An Analysis of Factors Which Influence High School Administrators' Readiness and Confidence to Provide Digital Instructional Leadership

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School leaders are to be instructional leaders within a digital environment, just as they are expected to do in the non-digital environment. The purpose of this study was to analyze the factors which high school administrators perceive to influence their knowledge and confidence to lead in a digital school environment. Findings suggest that administrators should seek professional development opportunities, knowledgeable and confident colleagues, and opportunities to supervise others to increase knowledge and confidence.

Keywords*:* digital instructional leadership readiness, principal preparation, digital leadership, digital school culture

In the second decade of the 21st century, most of the research on technology and training has focused primarily on preparing teachers to utilize technology in the classroom, rather than on administrators' preparation, skill, knowledge, and related leadership. Continuation of teacher-focused research, though beneficial, has left a research gap concerning the skills and preparation needed by administrators to become digital instructional leaders (McLeod & Richardson, 2011; Schrum, Galizio, & Ledesma, 2011). To adequately support instructional practice and student achievement, digital instructional leadership should be examined further to discern future potential for improved effectiveness (Machado & Chung, 2015).

Despite research showing that administrators' leadership is critical for promoting use of technology, there remains a gap in research surrounding administrators' readiness to lead in such a digital learning environment (McLeod, Richardson, & Sauers, 2015). To this end, administrators need to be among the most well-versed individuals within a school so they effectively model and support technology initiatives (Dexter, 2011; Jones & Dexter, 2018; Schrum & Levin, 2016; Williams, 2008). It is important for administrators to recognize effective instruction and settings within a digital environment, just as they are expected to do in a non-digital environment (Keengwe & Onchwari, 2011; Ertmer & Ottenbreit-Leftwich, 2010). Further, if administrators lack comprehensive understanding of information and communication technology (ICT) capabilities, they will not be prepared to provide the assistance needed for their schools to maximize student learning (Warschauer, Zheng, Niiyam Cotton, & Farkas, 2014). The International Society for Technology in Education (ISTE, 2018) echoed this sentiment by stating that administrators have so much influence within the school that their thoughts and opinions regarding the school's integration of technology is of vital importance. Therefore, it is essential that administrators are sufficiently prepared to be digital instructional leaders and act accordingly to ensure that technology integration permeates all aspects of the teaching and learning process (Schrum & Levin, 2016).

The purpose of this study was to identify and analyze those factors which high school administrators in a large urban school district of approximately 200,000 students, perceived to influence their knowledge and confidence to lead in a digital school environment. Prior to 2016, the school district had not implemented digital technologies as the primary method of learning in all 19 high schools. Researchers examined high school administrators' perceptions related to particular factor(s) that influenced their knowledge and confidence prior to the start of the first year of district wide high school implementation of digital technologies as the primary method of learning. At the end of the 2016-2017 school year, high school administrators were asked to re-examine the same factors and indicate which factor(s) they perceived to influence their knowledge and confidence to lead in a digital environment. While there was no specific experimental intervention, the experience of leading in a digital environment was the intervening variable.

Findings from this study may assist school district-based administrators, school-based administrators, and educational leadership programs in supporting and preparing others to collaborate in building digital environments that develop and maintain a high quality and rigorous educational program. Educational leadership programs may benefit from the findings for continuous program improvement of coursework and practice experiences. Additionally, the lack of literature on preparation of administrators to be digital instructional leaders supports the significance of the findings.

To this end, two research questions are addressed in this article.

1. What factors do high school administrators perceive to have influenced their knowledge and confidence in their ability to lead in a digital school environment?

2. What factors are perceived as being stronger influences for development of high school administrators' knowledge and confidence?

Review of the Literature

Organizations that use digital technologies will likely rely on its leaders to ensure that programs and initiatives are well-designed, effectively implemented, completed on time, and incorporated into an operational process in such a way that guarantees success with the intended goals. An array of researchers (Green, 2010; Howell, 2010; Korrapati, 2010; Oren, 2009; Thompson, 2010) note leadership behaviors that can improve the success rate of a technology initiative, (e.g., the ability to effectively identify and assess the impact a technology can bring). Leaders who exhibit digital instructional leadership behaviors create success by fostering a culture that is carefully developed, supportive, and encouraging for individuals to trust in the technology process and the organization's knowledge base (Green, 2010; Ismail, Khairuzzaman, Nor, & Marjani, 2009; Scott-Young, 2009). Understanding how to most effectively be a leader in digital environments remains a relevant topic for creating successful digital high schools (Eveleens, 2010; Oren, 2009; The Standish Group, 2011; Warschauer, Zheng, Niiyam Cotton, & Farkas, 2014).

Instructional Leadership

To effectively lead a school's instructional program, an instructional leader possesses knowledge of curriculum, instruction, and assessment (Jenkins, 2009). As instructional leaders, administrators review curriculum plans and perform frequent classroom observations to evaluate and enhance the curriculum, analyze teachers' instructional practices, and evaluate the classroom environment (Francera & Bliss, 2011; Hallinger & Murphy, 1987; Halverson, Grigg, & Thomas, 2007). Instructional leaders lead by modeling behaviors and actions for teachers, conversing with teachers and other educators about instructional practices, analyzing the quality and practice of teachers, and seeking out new curriculum and teaching practices (Andrews, Basom, & Basom, 1991; Francera & Bliss, 2011; Hallinger & Murphy, 1987; Halverson et al., 2007; Mendel, 2012; Smith & Addison, 2013).

Given the accountability in educational organizations and the relationship between instructional leadership practices and student achievement, instructional leadership is imperative (Goldring, Cravens, Murphy, Porter, & Elliott., 2012; Hattie, 2009; Leithwood & Louis, 2012; Marzano, Waters & McNulty, 2005; Robinson, Lloyd, & Rowe, 2008). Instructional leaders work to promote collaboration, professional development, teacher empowerment, and enhanced leadership (Fink & Resnick, 2001; Smith & Addison, 2013; Stronge, Richard, & Catano, 2008). They may create an atmosphere of professional collaboration within the school environment by establishing professional learning communities or collaborative structures (Halverson et al., 2007; Smith & Addison, 2013). Within their school they foster leadership and empower others by mentoring, creating leadership teams, conversing with stakeholders about school issues, and providing professional development to enhance teachers' specific knowledge about teaching, learning, or subject matter (Fink & Resnick; 2001; Smith & Addison, 2013).

Digital Instructional Leadership

Digital instructional leadership is a term based on the research-supported notion of instructional leadership and findings from school-based technology initiatives and one-to-one studies (Bendickson, Robinson, & Hattie, 2012; Orphanos & Orr, 2014; Fox, Gong, & Attoh, 2015). One of the main challenges in becoming a digital instructional leader is for administrators themselves to have a solid knowledge base of what technology can do (Berret, Murphy, & Sullivan, 2012; Schrum & Levin, 2016). Effectively incorporating technology requires administrators to have knowledge and skill over a broad range of complex issues (Anderson & Dexter, 20011; Beytekin, 2014; Flanagan & Jacobsen, 2003; Schrum & Levin, 2016; Warschauer, Zheng, Niiyam, Cotton, & Farkas, 2014). However, Beytekin (2014) wrote that few administrators would consider themselves to be leaders of digital technologies within their schools. And yet, administrators are expected to be digital instructional leaders in the utilization of information technology and practices (Aksal, Mukhametzyanova, & Gazi, 2017; Beytekin, 2014; Schrum & Levin, 2016; Stuart, Mills, & Remus, 2009; Wang, 2010).

Organizational Change. Integration of technology requires that administrators understand the changes taking place, as well as the change process (Anderson & Dexter, 2005; Beytekin, 2014; Jones & Dexter, 2018; Warschauer et al., 2014). Purposeful and deliberate change leadership does not take place without a full understanding of the desired change and the potential results of that change (Davies, 2010). Digital instructional leaders understand the organizational dynamics and anticipate how individuals will react, particularly when introducing new technology (Beytekin, 2014). Understanding personal change, organizational change, culture change, and how technology will play a role in influencing those aspects in others is within the knowledge needed for digital instructional leaders.

Vision. One such way to accomplish successful change is by instilling a shared vision, which incorporates technology in the school's culture (Dexter, 2011; Machado & Chung, 2015; Richardson & Sterrett, 2018). Administrators have the role of defining and explaining the purpose of technology integration and what its function will be within the community. To successfully lead a technology integration movement, administrators seek to incorporate multiple view points and perspectives to create a shared vision that conveys an uplifting message for the future (Moos, Krejsler, & Kofod, 2008). This shared vision within a digital school environment is more likely to take place when administrators inspire, lead, and implement technology integration to promote excellence and support a culture change within an organization (Beytekin, 2014). A shared vision is easily understood and within the context of a digital school environment inspires stakeholders to maximize their technology resources and knowledge to promote a positive instructional change. Digital instructional leaders advocate for and promote technology efforts by committing resources and time to help further support change to achieve the shared vision (Beytekin, 2014).

Professional Development. Digital instructional leaders understand the organizational culture and know how best to inspire teachers to learn and use innovative technology approaches in curriculum design, instruction, and assessment (Dexter, 2011). Machado and Chung (2015) noted that administrators consider teacher willingness and professional development to be the most influential factors in determining the success of a one-to-one initiative. Further research by Richardson & Sterrett (2018) supports the value of professional development in one-to-one initiatives, particularly as professional development programs continue to adapt to the changing technology climate and infrastructure of schools. Continuing to revisit and revise how professional development is planned and implemented is more vital than ever due to variables associated with

teacher integration of technology in instruction, particularly those which may require a unique pedagogical approach (Machado & Chung, 2015; Richardson & Sterrett, 2018). With consistently new implementations within digital environments, the digital instructional leader is a model for digital citizenship within the school setting (Isin & Rupert, 2015).

Administrators have the power to take an active role in the oversight and in the problem-solving process (Cakir, 2012; Davies, 2010). Thus, when they are directly involved in the technology implementation process, teachers and students are more likely to be engaged in the teaching and learning process (Schrum & Levin, 2016). Sharing their digital technology beliefs can act as an effective tool for aiding in the creation of a digital environment (Davies, 2010). In summary, administrators who are digital instructional leaders provide teachers with opportunities for professional growth in incorporating technology by promoting a shared vision focused on technology in the classroom and encouraging new learning experiences (Abdullah, DeWitt, & Alias, 2013; Jones & Dexter, 2018).

Methods

The aim of the study was to observe how high school administrators' self-perceived knowledge and confidence changed over the course of a school year and to examine the factor(s) administrators perceived to be most influential in furthering their own knowledge and confidence during the period of the study. During the 2016-2017 school year, all school administrative personnel who supported teachers with the implementation of the one-to-one digital environment were invited to take part in this study.

This study examined the extent to which high school administrators perceived that particular factors influenced their knowledge and confidence prior to the start of the 2016-2017 school year in which all high schools in the school district began implementing digital technologies as the primary method of learning. At the end of the same school year, high school administrators were asked to re-examine the same list of factors and indicate what factor(s) they perceived to have influenced their knowledge and confidence to lead in a digital environment. During the 2016-2017 school year, the school district provided support and feedback to high school administrators; however, no formal intervention was in place to be tested. Hence, the design included two administrations of the same instrument, Digital Instructional Leadership Readiness Instrument (DILRI)©, to determine the administrators' perceptions of factors of influence from their experience in leading in a digital school environment (e.g. supervising teachers, observing students, collaboration with teachers and other administrators, and professional development) and not to measure the result of a single or formal intervention.

To this end, this study was designed through the lens of a quantitative case study approach to analyze the self-perceived factors of influence, knowledge, and confidence of high school administrators in a large urban school district to lead in a digital school environment.

Instrumentation

This quantitative case study contains data derived from the researcher-created Digital Instructional Leadership Readiness Instrument (DILRI©). Creation of the DILRI© was necessary because the researchers found no other scales or instruments that measured knowledge and confidence, thereby inferring readiness, that had been created exclusively for high school administrators leading in a digital school environment. Sixty-two items in the DILRI© were derived from the literature and

included seven components. The components were:

- identification of factors of influence on knowledge and confidence,
- rank order of factors of influence on knowledge and confidence,
- recognition of effective standards-based instruction and assessment that incorporate technology,
- knowledge and confidence in ability to develop a digital school's culture and norms,
- knowledge and confidence in providing feedback to teachers regarding their incorporation of technology into standards-based instructional practices and assessment,
- participant demographics, and
- participant comments.

Although the DILRI© has 62 items, this article only addresses findings from these components: identification of factors of influence on knowledge and confidence, rank order of factors of influence on knowledge and confidence, participant demographic variables, and open-ended items. It does not address the remaining DILRI©.

Two separate reviews of the DILRI© were completed by a panel of doctoral candidates, local school district leaders, and knowledgeable university faculty who validated the content of the survey to ensure the relevance of the individual items within the instrument. Reliability coefficients were evaluated based on the guidelines by George and Mallery (2016) who suggested that coefficients of .7 or greater indicate acceptable reliability. During this review, the construction, coherence regarding question clarity, and the progression of the DILRI© items and instructions was examined.

Additionally, the DILRI© was piloted with school district leaders for content validity and clarity of communication. Feedback from the pilot was incorporated in the final form used in this study. The DILRI© is presented in its entirety in the Appendix.

Items one and two ask the participants to select all that apply from a list of factors that may have influenced their knowledge and/or confidence. Those factors are: Colleagues, Experience Supervising Others, Graduate Course Work, Instructional Coaches, Professional Conferences, Professional Development, Professional Practice, Readings, Supervisors, Workshops, and Others.

Participants were then asked to rank the same factors for items 3-13 on a scale from 1 to 11 with 1 being the most influential and 11 being the least influential in their development of knowledge and confidence to lead in a digital environment. Ranking had the purpose of distinguishing strength among the factors of influence to answer the second research question.

There are also open-ended items (56, 57, and 62) which solicit deeper responses and provide additional detail and confirmation of the quantitative findings. DILRI© item 56 reads, "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." DILRI© item 57 asks participants, "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?" Finally, DILRI© item 62 asks participants, "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?"

Population and Sample

The population of administrators in the large urban school district included those in elementary schools, middle schools, high schools, special schools, and in various school district and school

district area positions. A purposive sample was selected that included all administrators in the 19 high schools within the school district during September 2016 and June 2017. Purposive sampling was based on the premise that specific individuals were selected "based on a specific purpose rather than randomly'' (Tashakkori & Teddlie, 2003, p. 713). For this purposive sample participants were chosen based on the criteria that they were currently employed as school administrators (male and female, grades 9-12) who were leading in a digital high school environment, excluding charter and special schools. At the time of the study there were 19 high schools with a sample of 125 high school administrators during the first administration and 119 high school administrators during the second administration. Some high schools had two principals, one of whom was responsible for an off-site 9th grade campus. Table 1 represents the individuals within the school district who qualified to take part in this study.

Table 1
Potential Participants' Job Titles and Instrument Administration Months

Job Title	September 2016 (*N*)	June 2017 (*N*)
Principal	20	21
Assistant Principal	90	84
Other Administrative Personnel	15	14
Totals	125	119

High school administrators within the target school district were requested to anonymously complete the DILRI© at two separate points in time: September 2016 and June 2017 by the Area Superintendent for High Schools. The expectation was that the high-level advocacy would increase response rates (Dillman, Smyth, & Christian, 2014). During the September 2016 survey window, the school district employed 125 high school administrators. Of those, 76 high school administrators voluntarily took the anonymous survey. The total response rate for the September 2016 survey administration was 61%.

On the second survey in June 2017, there was a total sample of 119 high school administrators employed by the school district. From that group, 69 high school administrators took the anonymous survey, which gave the June 2017 survey administration a response rate of 58%. Individual participant responses for the two administrations could not be matched due to the anonymous nature of the survey administration.

At the beginning of the September 2016 school year, 34 of the participants had less than one year in being an administrator in a digital school environment, while 19 participants had more than one year of experience. Position titles were categorized as Assistant Principal, Principal, or Other Administrator.

For the demographic information relating to the participant's time leading in a digital school, a category of More Than One Year (1+) was created to incorporate item responses of 1-3 years, 4-6 years, 7-9 years, and more than 10 years, since there were few participants in each of the individual groups. Table 2 displays aggregated data of the range and mean of participant reported years of experience for administrators who completed the September 2016 DILRI© administration. As previously noted, this was the first year for the target school district to utilize digital technologies and resources as the primary source for student learning. Examination of Table 2 highlights the

minimal experience for high school administrators who were leading in a digital school environment during the September 2016 DILRI© administration.

Table 2
September 2016 Participant Years of Experience by Job Title (n=76)

School Administrator Position	Range in Current Position	Mean in Current Position	Range in a Digital School Environment	Mean in a Digital School Environment
Assistant Principal	0 to 11	4.0	0 to 2	0.9
Principal	0 to 5	2.5	0 to 2	1.5
Other Administrator	0 to 11	2.8	0 to 5	1.4

Analysis

To answer Research Question One, frequency of responses and percentages were computed for DILRI© items one and two. These items relate to the 11 factors that may have influenced their knowledge and confidence: Colleagues, Experience Supervising Others, Graduate Course Work, Instructional Coaches, Professional Conferences, Professional Development, Professional Practice, Readings, Supervisors, Workshops, and Other.

To answer Research Question Two the same 11 factors were then ranked by participants to determine their perception of the most and least influential factors. Factors were ranked from 1 to 11 with 1 being the most influential and 11 being the least influential. An overall rank across the school year's two survey administrations was also calculated by combining ranks from both DILRI© administrations.

Open-ended responses from items 56, 57, and 62 on the DILRI© were categorized according to the knowledge and confidence factors of influence relating to school administrators' ability to lead in a digital school environment. These responses were read and analyzed by the researchers and assigned a unique alpha numeric code. Similar responses were placed in groups to highlight the factors and how they directly or indirectly influenced the readiness level of school administrators to lead in a digital environment.

Upon analysis of the data derived from items 56, 57, and 62, Creswell's model of concurrent methodological triangulation (2003) was used to promote credibility. This model was used to compare the results of both quantitative (items 1-13) and open ended item data (items 56, 57, and 62), alongside the current body of literature, to determine if a single understanding emerged related to high school administrators' self-reported readiness to lead a digital school environment. Additionally, member checking and negative case study analysis were used to further promote credibility for the study's findings. Nested data were integrated into the larger data collection process to help analyze the data and respond to the research questions.

Results

Research Question One

Research Question One examined the factors that high school administrators perceived to have influenced their knowledge and confidence to lead in a digital environment. Participants could select all that applied, so the frequencies and percentages exceeded the number of participants. The factors were: Colleagues, Experience Supervising Others, Graduate Course Work, Instructional Coaches, Professional Conferences, Professional Development, Professional Practice, Readings, Supervisors, Workshops, and Other.

Knowledge. The factors perceived to have influenced the knowledge of high school administrators (n =76) on of the September 2016 administration resulted in the most frequently noted factor of colleagues (f = 60, 79%). Professional development and professional practice were both perceived as being influential by 42 or 55% of participants. Experience supervising others was perceived to have an influence by 39 or 51% of the participants. Instructional coaches were recognized by 36 or 47% of participants as a factor of influence.

Then, nine months later in the June 2017 administration of the DILRI©, the factors perceived to have influenced the knowledge of high school administrators (n =69) had changed. Like in fall 2016, the most frequently noted factor was colleagues (f = 44, 64%). Experience supervising others was observed to have an influence with an f = 40 or by 58%. Professional practice was noted by 36 (52%) participants as having influence, while professional development was recognized by 34 (49%). A complete list of the response frequencies (f) and the overall percentage for each factor are presented in Table 3.

Confidence. Similar to influences on knowledge, the most frequently noted factor influencing confidence on the September 2016 administration was colleagues (f = 52, 68%). Experience supervising others was observed to have an influence by 36 or 47% of the participants. Both instructional coaches and professional practice were recognized equally by almost half of the participants (f = 34, 45%) as a factor of influence. Supervisors were noted by 30 (39%) participants as being influential. Professional development was recognized by 25 (33%) participants as having influence.

The factors perceived to have influenced the confidence of high school administrators (n =69) on item two of the June 2017 administration of the DILRI© revealed that the most frequently noted factor was experience supervising others, which was observed to have an influence by 41 (59%) participants. The second most noted factor was colleagues which was observed to have an influence by 40 (58%) participants. Instructional coaches and professional practice were both recognized by 34 or 49% as a factor of influence. Professional development was recognized by 27 (39%). As with the knowledge data, frequencies (f) and percentages for each factor perceived to influence confidence are presented in Table 3.

Table 3
Factors of Influence on Knowledge and Confidence in Leading a Digital School

	Knowledge		Confidence	
Influence Factors	*f*	%		%
Colleagues				
September 2016 (*n* = 76)	60	79	52	68
June 2017 (*n* = 69)	44	64	40	58
Experience supervising others				
September 2016 (*n* = 76)	39	51	36	47
June 2017 (*n* = 69)	40	58	41	59
Graduate coursework				
September 2016 (*n* = 76)	16	21	12	16
June 2017 (*n* = 69)	12	17	10	14
Instructional coaches				
September 2016 (*n* = 76)	36	47	34	45
June 2017 (*n* = 69)	32	46	34	49
Professional conferences				
September 2016 (*n* = 76)	16	21	11	14
June 2017 (*n* = 69)	18	26	12	17
Professional development				
September 2016 (*n* = 76)	42	55	25	33
June 2017 (*n* = 69)	34	49	27	39
Professional practice				
September 2016 (*n* = 76)	42	55	34	45
June 2017 (*n* = 69)	36	52	34	49
Readings				
September 2016 (*n* = 76)	21	28	13	17
June 2017 (*n* = 69)	28	41	17	25
Supervisors				
September 2016 (*n* = 76)	25	33	30	39
June 2017 (*n* = 69)	25	36	19	28
Workshops				
September 2016 (*n* = 76)	24	32	21	28
June 2017 (*n* = 69)	24	35	20	29
Other				
September 2016 (*n* = 76)	2	3	4	5
June 2017 (*n* = 69)	3	4	3	4

Note: Participants were requested to only select those factors that applied, thus the frequencies may not equal *n* of 76 and the total percent value may not add up to 100%.

Research Question Two

Research Question Two examined the perceived strength of each factor that influenced high school administrators' knowledge and confidence. The means and standard deviations for the rank of each of the 11 factors was used to determine the strength and rank assigned.

On the September 2016 administration of the DILRI©, 50 out of the 76 participants completed this ranking that had a potential range of 1 to 11 with 1 being the greatest perceived strength and 11 being the lowest perceived strength. The factor perceived to have had the most influence was colleagues (M = 3.02). The second most influential factor noted was experience supervising others (M = 3.52), followed next by professional development (M = 4.10), professional practice (M = 4.36), and instructional coaches (M = 4.62).

As in September 2016, at the end of the first school year of all high schools using digital technologies as the primary method of learning (June 2017), 55 out of 69 participants ranked these 11 factors on the DILRI©. The factor perceived to have had the most influence was experience supervising others (M = 3.24). The second most influential factor noted was colleagues (M = 3.78), followed next by professional development (M = 4.09), instructional coaches (M = 4.62), and professional practice (M = 4.69). Means and standard deviations for all factors are presented in Table 4.

Additionally, Table 4 displays the overall rank and mean created by combining scores from both the September 2016 (n=50) and June 2017 (n=55) administrations of the DILRI©. If two factors had the same rank, then the next rank was skipped. It was observed that the overall lowest mean, and thus most prominently ranked factor, was experience supervising others with an overall mean of 3.38. Ranked second was the factor, colleagues, with a mean of 3.40. Third ranked was the mean of 4.10 for professional development. The fourth and fifth ranked factors were professional practice (M = 4.53) and instructional coaches (M = 4.62) respectively. All other factors carried an overall mean of greater than 6 on the 11-point scale.

Table 4
Rank Order and Mean of Factors of Influence on Knowledge and Confidence

			September 2016 (n=50)			June 2017 (n=55)		
Factors of Influence	Overall Rank	Overall Mean	Rank	*M*	*SD*	Rank	*M*	*SD*
Experience supervising others	1	3.38	2	3.52	2.4	1	3.24	1.99
Colleagues	2	3.40	1	3.02	1.9	2	3.78	2.60
Professional development	3	4.10	3	4.10	2.3	3	4.09	2.56
Professional practice	4	4.53	4	4.36	2.4	5	4.69	2.54
Instructional coaches	5	4.62	5	4.62	2.2	4	4.62	2.19
Workshops	6	6.76	7	6.94	2.5	7	6.58	3.07

Professional conferences	6	6.76	8	6.96	2.1	6	6.55	2.38
Supervisors	8	6.96	6	6.74	2.6	9	7.18	2.43
Readings	9	7.05	9	7.16	1.9	8	6.93	2.12
Graduate coursework	10	7.68	10	7.74	2.8	10	7.62	2.75
Other	11	10.79	11	10.84	1.0	11	10.7	1.41

Open-ended Responses

Using Glaser's (1998) approach to grounded theory methodology, open-ended responses for items 56, 57, and 62 were analyzed for similarities. Those with similar words and phrases were grouped together to form categories. An independent review was conducted by a qualitative researcher to confirm these findings. Based on the responses, groups were created, and similar responses were placed in groups to highlight the factors and how they directly or indirectly influenced the readiness level of school administrators to lead in a digital school environment. Other insights were analyzed to identify emerging themes and patterns.

Open-ended responses were provided by 43 participants on the September 2016 DILRI© administration and 45 participants on the June 2017 DILRI© administration. Given that the participants were anonymous to the researcher the same of different administrators may be in both groups. In total, among the 88 participant responses, 75 were identified as influences on knowledge and confidence. These comments created two categories: collaboration with colleagues and professional development. Table 5 contains sample comments to substantiate the emergence of each category.

Category: Collaboration with colleagues. Responses in this category expressed a need for increased collaboration with colleagues, such as professional learning communities, professional conferences, and workshops. When considering collaboration with colleagues, 47 (63%) of the 75 open-ended responses noted collaboration with colleagues as being useful for creating and sharing knowledge within the digital school environment. Assistant principal AP2.6 stated, "Continuation of professional development, workshops, and collaboration with colleagues". Another assistant principal voiced his opinion about the importance of collaboration with colleagues by stating how he/she will, "Continue to seek out professional development for administrators regarding digital school environment and seek out peers with this expertise" (AP6.1).

Category: Professional development. The topic of professional development was mentioned in 28 (44%) of the 75 open-ended responses. Responses in this category consisted of comments by administrators who noted a need to invest time in individual learning pursuits, through observations, and general statements for increased professional development. AP1.3 stated, "I'm going to continue reading literature about the instructional framework." While others focused on observations commenting, "I plan to continue to develop my knowledge base through teacher observation and asking both teachers and students to describe how they are using technology for different learning activities" (AP7.3).

Table 5

Category and Sample Quotes (f = 75)

Category	Sample Quotes
Collaboration with colleagues (*f* = 47)	Continuation of professional development, workshops, and collaboration with colleagues (AP2.6). Continue to seek out professional development for administrators regarding digital school environment and seek out peers with this expertise (AP6.1).
Professional development (*f* = 28)	I'm going to continue reading … instructional framework (AP1.3). Continued professional development (AP16.6). …continue to develop my knowledge through teacher observation and asking both teachers and students to describe how they are using technology for different learning activities (AP7.3).

Discussion

Although the range of years reported (0-5) for leading in a digital environment reflected that most administrators were novices, their survey responses indicated that the perceived level of digital expertise for high school administrators who participated in this study steadily increased. As they gained more experience with technology, they perceived their ability to recognize digital school instructional factors increased as well. This increased expertise led to higher, more targeted, and specific feedback for teachers who utilized digital technologies as their primary method of instruction.

Results from this study reveal that administrators may have knowledge and yet lack confidence in leading in a digital environment. Perceived lack of confidence was particularly evident during the beginning of the year when all high schools first began using digital technologies as the primary method of learning. However, with learning from colleagues and from experience supervising others their perceived knowledge and confidence both increased. Each of these factors was noted by at least 47% of the participants and, the lower confidence relating to experience supervising others (47%) was due to the September 2016 administration, but then increased by 7% for knowledge and 12% for confidence by June 2017. This change in perceived confidence was the greatest percentage increase for any factor between the two DILRI© administrations. Given that 2016-2017 was the first school year for 34 of the 75 participants to be in a completely digital school environment, the notion that participants gained experience over the course of the school year increased their perceived knowledge and confidence further supports these results. Experience supervising others is a result of many leadership actions such as facilitating classroom walkthroughs, conducting teacher evaluations and lesson plan reviews, and other interactions in which high school administrators were engaged. This thought was echoed by AP3.9 who said, “It is a learning curve”.

Open-ended responses mentioning collaboration with colleagues and professional development varied greatly in terms the thoroughness of the response, but never-the-less, both categories were mentioned 75 times among the 88 respondents. Some responses were minimal, such as from AP4.3 who simply stated, "PD" for his/her response on item 57. However, there were also other more detailed responses which clearly emphasized the importance of observing others and taking advantage of professional development opportunities.

> I plan to continue to improve through personal reflection and continued professional development. I learn best by doing and the more I get into the classroom and personally reflect the better I will become at giving productive feedback. (AP14.3)

This finding emphasizes the importance that these participants placed in gaining new knowledge for themselves, as well as for others in their schools. Further, this finding reiterates what Grady (2011) and ISTE (2018) emphasize: school administrators should be engaged in professional development alongside teachers and that they should work to provide frequent professional development opportunities for teachers that emphasize use of technology and that facilitate integration of technology within the digital school environment.

The most frequently cited comments center around the notion of collaboration with colleagues. Thus, this result is noteworthy because it further supports, and is supported by the quantitative results of Collaboration with Colleagues as being the most perceived influential factor. Triangulation of data from the open-ended responses, item analysis, and current research and literature all aid to confirm and support the results of this study.

Triangulating the open-ended and quantitative responses, with relevant literature reveal that growing professionally within the digital school environment can be accomplished by conversing frequently with other knowledgeable and confident colleagues, observing and having discussions with teachers within the digital school environment, participating in relevant professional development, and through consistent and conscientious professional practice. These methods suggest that growing professionally within the digital school environment can best be accomplished through reciprocal learning between colleague administrators, and between administrators and teachers. As an example, administrators learn effective digital instructional leadership practices by observing teachers and from instructional coaches; teachers learn how to continually improve their practice from the coaching provided by administrators. Reciprocal learning in this way enhances the entire learning environment and helps to foster a healthy digital school culture (Taylor & Chanter, 2019).

The importance of these findings cannot be overlooked as Stokes (2012) noted that technology does not "have any impact on its own-- it all depends on how we use it" (p. 8). Therefore, there is a need for continual professional development for administrators to become digital instructional leaders with skills and knowledge to be successful within the digital school environment (Jones & Dexter, 2018; Robinson, 2011; Schrum, Galizio, & Ledesma, 2011).

Conclusions and Implications for Professional Practice

With the seemingly, ever increasing use of technology by teachers and students for educational purposes, it is no longer possible for administrators to remain detached from these developments, solely maintaining the status quo of traditional education management (Akcil et al., 2017). Digital instructional leaders focus on integrating technology into their leadership processes and take a stance as 21st century leaders by effectively modeling the use of digital communication tools (Akcil et al., 2017). Even with the growing utilization of technology and shift towards an increase in digital

resources, it continues to be stated by researchers that some principals are not adequately prepared to take on instructional leadership roles within the digital school environment (Metcalf & LaFrance, 2013). Schools, school districts, educational leadership programs, and organizations striving to excel in the 21st century will develop leaders who poses a clear vision for incorporating technology in learning and are familiar with their potential to improve standards-aligned learning (Chang, 2012; Ray, Laufenberg, & Bjerede, 2016). For educational technologies to directly affect a student's academic success within the digital school environment, effective digital instructional leadership is required (Beytekin, 2014).

The findings from this study support approaches to facilitate preparation of digital instructional leaders in graduate educational leadership coursework and application experiences, as well as in professional experiences provided by schools and school districts. Over nine months it was revealed that the overall means for perceived knowledge and confidence increased for all components of the DILRI© during the first year of digital implementation. Given that this was the first year for 31% of the high school administrators to lead in a digital school environment, this increase in perceived knowledge and confidence suggests that high school administrators need time to practice digital instructional leadership and to receive feedback. Further, over the course of this study, administrators perceived a shift in their ability to transfer their instructional leadership from a non-digital to a digital environment.

Educational leadership preparation programs may benefit from this research. With the increased emphasis on digital technologies, future educational leaders will need adequate preparation to ensure they are prepared to lead within the digital school environment. Programs that incorporate the research (e.g. 11 instructional factors and the 10 culture factors) that ground this study combined with professional practice may prove beneficial in developing knowledge and confidence for future administrators. Such a deliberate emphasis would ensure that administrators perceive themselves to be prepared and to have confidence to act as instructional leaders within their schools.

Based on the data from this study, high school administrators leading within a digital school environment should reflect on their current knowledge and confidence to act as digital instructional leaders, as both perceived knowledge and perceived confidence are important. Current and aspiring administrators should seek out opportunities ranked as most influential: professional development opportunities, knowledgeable and confident colleagues, and opportunities to supervise others. Digital school environments do not carry any innate impact on their own, rather they must be paired with effective pedagogy to be digital instructional leaders who are knowledgeable and confident in the role.

APPENDIX

Digital Instructional Leadership Readiness Instrument (DILRI)©

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

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
☐Other, 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
☐Other, 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?

Thank you for your time and participation in this study. If you would like to receive summary results of this research, please provide your name and e-mail address. Your responses will remain confidential.

Name:

e-mail:

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