**INFUSION LEVEL** The teacher provides the learning context and the students choose the technology tools.	**TRANSFORMATION LEVEL** The teacher encourages the innovative use of technology tools to facilitate higher-order learning activities that may not be possible without the use of technology.
ACTIVE LEARNING Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	Information passively received	Conventional, procedural use of tools	Conventional independent use of tools; some student choice and exploration	Choice of tools and regular, self-directed use	Extensive and unconventional use of tools
COLLABORATIVE LEARNING Students use technology tools to collaborate with others rather than working individually at all times.	Individual student use of technology tools	Collaborative use of tools in conventional ways	Collaborative use of tools; some student choice and exploration	Choice of tools and regular use for collaboration	Collaboration with peers, outside experts, and others in ways that may not be possible without technology
CONSTRUCTIVE LEARNING Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.	Information delivered to students	Guided, conventional use for building knowledge	Independent use for building knowledge; some student choice and exploration	Choice and regular use for building knowledge	Extensive and unconventional use of technology tools to build knowledge
AUTHENTIC LEARNING Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.	Technology use unrelated to the world outside of the instructional setting	Guided use in activities with some meaningful context	Independent use in activities connected to students' lives; some student choice and exploration	Choice of tools and regular use in meaningful activities	Innovative use for higher-order learning activities connected to the world beyond the instructional setting
GOAL-DIRECTED LEARNING Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	Directions given; step-by-step task monitoring	Conventional and procedural use of tools to plan or monitor	Purposeful use of tools to plan and monitor; some student choice and exploration	Flexible and seamless use of tools to plan and monitor	Extensive and higher-order use of tools to plan and monitor

The Technology Integration Matrix was developed by the Florida Center for Instructional Technology at the University of South Florida, College of Education. For more information, example videos, and related professional development resources, visit **http://mytechmatrix.org**.

APPENDIX B

TECHNOLOGY INTEGRATION MATRIX (TIM©) SCORING RUBRIC

TIM© Scoring Rubric (Taylor & Sanchez Corona, 2018)

Perceived TIM (FCIT, 2018) Level Evaluation Rubric

Score of 0	Score of 3	Score of 5
Little to no understanding of the level of technology integration. • Appropriate Teacher Use • Appropriate Student Use	**Partial** understanding of the level of technology integration. • Appropriate Teacher Use • Appropriate Student Use	**Complete** understanding of the level of technology integration. • Appropriate Teacher Use • Appropriate Student Use
Little to no understanding teacher selected pedagogically appropriate learning context (active, collaborative, constructive, authentic, and goal-directed). • Gradual Release Model of Instruction • Cooperative Learning • Student Choice of Technology Tools Used	**Partial** understanding teacher selected pedagogically appropriate learning context (active, collaborative, constructive, authentic, and goal-directed). • Gradual Release Model of Instruction • Cooperative Learning • Student Choice of Technology Tools Used	**Complete** understanding teacher selected pedagogically appropriate learning context (active, collaborative, constructive, authentic, and goal-directed). • Gradual Release Model of Instruction • Cooperative Learning • Student Choice of Technology Tools Used

Grade Level:__________

Content Area:_________________________

Circle 1: AP1, AP2, AP3, AP4, AP5, AP6, or Principal

APPENDIX C
TECHNOLOGY INTEGRATION MATRIX (TIM©) QUALITATIVE INTERVIEW PROTOCOL

TIM Qualitative Interview Protocol© (Taylor & Sanchez Corona, 2018)
Adapted from Florida Center for Instructional Technology's (2018)
Technology Integration Matrix (TIM©)

Interviewer:

Interviewee:

Date:

Time:

Consent Statement: Have you read the informed consent; do you agree to be recorded?

Knowledge of Digital Instructional Leadership

1. In regards to technology use in the classroom, what do you think instruction at the ENTRY level looks like?
2. In regards to technology use in the classroom, what do you think instruction at the ADOPTION level looks like?
3. In regards to technology use in the classroom, what do you think instruction at the ADAPTATION level looks like?
4. In regards to technology use in the classroom, what do you think instruction at the INFUSION level would look like?
5. In regards to technology use in the classroom, what do you think instruction at the TRANSFORMATION level would look like?

Demographic Information

6. Do you support the English Language Arts or Reading Department? If you do, which one(s)? (If yes, please proceed to questions seven to 14; if no, please conclude the interview).

Technology Integration Rating by Grade Level and Department

7. Think of instruction in 9th grade English only. Where do you think, on average, is the instruction you have observed in the department be found on the TIM©?
8. Give an example of a lesson that you observed that supported this rating.
9. Think of instruction in 10th grade English only. Where do you think, on average, is the instruction you have observed in the department be found on the TIM©?
10. Give an example of a lesson that you observed that supported this rating.
11. Think of instruction in 9th grade reading only. Where do you think, on average, is instruction you have observed in the department be found on the TIM©?
12. Give an example of a lesson that you observed that supported this rating.
13. Think of instruction in 10th grade reading only. Where do you think, on average, is instruction you have observed in the department on the TIM©?
14. Give an example of a lesson that you observed that supported this rating.
15. Think of instruction in the departments you supervise. Where do you think, on average, is the instruction you have observed in the departments to be found on the TIM©?
16. Give an example of a lesson that you observed that supported this rating.

Revised: 3/9/19 (P1, P2, P3, P4, P5 (Principal), and P6 responded to these two additional items; however, P7 responded to these items previously.)

17. Think of instruction in the departments you supervise. Where do you think, on average, is the instruction you have observed in the departments to be found on the TIM©?
18. Give an example of a lesson that you observed that supported this rating.

APPENDIX D

DIGITAL INSTRUCTIONAL LEADERSHIP READINESS INSTRUMENT (DILRI©)

Digital Instructional Leadership Readiness Instrument (DILRI)©

Taylor, R., & Shepherd, A. (2016)

I have read the informed consent and agree to participate in this survey.

☐Yes
☐No

Please read each item carefully and select the options that most closely resemble your self-perception and experience related to leading in a digital school environment.

1. Select all factor(s) that apply which have influenced your ***knowledge*** to lead in a digital school environment.

☐Colleagues
☐Experience Supervising Others
☐Graduate Coursework
☐Instructional Coaches
☐Professional Conferences
☐Professional Development in Leading a Digital School Environment
☐Professional Practice
☐Readings
☐Supervisors
☐Workshops
☐Others, please write in ________________.

2. Select all factor(s) that apply to influencing your ***confidence*** to lead in a digital school environment.

☐Colleagues
☐Experience Supervising Others
☐Graduate Coursework
☐Instructional Coaches
☐Professional Conferences
☐Professional Development in Leading a Digital School Environment
☐Professional Practice
☐Readings
☐Supervisors
☐Workshops
☐Others, please write in ________________.

Rank each of the factors that follow as to how they have influenced your knowledge and confidence to lead in a digital school environment with 1 being the most influential and 10 being the least influential. If a factor does not apply select N/A.

3. ☐ Colleagues
4. ☐ Experience Supervising Others
5. ☐ Graduate Coursework
6. ☐ Instructional Coaches
7. ☐ Professional Conferences
8. ☐ Professional Development in Leading a Digital School Environment
9. ☐ Professional Practice
10. ☐ Readings
11. ☐ Supervisors
12. ☐ Workshops
13. ☐ Others, please write in ________________.

Please read each item carefully and select the level of knowledge you have to recognize the following instructional factors within a digital school environment.

Item	**1 Not Knowledgeable**	**2 Somewhat Knowledgeable**	**3 Knowledgeable**	**4 Extremely Knowledgeable**
14. Student Engagement				
15. Student Problem Solving				
16. Student Multi-media Projects				
17. Student Collaboration				
18. Student Writing				
19. Student Use of Digital Resource Tools				
20. Teacher Use of Digital Resource Tools				
21. Teacher's Construction of Standards-based Instructional				

Plans

22. Teacher Provided Feedback
23. Formative Assessment via Digital Tools
24. Differentiated Instruction

Please read each item carefully and select the level of confidence you have to recognize the following instructional factors within a digital school environment.

Item	**1 Not Confident**	**2 Somewhat Confident**	**3 Confident**	**4 Extremely Confident**
25. Student Engagement				
26. Student Problem Solving				
27. Student Multi-media Projects				
28. Student Collaboration				
29. Student Writing				
30. Student Use of Digital Resource Tools				
31. Teacher Use of Digital Resource Tools				
32. Teacher's Construction of Standards-based Instructional Plans				
33. Teacher Provided Feedback				
34. Formative Assessment via Digital Tools				
35. Differentiated Instruction				

Please read each school culture factor carefully and select your level of knowledge for developing the school culture within a digital school environment.

Item	1 Not Knowledgeable	2 Somewhat Knowledgeable	3 Knowledgeable	4 Extremely Knowledgeable
36. Community Support				
37. Motivating Stakeholders				
38. Resource Allocation				
39. Learning Communities				
40. Leadership Teams				
41. School Improvement Teams				
42. Knowledgeable About the Feature Set (e.g. hardware, software, systems)				
43. Leading by Example with Technology				
44. Empowering Teachers				
45. Shared Vision				

Please read each school culture factor carefully and select your level of confidence to develop the school culture within a digital school environment.

Item	1 Not Confident	2 Somewhat Confident	3 Confident	4 Extremely Confident
46. Community Support				
47. Motivating Stakeholders				
48. Resource Allocation				
49. Learning Communities				
50. Leadership Teams				
51. School Improvement Teams				
52. Knowledgeable About the Feature Set (e.g. hardware, software, systems)				
53. Leading by Example with Technology				
54. Empowering Teachers				
55. Shared Vision				

56. Provide an example that demonstrates your knowledge and confidence in providing coaching feedback to teachers regarding their use of technology in standards-based instructional practices and assessment.

57. What is your plan for continuing to build your confidence and expertise in providing feedback to teachers, staff, and other administrators within the digital school environment?

58. What is your current position?
☐Principal
☐Assistant Principal
☐Senior Administrator
☐Program Coordinator
☐Digital Dean
☐Academic Dean
☐Dean
☐Other________

59. Select the timeframe that best represents how long you have been in your position in your current school.
☐Less than 1 year
☐1 - 3 years
☐4 - 6 years
☐7 - 9 years
☐More than 10 years

60. How long in total have you been working in an administrative position (senior administrator, program coordinator, assistant principal, principal, digital dean, academic dean, dean)?
☐Less than 5 years
☐5 - 10 years
☐11 - 15 years
☐16 - 20 years
☐21 - 25 years
☐26 - 30 years
☐More than 30 years

61. Select the response that best represents how long you have been leading in a digital school environment.
☐Less than 1 year
☐1 - 3 years
☐4 - 6 years
☐7 - 9 years
☐More than 10 years

62. Relating to your preparation and experience in building your knowledge and confidence to lead in a digital school environment, is there anything you would like the researchers to know that may assist others in the digital environment implementation process?

APPENDIX E
INFORMED CONSENT

University of Central Florida

EXPLANATION OF RESEARCH

Title of Project: A CASE STUDY OF HIGH SCHOOL ADMINISTRATORS' SELF-PERCEIVED READINESS TO BE DIGITAL INSTRUCTIONAL LEADERS

Principal Investigator: Brian K. Sanchez Corona

Faculty Supervisor: Dr. Rosemarye Taylor & Dr. Marjorie Ceballos

You are being invited to take part in a research study. Whether you take part is up to you.

Participants must be 18 years of age or older to participate.

The purpose of the research is to examine how school based administrators perceive the integration of technology in instruction, how their readiness to lead in a digital environment may change over time, and how their digital instructional leadership may effect student achievement.

Participants will be asked to:

1. Participate in an online survey titled Digit Instructional Leadership Readiness Instrument (DILRI)©. The survey will take less than 10 minutes to complete and can be completed via any electronic device connected to the internet. The survey will not collect any personally identifiable information.
2. Participate in a digitally audio recoded interview at their school site. The interviews will take less than 20 minutes to complete. Participants will be asked a series of questions that relate to integration of technology in instruction. No personally identifiable information will be collected during the recorded interview.

Questions or comments, about this study, may be directed to Brian K. Sanchez Corona via email at esebrian@knights.ucf.edu, Rosemarye Taylor, Professor of Educational Leadership at rosemarye.taylor@ucf.edu, or Marjorie Ceballos Assistant Professor of Educational Leadership at Marjorie.ceballos@ucf.edu.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been determined to be exempted from IRB review unless changes are made. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

APPENDIX F
UNIVERSITY OF CENTRAL FLORIDA RESEARCH NOTICE APPROVAL

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Determination of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Brian Kenneth Sanchez Corona, Ed.D.** and Co-PIs: **Marjorie Ceballos, Rosemarye T Taylor**

Date: **August 07, 2018**

Dear Researcher:

On 08/07/2018, the IRB reviewed the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	A CASE STUDY OF HIGH SCHOOL ADMINISTRATORS' SELF-PERCEIVED READINESS TO BE DIGITAL INSTRUCTIONAL LEADERS
Investigator:	Brian Kenneth Sanchez Corona, Ed.D.
IRB Number:	SBE-18-14210
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

This letter is signed by:

Signature applied by Gillian Morien on 08/07/2018 04:21:29 PM EDT

Designated Reviewer

Page 1 of 1

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