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Principals' Perspectives on Integrating Digital Tools in the Jamaican Primary Curriculum

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Walden University

College of Education

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Audrea Joylyn Samuels

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2022

Abstract

Principals' Perspectives on Integrating Digital Tools in the Jamaican Primary Curriculum

by

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MSc, Florida International University, 2012

BA, Northern Caribbean University, 2004

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

August 2022

Abstract

There is a growing demand for schools to be digitalized in the fourth industrial revolution, yet many teachers do not use digital tools in their pedagogical practices. Primary school principals have experienced challenges in motivating teachers to use digital tools in curriculum delivery in a rural quality education circle (QEC). The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica. The technological, pedagogical, and content knowledge (TPACK) framework was used in the study. It emphasized how teachers' TPACK influence their technology integration practices. Two research questions were used to probe the challenges experienced in the QEC and the support provided for technology integration. Eleven primary school principals, most with more than 4 years' experience, participated. Data from semistructured interviews were coded and analyzed inductively and deductively to identify themes. The results indicated that barriers such as teachers' lack of TPACK understanding, lack of necessary resources for instruction, and teachers' negative attitudes towards technology integration prevented routine use of digital tools. Continuous training and instructional support for teachers and principals and necessary digital tools were highlighted as required support systems. A professional development program for the teachers and principals in the QEC using the tenets of TPACK was developed. This professional development may affect positive social change by enabling educators within the QEC to improve technology integration, which may lead to greater academic achievement for students and improved pedagogical skills for teachers.

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Dedication

This research project is dedicated to my children, Audreine, Adene, and Givanni, and all my siblings, nieces, and nephews who are breaking barriers to achieving their educational goals. The next generation already looks promising because you comprise it. I am so proud of all your achievements. Be inspired; I am your biggest cheerleader.

Acknowledgments

In her song, “Toast,” Koffee, the Jamaican singer, said, “Gratitude is a must.” Based on that premise, I would like to extend heartfelt thanks to the persons who were critical to me achieving this momentous milestone. I am grateful for the support and encouragement from my committee members chaired by Dr. Paul Kasunich. I was never alone throughout this journey; your expertise and insights guided me. To my colleagues and friends who checked in constantly, your support has not gone unrecognized.

I am unfeignedly thankful for Winston “WDC” Collins, whose love, patience, encouragement, and replenishing meals motivated me. He was beside and behind me, nudging me on even when I articulated frustration and weariness. He is indeed worthy of the title best friend. I am forever grateful to Audreine, Adene, and Givanni, who loved and encouraged me from a distance. They understood the imperative but waited patiently for our family to be reunited. You are my loudest and strongest supporters.

To my parents, Joyce Chang and Lambert Alan Gaynor Samuels, who have been a tower of strength and always loved and propelled me to greatness, thank you. You believed in me. I know you are both proud; Daddy, you must be beaming with pride from the heavens.

I am indeed blessed to have benefitted from all your collective efforts and fervent support as you walked this journey with me, for without you, it would have been entirely impossible. I thank you all.

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Section 1: The Problem

With the onset of the industrial era and the advancement of technology, there has been a shift to blending traditional instructional materials with digital resources in the classroom. Teachers, being at the center of the classroom, are required to make the shift in their pedagogy. To do this effectively, they must possess the skills and knowledge required to utilize and integrate the technological tools in their teaching (Kirikcilar & Yildiz, 2018). Digital tools, used effectively, can enhance the curriculum, with students benefitting from the process (Dias, 2017). For this reason, educational governing bodies have focused on the role of the teacher in using digital tools and on preparing them to effectively use them in instruction (Al-Ahmad et al., 2020; Faruk Islim et al., 2018; Mei et al., 2019).

The Local Problem

The problem is that primary school principals have experienced challenges in motivating teachers to use digital tools in curriculum delivery in a rural quality education circle (QEC) district in Jamaica. The National Standards Curriculum (NSC), the primary curriculum of Jamaica, implemented nationally in the 2017–2018 school year, requires teachers to use digital tools in their lessons (Ministry of Education, Youth, and Information [MOEY&I], 2021). With this expectation not being met, primary principals in the QEC have expressed their concern that teachers were not using digital tools despite having the resources that would enable them to do so.

Jamaica, a developing country, has seen a rapid increase in the use of technology in education. The government expends billions of Jamaican dollars on the

implementation of technology in schools through projects, for example, e-Learning Jamaica (Auditor General's Department, 2021). The efforts focus on the education infrastructure through the administration of projects to improve the physical and human capacity at all levels. The country's secondary schools have benefitted from the provision of multimedia computer facilities, internet connectivity, and the training of 11,400 teachers, as of 2010 (U.S. Agency for International Development & Educational Quality Improvement Program I, 2011) The Secondary Schools e-Learning project in the 2014–2015 school year received government funding of approximately \$JA 1.237 million towards instructional materials, teacher training, technology deployment, and continuous assessment (diGJamaica, n.d.). In the same year, the technology project concept was extended to Jamaica's primary schools (Linton, 2014).

The Tablets in Schools (TIS) Pilot Project in April 2014, extended to primary schools islandwide, incurred \$JA 14.5 billion in costs (The Auditor General's Department, Jamaica, 2021). The Jamaican Ministries of Education and Science, Technology, Energy, and Mining embarked on the TIS Project. The TIS project provided technological resources such as tablet devices for individual teachers and students and multimedia projectors, interactive boards, laptops, smartboards, and Wi-Fi-enabled capacity to 38 selected preprimary, primary, infant, secondary, special, and tertiary level schools across the island in the first phase. Another stage followed, the TIS Roll Out Project, which saw other schools receiving digital resources, including laptops and audio-visual tools, classroom management software, digitalized instructional materials, Wi-Fi and broadband internet, and teacher and leadership training. That phase of the project

ended in 2017, and the MOEY&I introduced a new project, Technology in Infant and Primary Schools. Over 1,100 schools were targeted in this stage, including teacher training colleges (e-Learning Jamaica, 2021). In 2020, an initiative of the Government of Jamaica valued at approximately US\$11.1 million supplied 25,000 tablets for teachers and 40,000 shared tablets for students across the island (Scott, 2020).

Following these initiatives, curriculum planners in Jamaica have articulated the need for much more integration of technology in education in schools. Consequently, bridging the digital divide and information and communication are strategic policy priorities of the MOEY&I. Curriculum leaders implemented NSC, the primary curriculum of Jamaica, nationally on a phased basis in the 2016–2017 school year (MOEY&I, 2021). It requires that teachers prepare students to become 21st century citizens by integrating technology using digital tools in their lessons (MOEY&I, 2021). With the influx and availability of technological devices, there is an opportunity for teachers to integrate digital tools in instruction which is exemplified at the middle school and the higher education levels (Mei et al.; Siefert et al. 2019). However, many teachers experience a range of challenges in maximizing the use of digital tools in instructional delivery (Hill & Uribe-Florez, 2020; Hsu et al., 2017; Lindqvist, 2019; Muhaimin et al., 2019), which creates a problem for principals who supervise instruction.

Principals at a QEC meeting in November 2018 expressed that their teachers were not using digital tools despite having the technological resources that would enable them to do so. A survey conducted by the e-Learning Jamaica entity of 146 teachers and principals who participated in the TIS Project disclosed that there were fewer teachers

who demonstrated instructional development capacity. Some of their limitations include teachers' inability to use digital tools such as drawing software, digital storytelling, animation, and even products in the Microsoft Office suite. Throughout the project, teachers received training in information and communications technology (ICT) integration and instructional leadership. Each school was assigned a regional training officer, who provided coaching support to teachers in technology integration in the classroom (e-Learning Jamaica, 2021). Some primary-level schools were among the beneficiaries of the TIS Project. However, despite the availability of the technological tools, in their situational analysis report of the e-Learning's TIS Project in Jamaica, Onyefulu et al. (2019) indicated teachers' unwillingness to use technology during the life of the project. They cited challenges such as the lack of adequate planning, training, sensitization, and implementation. They suggested that research be conducted to further explore the challenges.

In an email, the supervisory education officer, in May 2021, brought the underutilization of digital educational resources to the attention of principals within the QEC. Only 7.1% of the 11 primary schools accessed the e-resources provided to schools at the start of the 2020–2021 school year according to the email. Based on this data, the principals were asked to give an account of the teachers' widespread underutilization of digital resources, which included interactive e-books. Principals have become increasingly concerned that the teachers do not infuse the tools even though at their disposal. Xie et al. (2021) suggested that many factors relate to each other, such as inadequate professional development, which influences teachers' use of technology in the

classroom and should be explored to promote teachers' technology use. The absence of targeted professional development and insufficient ICT skills impede technology integration, as indicated by teachers, principals, and students (Lindqvist & Pettersson, 2019).

Teachers from select schools in the QEC have participated in several training sessions geared towards technology integration. Some of these sessions were provided through the TIS Project in collaboration with e-Learning Jamaica. The educational technology training officer with responsibility for the QEC, in May 2021, expressed that despite the series of training offered to schools since 2014, many teachers do not use the tools. As a result, several school leaders requested assistance with resolving the issue of underutilization within their schools. Between August 2014 to August 2017, teachers received professional development in technology integration throughout the school year, with annual follow-up training by the Jamaica Teaching Council from 2018 to the present, according to the school's 2020 training log which I obtained from the principal. any studies related to technology integration and teachers' perspectives have been conducted in the Caribbean and Jamaica. These perspectives include the preservice technical and vocational education and training teachers' perceptions of their readiness to integrate ICT in the curriculum (Martin, 2019) and early childhood teachers' attitudes towards technology in the classroom (Kelly-Williams et al., 2017). Together, these studies examined teachers' perspectives of technology integration at the pre-service and early childhood levels in Jamaica and strengthened the need to explore the gap in practice as it relates to primary principals and the challenges experienced with leading teachers to use digital tools

in the local curriculum. However, there is a shortage of research addressing the principal's challenges specific to the teachers' underutilization of digital tools at the primary level in a rural setting.

Other researchers have found that technology integration is problematic for teachers (Claro et al., 2017). Claro et al. (2017) suggested that principals use technology-based monitoring of teaching and learning data to improve technology integration among teachers to provide support for them. Culture influences teachers' technology integration behaviors (Vongkulluksn et al., 2018); principals' leadership towards technology integration in the 21st century classroom (Raman & Thannimalai, 2019); and principals' assessment of information, communication, and technology changes (Blau & Shamir-Inbal, 2017), research shows. Some researchers have focused on the challenges experienced by teachers in technology integration (Kirikcilar & Yildiz, 2018; Tusiime et al., 2020). Other researchers have addressed what makes schools digitally competent and inclusive (Kim et al., 2021; Petterson, 2018) and the role of principals in a digital age (Al-Hamad et al., 2020). These studies indicate that the principal's role in helping teachers to integrate technology in schools is a worthy topic of investigation.

Rationale

I conducted this basic qualitative research in a rural primary QEC. I used this approach because it allowed the primary principals within the QEC to share their experiences about the utilization of digital tools within their schools. Emphases of NSC include the development of students' 21st century skills and their exposure to science, technology, engineering, and math (MOEY&I, 2017). The MOEY&I considers these

skills as crucial to the development of students. Teachers are expected to deliver the curriculum using digital tools to adequately prepare students for the secondary level (MOEY&I, 2017). As supervisors of the NSC, principals provide the information that teachers need to integrate digital tools at the primary level.

The basic qualitative research approach was well suited to exploring the study phenomenon in detail within a particular context. Principals within the district are desirous of seeing the integration of digital tools among their teachers, as expressed at a QEC primary principals' meeting that I attended. An increased understanding of the technological leadership essential to creating conditions that promote the use of digital tools in the NSC may have implications for the realization of the Ministry of Education's target at the local site as principals guide their teachers in response to the expectations.

Although more teachers are adapting to digital tools, they sometimes only use tools as substitutes (Martin, 2019). For high-quality instruction that incorporates digital technology beyond substitution, principals need to monitor and supervise to support the goals outlined in the NSC (Caukin & Trail, 2019). The TPACK framework outlines how the teacher's pedagogy and content knowledge combine with technology to make teachers effective in instruction with the digital tools (De Rossi & Trevisan, 2018). So, it is critical to understand principals' perspectives about this problem as they seek to engage and support teachers in using digital tools. The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica.

Definition of Terms

Digital leadership: The principal's ability to lead their school to digital transformation using instructional technology. It also involves teacher inspiration and creating the conditions necessary to enhance and support the teaching and learning process that will lead to the use of digital tools in schools (Zhong, 2017).

Digital tools: Online applications that are used in education, such as wikis, blogs, Google, YouTube, and WhatsApp (García-Martín & Cantón-Mayo, 2019). The term also refers to digital technology in classrooms, such as laptops or tablets, that allows students and teachers access to online applications. Therefore, digital tools incorporate the usage of digital technology to fulfill specific tasks in the teaching and learning experience (Almén & Bjursell, 2020).

National Standards Curriculum (NSC): A curriculum that was implemented in 2016 as the curriculum for all public educational institutions at the Grades 1-9 levels in Jamaica (MOEY&I, 2018). It focuses on concepts and 21st-century skills and competencies (MOEY&I, 2018).

Organizational supports: The resources, reinforcement, or encouragement provided by the leaders of an institution to support and improve the work of the employees. Support can also be in the form of policies and practices, visible leadership, role modeling, and nudges (Hamill, 2018).

Quality education circle (QEC): An educational initiative that began in Jamaica in 2009 (The Gleaner, 2019). It consists of a group of schools of all levels within a particular geographical area. The primary purpose of a QEC is to foster collaboration

among the stakeholder groups within each school as a learning community. The QEC provides a forum for the convening of stakeholders throughout the school year to share best practices through professional development, discuss challenges and propose solutions, assess data, and celebrate accomplishments (The Gleaner, 2019).

Primary schools: In Jamaica, public educational institutions that consist of Grades 1-6 or students ranging from ages 6 to 12 (Vlasopoulou et al., 2021).

Technological, pedagogical, and content knowledge (TPACK): A model that proposes that effective technology integration requires teachers to align the content they teach to the technology they use with a combination of knowledge-based technology, pedagogy, and technical skills (Mishra, 2019).

Technology integration: The meaningful use of technological resources in daily teaching and learning (Kimmons, 2018). Such technology includes computers, tablet computers, online applications and tools, and the internet.

Significance of the Study

This study may make a unique contribution to research on the utilization of digital tools at the local level by adding insight on principals' perspectives relevant to curriculum, instruction, and assessment. Existing research has focused on teachers' knowledge and perceptions of using technological tools to deliver the curriculum's content (Emre, 2019; Pareja Roblin et al., 2018; Sen & Ay, 2017). The experiences of primary principals who have challenges among teachers in their schools to utilize digital tools are needed to add to the literature.

In conducting this study, I aimed to gain an understanding of principals' experiences regarding the perceived challenges with leading their teachers to utilize digital tools and the resources required to support teachers towards adoption and usage. The Ministry of Education is desirous of having an education system in which teachers continuously and effectively use digital tools in instruction and officials prioritize schools with the needed technological resources to make this a reality (MOE Jamaica, 2021). In-depth information was needed from the primary school principals about the hindrances experienced by teachers to use digital tools.

There is a need to engender a greater understanding of the challenges of teachers of Jamaica's primary curriculum regarding integrating technology. Such research may clarify how governing bodies may support instructional leaders to support and facilitate the utilization of digital tools in instruction among teachers within their schools. The study may provide insights for primary school leaders about how they can help and organize their teachers towards achieving acceptance and utilization of digital tools, which may lead to improved curriculum outcomes (Acree et al., 2017).

Leaders at the local level can consider using the findings of this research as a springboard to positively drive change at the study's site as principals generally seek to improve teacher competencies in technology integration. The study and related project (see Appendix A) might also address the gap that exists in practice in the local context. Both can inform school leaders about teacher support, instructional decisions, training, and increased students' academic performance. This study may contribute to positive social change by positively affecting instructional leadership, teaching pedagogy, and

students' learning encounters regarding technology integration. The insights from this study should provide information to curriculum specialists, training officers, and school district leaders on what support teachers and principals can receive to prepare them to support the integration of digital tools in lesson delivery. In summary, the study can address the gap in curriculum practice surrounding the utilization of digital tools in the primary curriculum.

Research Questions

Many principals struggle to get their teachers to integrate technology into instruction. The objective of preparing students to be critical thinkers, collaborators, communicators, and creative leaders of the 21st century is at risk of being realized. A plethora of literature suggests that many teachers experience diverse and varied challenges in integrating technological tools into instruction, even at the primary level (Kalonde, 2017; Khlaif 2018; Ross, 2020). Teachers' unwillingness or inability to use digital tools in instruction creates a concern for principals. Principals are desirous of leading digitally savvy teachers and a digital-oriented institution that meets the needs of students and fulfills the mandate of the administration (Dexter & Richardson, 2020). Based on this premise, I used the qualitative approach to explore principals' viewpoints about the challenges experienced in mobilizing teachers to integrate technology into the curriculum and the forms of organizational supports needed for the utilization of digital tools in instruction by primary teachers. The analyses and findings were interpreted according to the following research questions (RQs):

RQ1: What are the perceived challenges faced by primary school principals in leading their teachers to utilize digital tools in the delivery of the primary curriculum?

RQ2: What do principals perceive as organizational supports needed for the utilization of digital tools in instruction by primary teachers?

Review of the Literature

In this section, I analyze various studies and other literature that provide an overarching understanding of digital tools, technology integration, related challenges, and opportunities for primary teachers and school leaders. I also refer to the NSC of Jamaica and the issue of digital competence and curriculum delivery. I describe the conceptual framework of TPACK by Mishra and Koehler (2006) and use it to organize the ideas of the study related to teacher competences and school's support systems for technology integration. I use the TPACK framework to understand the teachers' needs according to digital tools and conceptualize the support principals can offer in that context. The use of digital tools is an essential aspect of technology integration; the TPACK framework is ideal to understand the effective use of digital tools and what areas of improvement are needed in technology, content, and pedagogy. The absence of a recent study on the principals' perspectives on the utilization of digital tools at the primary level suggested a need to close the gap in practice by undertaking this qualitative study in the local context.

Conceptual Framework

This basic qualitative research was anchored in the TPACK conceptual framework. Teachers who effectively integrate technology in the classroom are said to display a good understanding of the components of the TPACK framework (Koehler &

Mishra, 2009). These teachers are aware of the instructional practices that shape content-driven, sound technology, and pedagogy (Hsu et al., 2017; Mei et al., 2019). The TPACK framework defines technology integration as a close connectedness among the three core components of content, pedagogy, and technology and is synonymous with effectively utilizing technology (Koehler & Mishra, 2009). With each passing day, technology changes, so teachers need to keep abreast of the changes and apply technological knowledge to pedagogy and content (Hsu et al., 2017; Pareto & Willermark, 2019).

In exploring the principal's perspectives on digital tools in the primary curriculum, it was essential to view it from the lens of the TPACK framework. This framework developed over time from the combined work of Shulman (1986), who posited the content pedagogical knowledge (CPK) framework and the Knowles' adult learning theory (Knowles et al., 2011). CPK describes the teacher's content knowledge in a particular field, while pedagogical knowledge indicates how the teacher organizes and delivers the curriculum (Shulman, 1986). Following the CPK model, TPACK was developed to explain how a teacher's understanding of CPK, and technology combined can produce effective technology integration (Mishra & Koehler, 2006). So, the TPACK framework explains the required knowledge that teachers must possess to experience successful design and implementation of teaching with technology integration. The framework features three components with sub-knowledge categories namely, content, pedagogical, and technological knowledge (Rosenberg, 2015). They are further integrated to represent the teacher's technological pedagogical content knowledge (TPACK) which incorporates technological pedagogical knowledge (TPK), technological content

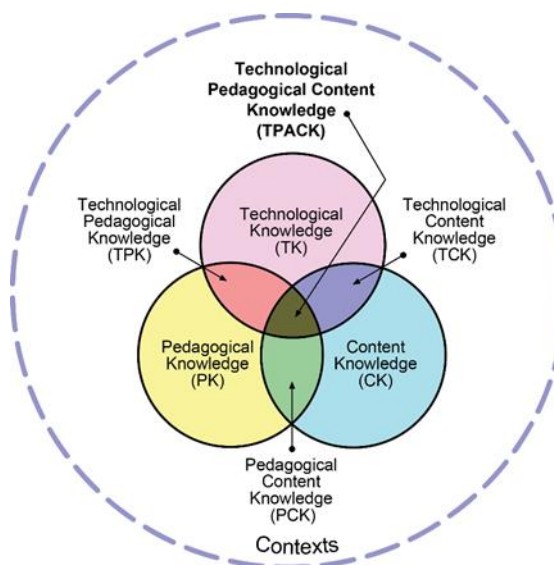
knowledge (TCK), and pedagogical content knowledge (PCK; Kirikçilar & Yildiz, 2018; Koehler & Mishra, 2009; Mishra, 2019; Yu & Franz, 2018).

Components of TPACK

Pedagogical knowledge is the teachers' understanding and knowledge of effective teaching and learning methodology. The teachers' knowledge of the content they teach is described as content knowledge. In contrast, technological knowledge refers to the teacher's understanding of technology and its application to real-world situations, to be abreast of changes and adapt to them (Mishra, 2019; Rosenberg & Koehler, 2015). However, the framework represents an integration of the components in pairs as TCK, TPK, and PCK (Kirikçilar & Yildiz, 2018; Mishra, 2012; Pareto & Willermark, 2019). PCK encompasses the delivery of the curriculum in such a manner that stimulates learning with a strong link between teaching, learning, and assessment.

Figure 1

Illustration of the TPACK Model



Note. From *Using the TPACK Image*, by M. J. Koehler and P. Mishra, 2011, TPACK.org (<http://tpack.org>). Copyright 2012 by TPACK.org. Reprinted with permission. (See Appendix B)

TPK refers to how teachers can use technology to enhance curriculum delivery. In contrast, TCK underpins how technology and content influence the other during instruction. All the classifications put together form TPACK. TPACK entails skilled teaching that features subject content, pedagogy, and technology (Mishra & Koehler, 2006; Pareto & Willermark, 2019).

TPACK and Context

Researchers have recently discussed the TPACK framework to refine the components and included another dimension (Rosenberg & Koehler, 2018). Roussinos and Jimoyiannis (2019) and Porras-Hernandez and Salinas-Amescua (2013) discussed that context is important to educational technology though it is excluded from TPACK. They emphasized that TPACK should include the contextual aspects of schools within which teachers and students operate. Contextual consideration should be given to the physical setting of the classroom and how technology is organized, students and teacher demography, the psychological and psychosocial characteristics of students and teacher, and the teacher's knowledge and skills (Porras-Hernandez & Salinas-Amescua, 2013). These factors together differentiate the context within schools, so TPACK must be interpreted and applied with consideration given to the context.

The TPACK framework is used to undergird this qualitative study as the constructs of knowledge, pedagogy, and content are critical to utilizing digital tools or

technology integration in the curriculum. The framework is related to the study as its components can be used to categorize and understand the practice of technology integration at the primary level. Principals and teachers practice technology integration within the scope of TPACK, as postulated by Shulman (1986) and Koehler and Mishra (2009). The RQs seek to recognize the perceived challenges primary school principals face in leading their teachers to utilize digital tools in the delivery of the primary curriculum. Additionally, I will use the RQs to probe the organizational supports needed for digital tools to be utilized by the primary teacher and how the support is aligned to TPACK. The use of the TPACK model then is essential to understanding the challenges experienced by teachers and principals. Also, it helps to understand how organizational supports are strategized around technology, pedagogy, content, knowledge, and context, which are important to the effective use of digital tools in instruction. The scope of the questions from the interview protocol reflects the TPACK conceptual framework pertaining to the challenges related to teachers' TPACK. Additionally, the questions should produce responses about the schools' technology integration supports aligned to TPACK. The thematic analysis will organize the school administrators' views about the challenges and supports according to the TPACK framework.

Review of the Broader Problem

In this literature review, I examined several peer-reviewed journals that provided insight on TPACK, TPACK leadership, challenges experienced with digital teaching, and organizational supports for digitalization. I also focused on the NSC, teacher competencies, and K-12 education. Consequently, the search terms and phrases used to

yield the search results *included teacher competence, digital tools, leadership challenges, and principals' perspectives. Other terms are primary teachers' challenges, primary education, digitalization, supports, professional development, integrating resources, technology integration, Jamaica, and e-learning.*

I acquired the references from several scholarly databases, including Walden University's database of scholarly journals, Academic Search Complete, Thoreau Multi-Database Search, *Business Source Complete*, Computer, and Applied Sciences Complete, Education Source, ERIC, and the Ministry of Education Jamaica website. I used Google Scholar to follow alerts on critical phrases such as TPACK, technology integration, challenges and supports, and to locate references of interest gleaned from articles. I limited the search to 2017 except in instances where seminal work was used to explain the conceptual framework and identify any adaptations critical to the study. The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica.

This section will present the advantages of using digital tools to support teaching and learning at the primary level and the challenges faced with digitalizing schools. Furthermore, a section will explore the challenges experienced with teachers utilizing digital tools, TPACK leadership, and the nature of organizational supports for the utilization of digital tools.

National Standards Curriculum

Jamaica, the largest English-speaking Island in the Caribbean, gained its independence from the British in 1962. The island models traditions of its colonial past, which is evident in the education system. Teachers are seen as the powerful authority of knowledge and to whom students go to receive knowledge. However, there has been a shift towards an inclusive method of teaching where no one is seen as dominating the classroom, which led to the implementation of a new curriculum in 2016 that would replace the Revised Primary Curriculum and the Reform of Secondary Education for grades 1-9 (MOEY&I, 2019).

The shift towards the NSC emanated from the 2004 Task Force on Educational Reform which articulated that there needed to be a new national curriculum that would meet the educational needs of the Jamaican student. The Task Force found that the existing curriculums lacked developmentally- appropriate outcomes and were too content heavy. Additionally, it did not provide a smooth progression of learning from grades 1-9. Furthermore, it did not support the transfer of skills and other competencies since it was driven by the student's ability to retain factual knowledge (Davies, 2004). Consequently, the NSC was implemented in September 2016 to improve the quality of education offered to Jamaican students.

The NSC would focus on an inclusive learner-centered approach to engage the students using an articulation of standards across grades 1–9 aligned with the national assessment requirements for the secondary level. It aims to prepare students for the present challenges and opportunities to function effectively in the 21st century

technological world. The 21st century student must be able to perform in this rapidly changing world. So, they must be taught to be creative, critical thinkers, communicators, and collaborators (the 4Cs; Buckle-Scott, 2022). Hence, the colonial style of teaching and learning is being eroded, and the NSC is driven by the project-based/problem-based model integrated with science, technology, engineering, and mathematics. Moreover, the teaching-learning process is anchored in the 5E lesson-planning model (engage, explore, explain, elaborate, and evaluate; Buckle-Scott, 2022). With a greater focus on 21st century skills and competencies, students should now be able to demonstrate the appropriate skills of creativity, critical thinking, communication, and collaboration (MOEY&I, 2019).

In the Education for All Review, Ministry of Education proposed that the education sector will need flexible individuals who can adapt to the changes with the swift change in technology (Hylton & Hylton-Fraser, 2022). There will be a focus on teacher development so that the teachers are prepared to teach 21st century skills as one way of adjusting the way education and training are utilizing technology. Since the integration of information technology in education is a major thrust of the education sector, teachers should have the requisite skills, including ways of thinking, working, tools for working, and skills for living in the world. The emphasis is being placed on tools of working which incorporate ICT and information literacy. When teachers are equipped with these skills, they can transmit them to their students (MOEY&I, 2021).

Digital Tools in Support of Curriculum Delivery

The increasing digitization of societies impacts various elements of our daily lives and has implications for future jobs that present students will one day occupy. Utilizing digital technologies is an aspect of this new way of living as we have come to know it, is part of the Fourth Industrial Revolution (Schwab, 2017). Digital tools are used to support creativity and visualization in the classroom (Tusiime et al., 2020). Many studies have highlighted the numerous ways students benefit when teachers use digital tools in instruction, specifically across mathematics, language, special education, and science. The effective use of technological tools across subjects has supported research, language development, differentiation, communication, and collaboration (Börnert-Ringleb et al., 2021; Heflin et al., 2017; Hillmayr et al., 2020; Shatrid, 2020., Siefert et al., 2020; Supemaw & Reindorf, 2021). The use of digital tools appeals to visual and auditory learners, which increases their opportunity to achieve (Hillmayr et al., 2020). According to principals' responses from an interview in Project's Tomorrow report, digital tools can facilitate content that supports personalized learning, adjust to students' reading levels, and collect data about students' performance. They also facilitate multiple languages, individual students' accounts, and support teachers' development in efficacy (Project Tomorrow, 2021).

Teacher and student access to information have increased over the past few years. This has revolutionized education and caused major players in the school system to rethink education in this digital age of the 21st century (Niess, 2018). The convergence of technology and digital learning tools can support educational processes by engaging and

preparing students with the technological skills they need to function in this new era (Mei et al., 2019; Niess, 2018). What better way for the teachers to prepare them than with the digital tools that will somewhat bear semblance to what they will need to function in the digitalized world. With the upswing of ICT, there is an opportunity for advanced and improved teaching-learning processes and related educational outcomes. However, teachers must be willing to access the advantages and possibilities to integrate digital tools as part of the teaching-learning process (Makki et al., 2018; Martín & Cantón-Mayo, 2019).

In their study, Mei et al. (2019) reported that teachers found that utilizing digital tools caused them to reflect on their teaching and learning experiences. As a result, it positively affected their teaching practices. Digital tools are also effective for classroom management and collaboration among students (Li et al., 2019, Mei et al., 2019). When used effectively, digital technologies can promote self-directed learning, motivate the students, and stimulate their interest in learning. Also, they improve students' performance and help achieve language development targets (Azmi, 2017). Mobile digital tools can support various teaching methods that enhance the learning experience and in different contexts, such as the classroom or field trips, as they create stimulating learning environments with two-way interactions (Amhag et al., 2019). Students have reported that their work is more structured and autonomous when using digital tools (Almén et al., 2020).

While technological tools are becoming prevalent and schools have access to them, there is a shift in teaching and learning practices. The students do not experience

engaging and quality student-centered lessons with meaningful tasks and integration that deepen their learning (Siefert et al., 2020). Where there is systemic support for the use of digital tools in curriculum delivery, teachers' professional development and students' learning can be successful (Lavonen & Salmela-Aro, 2022). Many challenges arise with using digital tools.

Challenges in Utilizing Digital Tools

Even with the expectation that teachers should keep current with digital technologies and use them in their classrooms to support teaching and learning (Neiss, 2018), teachers and their leaders face many challenges in fulfilling these expectations of integrating digital tools into instruction. Barriers to ICT integration fall under two categories, namely internal and external barriers. Prasojo et al. (2019) cited external barriers as those that include lack of funding, lack of professional development, and school and district culture, while the internal barriers include lack of teachers' knowledge of ICT, lack of teachers' understanding of ICT and its integration, resistance, and traditional teaching styles. Similarly, challenges have also been categorized as extrinsic and intrinsic, relating to institutional and individual teacher challenges, respectively (Tusiime et al., 2020).

Teacher Challenges. According to Kirikcilar and Yildiz (2018), teachers struggle with the combination of technology and integration. Some teachers believe that technology is not aligned with their teaching goals. There are teachers whose attitudes make them reluctant to embrace technology which affects their professional development and classroom integration. The teachers' lack of digital competence and pedagogy

presents challenges for technological integration (Tusiime et al., 2020). These factors affect the teacher's technological knowledge, which creates a problem for them to integrate digital tools into instruction successfully. Walan (2020), in a study conducted with science teachers, found that there was a limitation with effectively supporting low-achieving students with the inquiry-based approach using digital technology. Even though the teachers possessed the technological knowledge, their pedagogical knowledge to fulfill the TPACK requirement was lacking.

Teachers identified that incorporating digital tools could be time-consuming, limiting their ability to integrate tools such as game-based learning in their classes (Hsu et al., 2017; Li et al., 2017). There is limited availability of technological tools. Teachers have a heavy workload which deters them from using digital tools since they need more time for planning (Razak et al., 2019). Tarman and Chigisheva (2017) found that professional development that is unrelated to the teachers' practice can be a barrier to teachers' use of digital tools. Professional development should promote the use of digital technology in the classroom by helping teachers organize and select high-quality digital learning materials that can supplement the content (Derbel, 2017). Professional development mitigates against the continuous changes in technology by providing the teachers with constant support. Professional development should promote produsage among teachers. Produsage is the teacher's willingness to design digital learning materials (Shamir-Inbal & Blau, 2017), which can help to improve their efficacy.

In comparison, the extrinsic or external challenges vary according to context and affect classrooms differently. For example, developing countries such as Jamaica

experience challenges that are related to infrastructure and insufficient access to the internet. Other challenges include maintenance and support from school leadership, inadequate digital technologies, and funding. There are issues with unreliable electrical supply, overcrowded classrooms, and the digital divide among the student population (Ekberg & Gao, 2018; Tusiime et al., 2020). Keeping abreast with technology means that the school personnel must be prepared to absorb the high cost to upgrade digital resources needed as the technology changes.

In several instances, these factors identified, personal and contextual, prevent teachers from successfully implementing TPACK within their everyday teaching practice (Cheah et al., 2019). Teachers also express a lack of instructional support from their principals (Li et al., 2017; Lindel, 2020). Since teachers are constantly required to learn about new technologies and integrate them in teaching and learning, they face frustration because they do not know how to apply or integrate TPACK in the classroom. This leads to technostress, a term that is defined as the teacher's inability to adapt to new and emerging technologies healthily and without stress-related ailments (Dong et al., 2020). In sum, Ekberg and Gao (2018) identified that inadequate support from school leadership, teaching preparation, teachers' attitudes, and technical knowledge as challenges encountered with technology integration.

Principal Challenges. Principals lead their schools on many levels; they communicate the vision, observe classes, and provide feedback and support to the teachers. They organize professional development sessions to promote the professional capacity of teachers, analyze various data, and use it to inform decisions and collaborate

with all stakeholders (Davis & Boudreaux, 2019). Specifically, a significant aspect of their roles and responsibilities is focused on instructional supervision. Principals, as technology leaders, play a crucial role in the successful integration of technology within their schools as it is essential to instructional supervision. The process of integration is a complex one that relies heavily on the principals and the readiness of the teachers (Blau & Shamir-Inbal, 2017). The principals are responsible for supporting the technical and educational needs of the school (Pettersson, 2018).

The principal influences the use of digital resources at their school (Navaridas-Nalda et al., 2020). With technology evolving fast, principals as instructional leaders, like their teachers, must remain current in their technical knowledge so that technology implementation is successful in their schools (Project Tomorrow, 2021). A study conducted with 15 principals found that their major challenges included budgeting, sustaining the initiative, and articulating the instructional expectations to guide teaching and learning (Gonzales, 2019).

School leaders experience pressures to keep current with technology which leads them not to consider aligning instructional impact to the procurement and implementation of technology (Webster, 2017). According to ISTE (2022), the principal must articulate a vision that will identify and support the utilization of digital tools. Moreover, teachers naturally look to the leaders in the school for assistance and guidance to facilitate the use of technology tools (van Thiel, 2018). In addition, Peled & Perzon (2022) indicated that principals should model systemic technology, which requires effectively integrating it into the curriculum and instruction. However, the idea of systemic technology can be

hard to attain when the school leaders face challenges that prevent them from achieving this.

Challenges facing 21st century principals face many challenges as classified as internal, referring to the principal, the teachers, and the school, and external, referring to the stakeholders within the school. Principals may experience challenges with implementing technology and lack the necessary skills and knowledge to function as technology leaders effectively. They may not access the requisite training to create digitalized schools (Apsorn et al., 2019; Nasreen & Odhiambo, 2018) and integrate it into the day-to-day pedagogical practices (Claro et al., 2017).

Vogel (2018) suggested that the principal should be prepared on effective use of technology to support student learning and to model the use of technology. Principals need to have a good understanding of the technological and pedagogical knowledge to supervise well and lead digital instruction transformation (Kotok & Kryst, 2017). However, Kotok and Kryst (2017) articulated those principals need only to have a good grasp of the available technologies to be able to empower their staff. Notwithstanding, other barriers include funding and access. Principals need financial resources to acquire digital supplies and software programs and provide intensive professional development for teachers (Kotok & Kryst, 2017). Funding is usually received from districts or education offices through the education governing body. However, this support can be lacking, resulting in another challenge that further compounds the lack of resources. Inadequate technological and human resources stem from little funding. Principals do not have sufficient technical support specialists to address the challenges faced by teachers

(Razak et al., 2019). Throughout the COVID-19 pandemic, schools were found to experience challenges with digitalization and infrastructure (Fauzi & Khusuma, 2020).

Principals need to know how to manage resources as part of school leadership (Apsorn et al., 2019). Additionally, the teacher's knowledge and skillsets, teachers' pedagogical skills and perceptions, and resistance are among some of the obstacles principals face when fostering technology integration within their schools. Resistance may be present not only among teachers but from different stakeholder groups, including parents, when they feel that technology is too demanding of their time (Kotok & Kryst, 2017). Some teachers may not quickly gravitate to technology and the use of digital tools since it requires adaptation to new pedagogy. They may feel overwhelmed with the expectations of utilizing digital tools, which seep into their planning time and make them unreceptive. Furthermore, principals may face issues of inequity where not all schools access the same school-based technologies or the funding to install adequate digital infrastructure (Collin & Brotcorne, 2019; Hall et al., 2020; Hughes & Read, 2018).

Also, the availability of effective online platforms for learning is considered the most essential. During the COVID-19 pandemic, this was found to be a problem across many schools, with many did not access to available online platforms to facilitate teaching and learning (Reimers & Schleicher, 2020). This suggests that there was limited access prior to the pandemic, which added to the myriad of challenges experienced by the principals.

TPACK Leadership

TPACK is crucial to the work of the principal as the technological instructional leader within the school. They provide the most support to their teachers to be competent in using digital tools in instruction. They must develop their TPACK competencies so that they can build the organizational capacity of the school and support teachers (Forsell & Baker, 2019). In the Speak Up Report, Project Tomorrow (2021), the principals admitted that if they invest in building teacher capacity for using digital tools, they will sustain the practices beyond COVID-19. The key to empowering teachers is through targeted professional development sessions (Fletcher et al., 2020). If teachers can see the prospects of using digital tools through training, then the utilization can be consolidated within schools (Martín & Cantón-Mayo, 2019). Principals can establish professional improvement among their teachers by ensuring that they have access to learning opportunities that can develop their practice (Hamzah et al., 2021). For principals to improve teachers' professional practice, they must align the teachers' digital competence or profiles to the TPACK framework and the 21st century competencies while positioning it to the technological possibilities (Caena & Redecker, 2019).

Principals can use the TPACK framework to design professional development for teachers' effective use of digital tools. It helps them focus on the different ways to empower teachers to grow and teach with technology (Forsell & Brazer, 2019). They can use the TPACK leadership diagnostic tool to support, develop, and implement technology initiatives (Clausen et al., 2019) that focus on training to use digital tools. The training should focus on each aspect of the framework. For example, teachers need to

know when to use the tools for instruction and assessment, keep students on task in certain learning situations, and be cognizant of how technological tools are linked to the 21st century skills (Forsell & Brazer, 2019).

Organizational Supports for Utilization of Digital Tools

Educators need to be aware that instructional practices are best shaped by content that is driven by sound pedagogy and forward-thinking technology (Hsu et al., 2017). Not only must they be aware, but this awareness must be honed and shaped through supportive environments that are made possible by the school districts. Teachers should demonstrate professional digital competence, which means integrating technology in their teaching using generic and specific teaching skills (Instefjord & Munthe, 2017). Teachers and principals need support to boost their professional digital competence to achieve digital teaching to build the school's capacity. It will transcend into the preparation of students equipped with the digital skills needed to function in 21st century society (Amhag et al., 2019; Costa et al., 2021). Teachers' support comes from the principals and the districts. Hamzah et al. (2021), in their study, found a statistically significant association between principals' digital leadership and teachers' digital teaching practice. Similarly, Shemshack (2021) contended that a principal's support could be in the form of ongoing professional development opportunities for teachers, which will enhance teachers' integration of technology in the classroom.

With the influx of digital tools, principals must become digital ambassadors who embrace the constant change and be risk-takers in equipping their schools to be of 21st century standards (Chang, 2019). One of the most critical tasks for principals is creating

and sustaining a digital learning environment that includes digital resources and technology modeling. When this is done, teachers will improve their technological literacy, teaching effectiveness, and students' achievements using digital resources (Zhong, 2017.) In the innovative digital school model, one element for developing schools' digital technology is infusing technology resources. Through the effective use of digital resources, teachers and students demonstrate digital competence and pedagogical and technical training and support (Ilomäki & Lakkala, 2018).

Therefore, school leaders should be more supportive of their teachers to increase their confidence levels and help them acquire the practical skills they need to integrate digital teaching. One way of providing support is through professional development. Through professional development, school leaders should provide teachers with clear guidelines about developing their learning outcomes by integrating digital tools (Kreijns et al., 2017; Napal et al., 2020). School leaders can continuously provide supportive environments for their teachers throughout the year by empowering them, allowing them time to learn about technology, and providing technical support in handling related issues (Kim et al., 2021; Hill & Uribe-Florez, 2020; Kirikcilar & Yildiz, 2018). In their study on secondary and middle school teachers, Hill and Uribe-Florez (2020) found that teachers were not confident in their technological knowledge and TPACK. They suggested that school and district leaders should strategically use professional development to equip the teachers with strategies to develop their technological knowledge and TPACK, strengthen their pedagogy, and use the technology to address issues that arise. The principal's role is to improve the quality of digital education by acting not only as a

supervisor but also as a coach to help develop the staff's competencies in using digital tools (Elistiowati et al., 2021). Principals should also collaborate with the staff to organize initiatives related to technology (Richardson & Sterret, 2018).

Principals also need support. Where there is active and effective technological support of school leaders, it has proven to help them to promote and support the vision of technology integration. Principals should be exposed to professional development that includes fundamental principles pertinent to their roles, such as leadership skills, digital fluency, and general technology integration. School districts can use an existing framework such as ISTE and UNESCO to assess the skillsets of principals and teachers and provide training in the missing areas so that the required change is achieved (Christensen et al., 2018). Similarly, the principals' training should be prioritized and personal to their needs (Richardson & Sterret, 2018). It should be used to improve the effectiveness of the principals so that they can recognize the necessary supports for teachers and balance training opportunities for them so that they can embrace modern technological tools (Prasojo et al., 2019; Richardson & Sterret, 2018). The professional development sessions must be relevant to the subjects being delivered in the classroom and use available technology and different standards such as ISTE, SAMR, and TPACK (van Thiel, 2018). In some schools learning coaches conduct professional development sessions among the teachers.

Several schools provide support for their teachers in technology integration using instructional coaches to improve instructional practices and strategies aligned to classroom instruction with reform education (Woulfin & Rigby, 2017). The role of the

instructional coach encompasses teacher support for new approaches and changes within curriculum and instruction (Hashim, 2020) to improve teacher pedagogy and students' learning outcomes (Kraft, 2018). Digital Learning Coaches work with teachers to integrate technology to support curriculum instruction (Hashim, 2020). They are critical to teachers' proficiency in delivering technology-enriched instruction. Their support is important to teachers and helps to focus and shape the development of the teachers' TPACK skills in instruction.

Implications

The literature review provided information on the TPACK framework for technology integration, how digital tools can support learners and yield desirable academic outcomes. It also looked at the challenges teachers and principals face in integrating digital tools in the curriculum ranging from digital competencies to limited infrastructure. It provided information on the supports that can be implemented across schools or districts to empower teachers to integrate technology. It also included support for principals as they provide instructional leadership to enhance their schools' digitalization and motivate teachers to utilize digital tools in instruction. This information was used to guide the study as I developed an understanding of the principals' perspectives about the challenges and supports related to their teachers' use of digital resources.

The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural

QEC in Jamaica. It focused on the challenges experienced by the teachers and the supports that are provided to them to encourage the integration of digital tools. The information ascertained the nature of the setbacks, the strategies that schools use to alleviate the problems, and the nature of supports received from the MOEY&I or any other related entity. The information gathered will help other schools to assess their challenges and to evolve beyond them. With the identification of specific challenges by the principals, professional development might be suited to assist principals in finding solutions. The professional development might assist teachers to improve the technological skills and pedagogy. It might help principals in coordinating instructional leadership and training opportunities and support according to the TPACK framework that will allow their teachers to grow through discussions with colleagues and experts in technology (Owen et al., 2020). This professional development for the principal will help them organize better supports that will sustain technology integration and motivate teachers to integrate technology. Appendix A contains the professional development program that I developed based on my findings.

Based on the principals' responses, other needs may arise, such as the principals' awareness of coordinated and collaborative strategic planning with stakeholders, including sponsors, partners, and parents outside of the school's walls. It might also call for their professional learning in the use of digital tools, peer coaching, and how to address specific infrastructure needs or maintenance issues, especially since they are located in rural communities (Owen et al., 2020). Principals as technology leaders should

be engaged in these activities that will help them to support technology integration and plan for effective instructional technology integration (Owen et al., 2020).

One common theme to addressing the issues of teacher and principal competence in technology integration is the use of professional development or training. Many schools and districts do not scaffold teachers and principals with the training that adequately prepares them for instructional technology that will enable them to improve student achievement (Nelson et al., 2019; Zarabanda, 2019). When educators receive continuous professional development centered around TPACK (Harris & Hofer, 2017), they are more likely to be confident and comfortable with shifting towards student-centered approaches to technology integration (Nelson et al., 2019; Pareja Roblin et al., 2019). So, this project study might focus on utilizing professional development aligned with the study's findings to cater for any areas such as TPACK-developed professional development and instructional support for teachers' use of digital tools.

The digitalization of schools and the effective use of digital tools are paramount for schools today as students are prepared to meet the needs of the digitalized society. School leaders and teachers should alter their pedagogical practice to support the learners' needs. The study provided information about the possibilities offered through professional development to equip teachers with the competencies that characterize effective technology integration. Digital tools, when innovatively implemented, can be naturally interwoven into teaching and learning practices that promote academic achievement for students.

Summary

Digitalization of schools is the new imperative for education, and many countries invest in ICT to enhance and develop their educational offerings (Apsorn et al., 2019; Owen et al., 2020). As digital tools become increasingly available, so does the need for a practical approach to school-wide technology integration that will impact the digital skills of the 21st century learner (Shemshack, 2021). The literature shows that many teachers maximize the digital tools to facilitate teaching and learning in several subjects (Börnert-Ringleb et al., 2021; Heflin et al., 2017; Hillmayr et al., 2020; Shatrid, 2020; Siefert et al., 2020; Supemaw & Reindorf, 2021) while others find that the advances in technology have made it more challenging to engage students (Gleason, 2018).

Teachers in developing countries as Jamaica face many hindrances with technology integration. They include the non-availability of technological resources and teachers' incapability to use technological tools (Ismail et al., 2020). Others include the teachers' lack of technical and pedagogical support and the development of their capacities to teach with digital tools (Claro et al., 2017; Ismail et al., 2020). These are barriers that principals and other school administrators must work to reduce within their schools. However, the principals also face challenges as they lead technology integration ranging from the provision of staff development, technical and infrastructure support, unwilling teachers, and budgetary constraints, incompatibility of the curriculum with existing facilities, and lack of training (Prasojo et al., 2019; Seraji et al., 2020).

Teachers and principals can benefit from many forms of support to produce effective use of digital tools. Continuous professional development support both the

teachers' pedagogical practices and competencies (Shemshack, 2021). Principals can also benefit from professional development that guides them into research-based instructional supervision practices to improve their capacity to lead, develop, and sustain schools that model effective technology integration. Principals should shape technology integration; they should support the development teachers' technological skills and provide an atmosphere conducive to technology integration (Apsorn et al., 2019). Principals who embrace technology will effectively lead their schools to acquire educational resources to enhance student engagement and learning.

In Section 1, I described the research problem, the rationale from a local and general viewpoint, the significance of the problem, and the RQs. This section also included a literature review on the TPACK conceptual framework and a review of the broader problem, including the challenges teachers and principals face with integrating digital tools. The literature base for this project curated topics about ICT, technology integration, digital tools, and the difficulties experienced by teachers. It also examined the supports that are afforded to teachers and principals to foster effective technology integration. Towards the last section of Section 1, I focused on the implications identified in the literature review for more research on the integration of digital tools. I suggested that professional development be used to address any issues identified from the interviews with the principals from the QEC about their experiences.

Section 2 will present the research design, approach, data collection, and analysis methods. Towards the end of the section, I will present the findings from this basic qualitative study. In Section 3, I will provide detail on the project to be implemented on

how principals can support their teachers' technology integration using the components of TPACK. I will also present the rationale for the project and a literature review related to the project and implications of the project. Section 4 will conclude this study with reflections and conclusions of the study. This will include reflection on what I learned throughout the journey, implications for future research, and recommendations and alternative approaches.

Section 2: The Methodology

The section includes a description of the research design and approach, the procedure for selecting participants, data collection methods, data analysis procedures, limitations, and ethical considerations. I conducted this study to explore principals' perceptions about the challenges they experienced in leading teachers to use digital tools in curriculum delivery and the organizational supports needed for the utilization of digital tools in instruction by primary teachers. I sought to understand principals' experiences regarding the perceived challenge of leading their teachers to utilize digital tools and the resources required to support their adoption. Additionally, the supports that may enable principals to create conditions that promote the teachers' use of digital tools in the NSC were investigated.

Qualitative Research Design and Approach

I used a qualitative research approach employing the basic qualitative inquiry design to discover the perspectives of primary school principals about teachers' utilization of digital tools in teaching and learning. The rationale for using this design is that it allowed for the collection of data and analysis related to the participants' experiences about utilizing digital tools in the primary school setting (see Aspers & Corte, 2019). The selected design matched the study because it enabled the exploration and unearthing of relationships and interconnectedness between people, events, and situations as they shared their lived experiences (Creswell, 2013) and the meanings they give to these experiences (Payne, 2017).

Practice Problem and Research Design

I explored the problem of primary school teachers' utilization of digital tools in the curriculum. Principals of the rural QEC expressed that many teachers are not using the digital tools at their disposal to teach the students. Some tools include internet connectivity, personal tablets for teachers and students, laptop computers, and smartboards. However, despite the availability of the resources, teachers do not integrate the tools into the curriculum. The lessons are being taught using traditional methods. When technology is employed, it is at the substitution level, where, for example, the multimedia projector is used to display images or notes. Additionally, when teachers were provided with e-books to use during the 2020-2021 school year, the usage rate was considerably low among the teachers of the QEC; according to the education officer, several of the teachers did not access the tools. With the constant emphasis on 21st century skills in the primary curriculum (MOEY&I, 2017), the underuse of the tools is a problem, according to principals.

I used a basic qualitative inquiry approach to examine primary school principals' views about digital tools. The study included a purposive sample of 11 primary school principals or vice principals who share the task of supervising teachers who must use digital tools to prepare students for the 21st century world. The principals and vice principals of the same district were the participants within the study. I conducted interviews with the principals or their vice principal to understand their views and perspectives about the challenges and supports with the utilization of digital tools among their primary-level teachers. Interviews facilitate conversations that probe a persons'

experiences about different situations and events (Van de Wiel, 2017). The rationale for selecting a qualitative methodology was to ensure the collection and analysis of in-depth information about the principals' experiences with the utilization of digital tools (see Merriam & Tisdell, 2015). I considered the quantitative and mixed-method approaches but opted against using either for this study.

I rejected the quantitative methodology because it focuses on collecting numerical data to assess the relationship between variables without using themes (Burkholder et al., 2019). In this study, no numerical data were collected, and there were no variables to evaluate against one another. The principals' views formed the collected data. Additionally, quantitative methodology necessitates hypotheses to test a theory (Burkholder et al., 2019). It rests heavily on control of variables with data collected through observations or directly from the participants. The researcher employing quantitative research seeks to understand or describe a phenomenon using statistical analyses (Burkholder et al., 2019). The phenomena in this study were described using themes and not statistical analyses, based on participants' responses. Such an approach is less restrictive when compared to the quantitative method (Kozleski, 2017).

I considered the mixed-methods approach because of the possibility that it would lead to the collection of more and varied information about the problem. However, it was not selected because it usually requires more complex RQs that seek to generate new ideas to inform science and policy using a mixture of perspectives and data forms and analytic approaches (see Clark, 2019). This method is best used by experienced researchers who can effectively integrate quantitative and qualitative data collection and

analysis to answer the RQs (Burkholder et al., 2019). In addition, mixed-methods research is time-consuming and requires more resources for data collection (McKim, 2017).

Description of the Basic Qualitative Inquiry Design

Merriam and Tisdell (2015) described the basic qualitative approach as centering individuals' construction of reality in their interactions with the social world. The qualitative method allows for generating new ideas, examining the past, and having a personal and social impact (Mohajan, 2018). Qualitative researchers use verbal and visual representations through narrative, observations, or field notes to understand the problem (Cypress, 2018). I was interested in understanding the phenomenon surrounding the use of digital tools in the primary school setting. The qualitative inquiry enabled me to investigate this phenomenon using verbal representations conveyed in participant interviews. The flexibility afforded by the qualitative method permitted me to seek clarity when participant responses were unclear (Lew et al., 2018) and to use field notes and digitally recorded interviews as other forms of representations to support the data.

Researchers who study phenomena in their natural environment try to make sense or meaning of people's experiences (Burkholder et al., 2019). Because qualitative inquiry involves the collection of data in participants' natural settings, it was appropriate to investigate principals' perspectives about practices in their schools. The participants are seen as storytellers who answer the questions, using their experiences to highlight important issues and contribute to new discoveries in a way that interacts with the researcher (Roulston & Choi, 2018). Furthermore, the nature of qualitative RQs evokes

responses that present different viewpoints drawn from their experiences. Whereas in quantitative studies, the participants respond to questions that are structured for them only to provide an answer (Kozleski, 2017), the qualitative methodology can replicate participants' experiences when the researchers seek to explain people's behaviors and experiences (Merriam & Tisdell, 2015).

Qualitative research is suited to address research issues or questions that might be challenging to explore using more structured research designs. It allows the researcher to conduct the inquiry even with topics that persons may consider personal (Roller & Lavrakas, 2015). Although the qualitative research suited this study, it had some limitations related to researcher bias. The qualitative researcher has more control over the sampling, collection, interpretation, and findings. Findings will be less generalizable if they are elicited from a small population and within a specific setting (Merriam & Tisdell, 2015).

Considering the nature of the qualitative research and the purpose of the study, to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica. I believe that the qualitative approach was best suited to fulfill the purpose of the study. The method suited this research because the information gleaned from the participants stemmed from their interactions within their natural settings. Qualitative research has constructivist and ontological underpinnings (Ravitch & Carl, 2021). The data collected in a qualitative

study incorporate words from people about their feelings, knowledge, and experiences gleaned from interviews.

Justification for the Research Design

In trying to determine which design would best align with this study, I contemplated action research, case study, grounded theory, and ethnography. These were considered because of the possibility of working in an organization and with groups of people. However, based on the research purpose, I eliminated them and opted for a basic qualitative design.

The researcher and the participants collaborate to apply theory to practice with a social change agenda to improve practice using action research. The aim is to make a system such as a school better through cyclical inquiry and practice (Mertler, 2019; Niemi, 2019). In this study, although there was a focus on social change, the purpose was not to work continuously in partnership with the participants but rather to get their views about digital tools. For that reason, this approach was abandoned.

Researchers conduct case studies to develop an understanding of a larger phenomenon through intensive examination of one specific instance (Harrison et al., 2017). They can also focus on organizations. Case studies are primarily descriptive or explanatory in depicting events, processes, and perspectives of real-life context (Harrison et al., 2017). According to Burkholder et al. (2019), a case study requires putting various pieces together to form a thorough picture of what is happening in the unit. They rely on a variety of triangulated data sources in data collection over time, such as interviews, observations, artifacts (Burkholder et al., 2019; Creswell, 2013; Rossman & Rallis,

2017). I did not use a variety of data collection methods, only open-ended questions. Additionally, there was not adequate time to be intensively integral in the schools to unearth the descriptive details required of a case study. Based on these factors, the case study was not selected as the preferred design.

Researchers collect rich data on a topic of interest in the grounded theory approach. They use this approach to generate theory inductively from the data. The researcher constructs the theory based on their worldviews (Chun Tie et al., 2019; Merriam & Tisdell, 2015). Because the purpose of this research was not aligned to the construction of a theory about the principals' views and digital tools, I did not select this approach.

Ethnographic researchers aim to understand the experiences of people's settings and culture and require long-term sustained engagement using multiple and flexible methods (Merriam & Tisdell, 2015; Rossman & Rallis, 2019). The focus of my research was not on the principals' or even the school's culture, so this approach was not considered a fit based on the purpose of the research.

The basic qualitative approach was suitable for the study because it is characterized by a small participant cohort (Kahlke, 2018) and features interviews to gather data that will be analyzed using themes (Moser & Korstjens, 2018). I based the RQs and data collection methods, featuring open-ended interviews, for this study on the research problem. Thematic analysis was used to make meaning of the data by identifying and interpreting the patterns and themes in the data. The basic qualitative approach was appropriate given that the main goal of this research was to explore and

uncover the participants' experiences and views about digital tools and processes (see Aspers & Corte, 2019; Merriam & Tisdell, 2015).

Participants

The participants for this qualitative case study were from QEC 64 (pseudonym), a group of schools in rural Jamaica. The QEC is home to 14 schools, three of them at the high school level and 11 primary-level schools. The student population varies among the primary level schools, with enrollment ranging from 100 to 500. Most of the primary schools also have an infant department that caters to students aged four to six years. Each primary school principal or their vice principal was invited to participate in the research. All the principals, but one, have no less than three years of experience, with a little under 50% of them having more than ten years' experience as school administrators.

Criteria for Selecting Participants

Emmel (2014) contended that qualitative research by its nature allows for the collection of in-depth, nuanced information about a phenomenon to understand its complexity and how it works. Since qualitative research focuses on the depth of investigation rather than on breadth of coverage, researchers must choose the sampling strategy to find participants who will provide information insights to the questions they seek (Shaheen & Pradhan, 2019). The focus must be on participants who can provide rich accounts because they possess the information or have the experience about the phenomenon within the context of the research. It is imperative that the participants are qualified to provide answers to the questions; hence I selected the purposive sampling strategy for this research.

I used purposive or nonprobability sampling to identify the participants for this study. The reason for using this technique is that it allows established criteria for selecting the participants to determine the eligible participants (Schwandt, 2015). In this research study, the group characteristics strategy specific to the homogenous sample was applied when inviting the participants because of the similarity that exists among them. The participants are within the same district, working with a similar portfolio, and supported by the same administrators (Patton, 2015). According to Bhardwaj (2019), researchers use the purposive sampling strategy because they know the target population can provide the information being sought. Additionally, its distinct advantage is that the participants will have the appropriate experience and understand the research to be studied well enough. The participants for this study are school leaders who know what pertains to digital tools and technology integration within their schools. Utilizing purposive sampling equips the researcher to get the desired information since they can communicate directly with the participants who have met the established criteria (Bhardwaj, 2019).

The principals and vice principals who participated in this research met certain criteria. Since there are high schools in the QEC, the participant had to be a primary school leader in QEC 64. They were selected because they most likely understand the expectations of technology integration at the primary level. Their experience with leading their teachers, observing lesson delivery, providing support, conducting teacher appraisals, and encouraging teachers to participate in professional development equipped them to provide insight into digital tools and the NSC. They are privy to different

programs in which technological tools were provided to teachers and students, the different trends in technology, and the state of technology integration. The principals and vice principals should know what resources exist within their schools, how their staff respond to training or apply what they learned from professional development training. They also should provide information on the supports that they provide for their staff and what the schools and principals receive. They were also able to comment on the response and support from the different stakeholder groups and the expectations obtained in relation to digital tools. Principals and their assistants as instructional leaders are aware of updates in curriculum and instruction. Technology integration forms a significant part of the curriculum. Their knowledge of their schools' situation illuminated an understanding of what technology integration looks like, what are the barriers experienced in their contexts, and what successful integration look like as part of the in-depth data to be collected.

To develop this in-depth information, the principals or vice principals must be willing to participate in a semistructured interview as they share the accounts and their views on the use of digital tools by teachers in the curriculum. These interviews highlighted how teachers use digital tools to engage students in instruction. The perspectives of all the primary principals in the QEC provided detailed and rich accounts about the context of digital tools within their individual schools and supplied the data that illuminated an understanding of the problem. The different accounts allowed me to check for similarities or variations among the schools within the QEC relating to challenges and the types of supports received or needed.

Justification for Number of Participants

Qualitative researchers must decide on the sample size before the study (Young & Casey, 2019). But Burkholder et al. (2019) said that because qualitative studies are not concerned with representing a population but are focused on acquiring relevant data to answer the RQs; the number of participants is not a focus. Other authors have varying perspectives on the number of participants that researchers should include in qualitative research. Bernard (2013) suggested that 10–20 participants should be sufficient to understand their lived experiences, while Patton (1990) stated that two to 10 participants should see the achievement of data saturation. Kuzel (1999) recommended five to eight participants when the participants are homogeneous. Sandelowski (1995) suggested that sample sizes of 10 may be sufficient for conducting a study with a homogenous population. Sandelowski (1995) also postulated that a sample could be too large, in which case it does not allow for deep qualitative inquiry. Morse (2000) said that in determining sample size, a qualitative researcher should consider the scope of the study and the nature when justifying their sample size. Creswell (2013) recommended that a small sample size in which the participants are engaged can yield to the collection of rich and thick details about a phenomenon to the point of saturation. This basic qualitative research will use the purposive sampling strategy and incorporate the recommendations of these authors to select the number of participants.

All 11 primary principals or their vice–principals were invited to participate because they may have the experience and expertise to answer the RQs (Johnson et al., 2020). Since generalizability is not a goal of qualitative research, it is acceptable to use

smaller sample sizes (Gill, 2020). It can be challenging for a researcher to fully determine a final sample size because of the data saturation expectation. Researchers should focus on getting thick and rich descriptions from the participants to ensure that the inquiry process is more profound and richer, which I intend to do (Johnson et al., 2020).

However, data saturation should not be the only measure of sufficient sample size as there are instances when the number of possible participants available to the study is small, as in this case (Johnson et al., 2020). The research was conducted among 11 primary school principals. Where principals did not opt to participate in the study, their vice principal was asked to maintain the required number of participants. Since there was no attrition, the sample size of eleven was sufficient to unearth the answers to the RQs with data saturation achieved. Data saturation was met with the planned sample size, and I did not recruit additional participants from within the QEC to gather more and new information (Guest et al., 2020; Hennink & Kaiser, 2020).

So, the justification of the number of participants was that the 11 principals or vice principals from the same geographical area and governing body have experience with digital tools in the schools. They were able to provide quality data about the scope and nature of the topic, digital tools and supplied the amount of rich detail needed to satisfy data saturation.

Procedures for Gaining Access to Participants

I worked as a primary school principal within the QEC from 2013 to 2019. Prior to that, I worked with some of the principals in my capacity as mathematics coordinator for their schools. Since 2019, I have been out of the system, studying in the United States.

However, I intend to return to the QEC within a year of completing the study. I have a good collegial relationship with many principals, which will help me earn their trust, an essential quality for undertaking this type of research. Not actively working within the QEC will eradicate any conflicts of interest with the study site or among the participants. Additionally, I did not fulfill any professional or individual loyalty or duty to any organization associated with the study's site, and there is no financial benefit (Rodwin, 2019).

Once I received Institutional Review Board approval from Walden University (approval no. 01-28-22-0593023), I requested permission from the MOEY&I to use QEC 64 as the site to conduct the study (see Burkholder et al., 2019). The submitted information addressed the purpose of the study, the procedures, and the protocols established to protect and ensure confidentiality of the QEC, the schools, and the participants (see Appendix C). When the Ministry of Education granted written approval to conduct the study and informed the schools, I then contacted each school's principal via email, using the email list that I acquired from the MOEY&I. In the introductory email, I informed the school leaders of my approval from the MOEY&I, (see Appendix D) submitted a description, and the purpose of the study, and invited them to be participants (see Appendix E). Extending the invitation to each principal or vice principal in the QEC reduced bias since they chose whether they wanted to participate (Creswell, 2013). The email also contained information on how I would maintain confidentiality and safeguard the participants' schools and their identities (Burkholder et al., 2019) and how they could contact me.

When the leaders indicated a willingness to participate, I responded with a request to complete a brief participant information form asking for their name, gender, school's name, school's location, and years of principalship (see Appendix F). They were also asked to complete the consent form. One section informed the principals and vice principals of the preferred mode of online meeting tool to conduct the interviews and a choice on the tool that worked best for them according to access and connectivity. The participants were requested to reply to the email with the words "I Consent" if they agreed to participate in the study. Upon receiving their responses, I contacted them by email to schedule the semistructured interviews to be conducted using a videoconferencing tool. The principals and vice principals were asked to indicate their willingness to use Zoom to participate in the interview and, if not, their preferred choice of a videoconferencing tool from a list of options.

Because I was not physically in Jamaica, I considered using a video conferencing tool to facilitate the individual interviews because of the geographical location of the researcher and the participants. The video tool enabled me to see the participants and establish rapport and to draw meanings about the research topic (Glegg, 2019). Using visual methods to facilitate interviews enable communication, represent the data, enhance data quality and validity, and facilitate the relationship between the participants and the researcher (Glegg, 2019). Such tools may include Zoom, Whatsapp video, Google Meet, Teams, or Skype. Zoom has been found to be an effective videoconferencing tool to facilitate interviews in qualitative studies. When used to accommodate interviews, the Zoom videoconferencing tool engendered rapport, convenience, and user-friendliness for

the researcher and participants (Archibald et al., 2019, Mirick & Wladkowski, 2019). It is accessible by most persons, saves time, and reduces travel requirements (Gray et al., 2020).

Where principals did not respond to the first email, and I did not receive a minimum of seven participants, I resent the introductory email as a reminder to those who did not respond. This email reminded them of the purpose of the study and how the findings may be useful for instructional supervision. When no response or willingness was forthcoming from the principals, I invited the vice principal to participate. This happened in two instances. Upon receiving additional participants, I followed through with the steps completed for the initial respondents.

Researcher-Participant Working Relationship

The participants are known to me through my work as colleague principal and mathematics coordinator within the QEC. My relationship with these individuals developed over ten years through our work in the QEC. While there exist different levels of the professional relationship, it did not in any way impede or erode the trust and rapport that developed from knowing each other as colleagues (Eide & Allen, 2005). Notwithstanding, I believe that the participants openly provided honest feedback on the questions during the interview because of that professional relationship. Throughout the study, I maintained that trust and rapport with the participants at all stages, from invitation to participate, interviews, and member checking.

As the researcher-participant of this qualitative study, I served as the primary data collection instrument through my involvement in the interviews. This role enabled me to

become intimately involved with the study's setting, the participants, and the data analysis, substantiating my role as researcher-participant (Creswell & Poth, 2018). After reviewing my project, MOEY&I (see Appendix E) and Walden University granted their approval. The informed consent forms signed by the participants provided information on my role and the project as a whole.

I operated with the awareness that as a researcher-participant, I have my personal views, experiences, and assumptions that I took with me throughout the study process. However, I reflected on and acknowledged that these personal influences could create biases and potentially interfere with the data collection. To lessen my presuppositions, I kept an open mind when listening to the participants' views, practiced reflexive journaling, and conducted external interviews. In my journal, I reminded myself of the rationale for the study, my assumptions, and my relationship with the participants (Burkholder et al., 2019). My purpose for engaging in external interviews was to allow a non-participant in the study to help me identify any biases to the respondents' answers and corrected where it existed (Tufford & Newman, 2010). Before collecting data, I completed the CITI Program's training on working within human subjects (see Appendix G).

Measures for Protecting Participants' Rights

Throughout the study, I adhered to ethical standards by engaging in specific protocols and routines to maintain the confidentiality of the participants and the data collected. I ensured confidentiality, by using pseudonyms for each of the participants (Prin01, Prin02, Prin03, and so on) to remove any identifying information that would

reveal their identities during the data collecting and reporting stage. These data sets included signed informed consent forms, coded data collected from interviews, and an information sheet. I maintained the security of the data by password-protecting all computer files related to the study and will only grant access to authorized persons. Any hard copy documents such as permission to conduct the study and recordings are locked away in my personal safe that is protected by a password (Burkholder et al., 2019).

According to Burkholder et al. (2019), the informed consent process must be transparent in communicating to the participants since it is their right to make an informed decision about voluntarily participating in the study. The following components were addressed on the consent form so that harm was minimized throughout the study:

- name of the researcher;
- a concise initial presentation of key details about the study;
- a brief explanation of the study's purpose;
- the expected time frame for the study;
- the study's procedures;
- any anticipated discomforts or risks associated with participation;
- a statement that participation is voluntary and refusal to participate or discontinuation of participation at any time will pose no negative consequences;
- a statement about how confidentiality and privacy will be safeguarded;
- instructions on how to submit the signed consent form to the researcher;

- a statement about how the data will be secured and eventually discarded, and;
- contact information.

Throughout the study, the protection of the participants' rights was important. I respected the participants' time, was open-minded in communication, and reaffirmed consent throughout the research process. I allowed the participants to review the interview information before I published the results, ensuring the integrity of the data. I will keep all files safe and inaccessible to unauthorized persons from the recruitment stage and onwards for five years. After the 5th year, in accordance with Walden University guidelines, I will discard all data collected throughout the study.

Data Collection

I collected data using interviews. This source of data collection was semi-structured interviews conducted with primary school principals or vice principals. I used interviews to discover information about any challenges and supports. The study explored principals' lived experiences and perceptions with challenges and supports necessary to integrating digital tools by their teachers.

Description and Justification of Data Collected

For this study, I used a basic qualitative approach to explore the perspectives of principals about digital tools. Therefore, the interview is appropriate for this research design because the information gleaned from the principals were based on the interactions between the researcher and the participants within their natural environments. This is anchored in constructivist and ontological underpinnings (Ravitch

& Carl, 2021). The data collected in a qualitative study includes words from people about their feelings, knowledge, and experiences gleaned from interviews or focus groups.

Interviews

Naturalistic data-gathering techniques for qualitative methods include interviews because they provide in-depth information about the phenomenon under study (Rubin & Rubin, 2011). They allow the researcher to explore matters or phenomena unique to the participants' experiences and allow for an insightful understanding of how they see or experience the phenomena (see McGrath et al., 2019). It is essential that the interviewer builds rapport and establish comfortable interactions with the interviews before and throughout the interview process (McGrath et al., 2019; Rubin & Rubin, 2011). One interview type that allows flexibility in establishing that rapport is the semistructured interview type. In the semistructured interview, the researcher prepares a limited number of questions about the research topic in advance and plans to ask follow-up questions (Rubin & Rubin, 2011). I employed the semistructured interview type with the leaders because it encouraged the interviewees to answer at length and in detail about their experiences and limited the perception of bias on the researcher's part (Creswell, 2012).

Each participant was asked about their lived experiences and perceptions with challenges and supports necessary to the integration of digital tools by their teachers. In addition to the types of challenges and the nature of support, the questions also focused on what they believed could be done to change the situation of underuse of digital tools in their settings. The initial questions were similar for all the participants, but probes or follow-up questions differed based on their responses. I audio-recorded and transcribed

the interviews so that the captured data reflected the participants' accurate responses and assisted with coding and analysis (see Merriam & Tisdell, 2015; Ravitch & Carl, 2021). I recorded the interviews with the participants' permission.

Data Collection Instruments and Sources

I describe the interview instrument and the source of data collected in this basic qualitative research.

Interviews

Interviews provide an opportunity to gain a deeper understanding of the principals' perspectives, actions, and experiences about digital tools. I used a semistructured interview instrument to collect data from the principals. The interview collection method was consistent with the qualitative approach. The protocol was developed with questions taken from other published principal interview protocols authored by Edwards (2020), Presby (2017), and Persaud (2006). They researched school administrators' views on their role in technology integration and how they learn to be technology leaders. Their breadth of questions included challenges faced and supports received. The questions selected from each of the protocols reflect the TPACK conceptual framework of this study. The nature of the questions generated responses about the challenges teachers face related to their TPACK and others. The framework was also key in determining the school's support systems for technology integration and how they align to TPACK.

I selected the interview questions because they align with the study's RQs and TPACK framework (see Appendix H). The 10 questions were used with permission from

the authors (see Appendices I-K), with additional clarifying questions developed by me based on the nature of the semistructured interview type. The clarifying questions provided the principals with greater scope in answering the interview questions and provided details in follow-up/probing questions. The first section of the protocol informed the interviewees of the purpose of the research. The second section contained open-ended questions which solicited information about the challenges the teachers experienced, the supports they have provided and received. The third section featured a request for any additional information and the closing remarks.

I offered the principals and vice principals Zoom meeting as a medium to collect data due to geographical boundaries. Using this platform enable me to still observe the participants' gestures and tone (Archibald et al., 2019). However, where the participants encountered technological challenges, they reconnected or were offered to participate via phone call.

Sufficiency of Data Collection Instruments

Using an interview protocol to collect information from the primary principals is key to finding answers to the RQs. As reported by the principals about digital tools in their schools and among their teachers, valuable information provided much-needed data about the phenomenon. As indicated by the data saturation principle, once the participants raised the same themes, issues, and topics, the small sample size was enough to make the collected data sufficient (Creswell, 2013). In this study, the sample size was 11. The participants work in the same geographical location within the same district and with the same administration. Therefore, the interviews allowed for the collection of in-

depth information even among a small group of persons, as in this case. The use of the interview protocol was sufficient as it provided in-depth and detailed information about the school leaders' thoughts, experiences, and issues (Rubin & Rubin, 2011). While interviews are used to support other data, it is sufficient to offer a complete picture of the principals' views about digital tools, hence supplying answers to the RQs. Additionally, a focus group was not used; the participants would be more comfortable speaking about their situations, issues, or sensitive topics (Guest et al., 2017). It was also a more efficient method to gather a larger breadth of information that would be garnered from surveys, written responses, or archival data and facilitates deep discussions (Guest et al., 2017).

Process for Generating and Recording Data

I began the data collection process after obtaining approval from Walden University's Institutional Review Board and the MOEY&I. The participants for this study were primary school principals in a rural QEC who provide instructional supervision to their cadre of teachers. It is their responsibility to ensure that quality education is delivered to the students and with the use of technological tools as per the NSC's goal of preparing students to function in the 21st century workforce.

The recruitment process began with an email sent to each school's principal and later vice principals using the email listing provided by the Ministry of Education. In the first email I introduced myself and provided an overview of the research. I asked the school leaders to indicate their willingness to participate in the study and to respond within two days. Once I received a response from the principals, I sent them another email to complete the demographic information sheet and return the signed consent form

(Rubin & Rubin, 2011). The recruitment process closed within three weeks of initiation since only the principals in the QEC were invited to participate. Following the selection process, I contacted each participant by email to work out the logistics of the video interviews.

Interview Arrangements

The scheduled interviews were conducted using a semistructured interview protocol and lasted no less than 45 minutes. Prior to the interview, participants were asked to reiterate consent to participate voluntarily and to record. Since the interviews were conducted with a video tool, participants were asked to agree to each point on the consent form prior to the interview (Gill & Baillie, 2018). I reminded the participants about the study and gave them an opportunity to ask questions. I also reminded them of how the collected data was used and that they are free to withdraw at any time. Each participant was assured of the steps to be taken to protect their identity and store the information confidential using non-sequential pseudonym codes for their schools and names. The codes are known only by me and kept on password-protected computers to maintain confidentiality and protect the participants from harm (Rubin & Rubin, 2011). Following the interviews, I transcribed the interviews verbatim. The interview transcripts are kept in electronic format and password-protected, along with a cloud backup that is also password protected (Saldana, 2015). The coded transcripts and recordings are stored in a locked safe with access only by me to maintain participant confidentiality. Each participant received a summarized copy of the transcript where they were asked to review and provide feedback on its accuracy. This was done to ensure the accuracy and

thoroughness of the data (Rubin & Rubin, 2011). Participants were asked to respond within a week. The principals responded to confirm accuracy of the data; two principals questioned different information, which I clarified.

Conducting the Interview

I conducted the digital interview in a quiet, private space, so that the participant's privacy and confidentiality were maintained. This allowed the participant to be comfortable and confident to participate in the interview. The participants were asked to select a quiet and private space while participating in the interview (Gill & Baillie, 2018). I greeted and explained the study's focus, asked the questions on the guide, and posed relevant follow-up questions. I remained attentive and expressed an interest in their answers while I took note of any body language and tone. I remained calm and positive and ended the interview in accordance with the agreed-upon time.

Semistructured interviews are used in instances when the researcher needs to ask predetermined questions, but there is also an opportunity to ask follow-up questions (Ravitch & Carl, 2021; Rubin & Rubin, 2011). Participants can also discuss issues that they feel are important to the RQs (Gill & Baillie, 2018). I used the interview protocol (see Appendix H) to guide the content of the interview. This included open-ended questions such as, "Why do you think these strategies were effective?" The nature of these questions elicited in-depth information and gave the participants an opportunity to discuss the issues important to them as I explored their experiences and perspectives. Other probing questions were asked that elicit information about hypothetical situations, provided clarity, or be interpretive to get a deeper understanding of their experiences and

to understand any concepts and terminology introduced by the participants (Merriam & Tisdell, 2015; Ravitch & Carl, 2021).

Tracking of Data From Instruments and Emerging Understandings

To keep track of the data and to capture the participants' viewpoints, I used interviews as a collection method. As I engaged in the data collection process, I wrote notes and data collection memos as I completed the repeated analysis of the data, which shaped my reflections. Writing memos ensure that I added additional thoughts about the interview and linked them to the interview transcripts (Deterding & Waters, 2021).

Notes and memos helped me to track my thoughts and referred or related to my insights, general ideas, or themes that will emerge at different stages of the study. The researcher's personal thinking might provide a hunch or insight about themes emerging in the interview or from observation (Creswell, 2012). I wrote notes on the interview guide during and after the interview (see Appendix I). The notes preserved observations about the environment and relationships shared with the participants throughout the interview. This form of reflection helped me capture the interview's key details and reminded me of any significant points mentioned by each principal.

I continued to engage in reflexivity and documented my motivations, biases, and ethical tensions (Reid et al., 2018; Palaganas et al., 2017) as memos in Microsoft Word (see Appendix J). I used memos to document my observations and reflections on different stages of the study, such as data collection, skills, and ways that my thoughts influence the data (Ravitch & Carl, 2021). The use of a memo also helped me track my biases and personal beliefs and distinguished them from the participants' views. Each memo

included the dates that I repeatedly listened to the interview audio recordings and compared them to the transcripts for accuracy. The memos included questions and potential themes used throughout the data analysis stage as I thought about the RQs and made connections to the data.

I uploaded each participant's interview response to NVivo 12. The coded names were used to differentiate the participants' data (Merriam & Tisdell, 2015). I coded each participant's interview separately. To begin the coding process, I identified the first cycle descriptive and concept codes, and second cycle pattern codes. As I went through the second cycle methods, I maintained a memo that helped me to identify categories, concepts, and themes and organized them (Saldana, 2015).

Means of Gaining Access to the Participants

When I received permission to proceed with the study, I contacted each participant by email. I used the email listing that I receive from the Ministry of Education regional governing body that has jurisdiction over the study's site. I informed the participants of the purpose of the research, their anticipated role, and invited them to participate. I frequently used email to communicate with the participants. As I used this method of communication, I developed a researcher-participant relationship that was positive and established connection with the participants.

Role of the Researcher

In this qualitative study, I served as an instrument of data collection through my participant-researcher role in the interviews while I tried to understand the perspectives of primary principals about digital tools (Creswell & Poth, 2018). I gathered data through

semistructured interviews. As the primary instrument of data collection, I contacted the schools to identify participants. Following the identification of the participants, I collected demographic data and obtained the informed consent via email in which the participants responded by saying, ‘I consent.’ I scheduled the interviews, prepared the virtual interview meeting links, and led the interviews. My role in the data collection process also involved transcribing the recordings, analyzing the data, and reporting the findings.

The study was conducted in a QEC that I have worked with for many years in various capacities, first as a mathematics coordinator who oversaw the delivery of the primary mathematics curriculum and then as a principal. However, I would have been away for close to four years at the time of the study. Though I established professional and collegial relationships based on my work experience, there was no professional association with the participants during data collection. The pre-established professional relationship promoted trust, sharing, and approachability. Obtaining consent from the participants provided leverage in that participants did not feel coerced in participating due to established relationships. I explained my role as a researcher, disclosed the intent of the study, and let the participants know that they could withdraw at any time without any repercussions (Heslop et al., 2018).

As I prepared to conduct the study, I acknowledged my biases. According to Reid et al. (2018), researchers should address their biases so that they are neither advantaging nor disadvantaging the participants in the study. I have biases about technology integration since I use technology in many areas of my life, including as an educator. I

conducted training with teachers on technology integration within the QEC and provided support for colleagues at another school in a different QEC. I believe that technology integration can be used to engage students in ways that will develop them into critical thinkers, effective communicators, and creative individuals. These biases influenced my research topic as I wanted to know what challenges are experienced by teachers as told by principals and the supports that could be provided to meet the expectation of technology integration at the primary level. Despite these biases, however, I recognized that the utilization of digital tools requires more than just having access, and so while I may be competent with using the tools, the experience is different for each teacher and in each school's context. Recognizing these biases also helped me to understand the challenges for teachers. Through this recognition, I remained open-minded throughout the data collection process so that I was transparent in finding answers to the RQs. Merriam and Tisdell (2015) suggested that researchers bracket their biases, prior knowledge, and interests when they engage in a study to not interfere with its outcome or validity. To minimize the surfacing of my biases in data collection and analysis, I practiced reflexivity. By using notes and journals, I critically assessed my analyses of biases and my role in the research process (Schwandt, 2015). I also engaged in member checking with the participants by restating or summarizing their accounts during the interview by asking questions to determine accuracy (Creswell 2007; Lincoln & Guba, 1985; Ravitch & Carl, 2021).

Data Analysis

In this section I describe the process of organizing and analyzing the data and the coding procedures in identifying the emergence of categories and themes. I also describe the steps taken to assure quality accuracy and credibility and the procedure of managing discrepant cases.

Coding Procedures

The data from the interviews were coded by going through each participant's transcript and highlighting the related statements made by the principals. Each interview transcript did not contain the participant's personal information but assigned a pseudonym as an identification code initially (Chauvette et al., 2019; Ross et al., 2018). The data were organized and prepared for data analysis by transcribing the interviews and arranging the data into different types depending on the questions asked. I used the online software program, Otter.ai to transcribe the audio recording of the interviews. I edited the output for accuracy by listening to each recording two more times. Comparing the audio and the transcript allowed me to listen to the participants' responses, become more familiar with the data, and develop a general idea for interpretation. I utilized my memos and analysis notes as part of the data analysis process as I reviewed each transcript, noted my own ideas and thoughts about what was being stated, and highlighted thematic codes (Bogdan & Biklen, 2007; Creswell, 2012). I used this procedure for each of the transcribed interviews. I identified general categories, themes and, patterns and labeled them to generate potential codes (Creswell, 2012; Saldana, 2015). I used NVivo 12 to cross-reference interviewees' responses to the video transcripts to identify patterns and

categories from the codes. I generated visuals that showed each participant's ranges of responses with the developed codes as I engaged in second cycle coding. I engaged in thematic analysis and open coding of the transcribed interviews to analyze the data. See Appendix O which contains the codebook that I created using NVivo 12 and Appendix P which contains a participant's coding summary chart.

For this study, I followed the coding procedures steps outlined by Nowell et al. (2017): becoming familiar with the data, generating the initial codes, searching for themes, and reviewing the themes. It also involved defining and naming the themes and then producing the report. I used the inductive process, moving from narrow themes to broad themes, to describe the study's site and the themes as they developed throughout the interviews (see Creswell, 2012). Researchers use coding to identify patterns, similarities in features, presentation, context, and meaning (Saldana, 2015). I used the transcripts to record and decide on the codes to complete my first cycle of individual coding of each transcript by analyzing sentences or groups of words that reflect an idea or concept (Creswell, 2012). I imported the transcripts into NVivo 12 and selected the codes. Where it was possible, I used in vivo codes from the participants or the transcript to label the data by assigning a word or code that describes the meaning of the text (Creswell, 2012; Ravitch & Carl, 2021). I developed a list of descriptive and concept codes from the interviewees and then engaged in second cycle coding.

As I engaged in second cycle coding, I looked for patterns and developed categories. Pattern coding is the opportunity to look at the data from a different perspective and identify words and phrases across participants that have shared meaning

(Saldana, 2015). I developed a list of the descriptive codes and then further coded them as conceptual codes. I then proceeded to categorize codes during this second cycle. The codes were presented in tabular form to show the categories and themes that emerged from both cycles of coding.

Coding brings meaning, structure, and order to data as the researcher progresses through the cycles (Saldana, 2015). I reviewed the codes and categories and assigned each based on their commonalities to each other as I developed the themes that were geared towards answering the RQs (a) What are the perceived challenges faced by primary school principals in leading their teachers to utilize digital tools in the delivery of the primary curriculum? and (b) What do principals perceive as organizational supports needed for the utilization of digital tools in instruction by primary teachers? Identifying these themes helped me to further analyze a code's shortened core by elaborating on its meanings (Saldana, 2015). The participants' responses were used to generate the codes that relate to challenges teachers experience in using digital tools and the organizational supports provided to them. The list of codes that represent the different themes, patterns, challenges, and supports, and categories that emerge from the interviews were used to generate the six major themes (Creswell, 2012). I used a table to show the themes and the categories developed from the study in answering the RQs.

Evidence of Quality

Throughout the study, I engaged in practices that ensured the trustworthiness of the study. Qualitative research is measured against the criteria of credibility, transferability, confirmability, and dependability (Guba & Lincoln, 1998). The biases that

I have about technology integration surfaced throughout the study as I sought to gain an understanding of the challenges and supports experienced by primary school teachers regarding digital tools. Regardless of my recognized biases, protocols and procedures were utilized to minimize my personal beliefs and ensure equity among the participants and the data sources to fill the trustworthiness criteria.

Credibility refers to the believability of the findings of the research account or whether the results are truthful within the context of the research (Burkholder et al., 2016). To achieve credibility, I used member checking during the interview by restating or summarizing information given by the participants and then questioning the participant to determine accuracy. This allowed the participants to confirm or deny the correctness and interpretations of data (Candela, 2019). Other times, participants were asked to restate their views for clarity or provide a summarized response as another way to maintain accuracy (Candela, 2019; Creswell, 2007). They were also asked to check the tentative findings of their interviews for accuracy (Birt et al., 2016; Creswell, 2012); the participants did not identify any issues with the summarized findings. I prepared a detailed description of the data analysis and verification of the sources of data obtained and from which participants (Daniel, 2019). I used memos throughout the study to document my thought processes and reflections as I engaged in reflexivity.

Transferability is concerned with how the conditions of a study will overlap within and across other contexts (Guba & Lincoln, 1998). I employed reflexivity when coding and identifying the themes and compared my developed themes to those in any similar study. Additionally, since the teachers' use of digital tools in teaching and

learning is expected, the use of thick descriptions can highlight the meanings of this study's site and context so that similar backgrounds can transfer the findings to their settings (Amin et al., 2020; Nowell et al., 2017).

I checked for consistency among the data collection, analysis, and reporting of the study (Burkholder et al., 2016). To account for dependability, I provided a detailed description of the methods employed throughout the study, including reporting on data collection operations. I remained consistent with record-keeping and note-taking that logged my assumptions, interpretations, and reflections. I also examined and incorporated any minority views that surfaced in the data and presented them in the final report (Amin et al., 2020). I observed procedures in conducting the research and ensured that the findings are grounded in the evidence.

Confirmability means that other researchers should draw the same conclusions from the study (Burkholder et al., 2016). I continued to engage in reflexivity to monitor my biases. I showed how the interpretations and findings derive from the data collected by being transparent so that the readers can understand the decisions taken (Nowell et al., 2017).

Limitations

According to Creswell (2012), limitations of a study are potential weaknesses or problems with the study identified by the research that will help readers to judge to what extent the findings can or cannot be generalized to other populations or settings.

Although I used qualitative research methods, I recognized that the findings of this study may be limited by certain factors, such as described below.

One such factor could be the inadequate sampling, in this case small sample size and selection of one stakeholder group as respondents. This study was conducted in one of 63 QECs in Jamaica and with 11 of nearly 700 primary school leaders. Although all the school leaders of QEC 64 participated in the study, the data collected from the principals and vice principals might not provide a consensus on the overall state of the utilization of digital tools in the QEC. Another limitation was unreliable access to the internet, which disrupted a few of the interviews. Even though the participants rejoined the meeting, the disconnection caused interruptions in the flow of the interview as well as the participants' chain of thoughts. The problem identified in the study surfaced before the onset of COVID-19. With the emphasis placed on online teaching and learning throughout the pandemic, it is possible that the data collected may be influenced by COVID-19. Owing to these limitations, readers should be cautious in generalizing the study's findings to other primary schools.

Data Analysis Results

The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica.

The findings from this study developed from one-on-one semistructured interviews conducted among nine primary school principals and two vice principals within QEC 64. The data collected from these interviews provided an in-depth understanding of the school leaders' viewpoints, knowledge, experiences, and readiness

to support and lead their teachers to utilize digital tools in the curriculum. I recorded, listened to, transcribed the interviews using Sonix.ai, and then proofread them for accuracy. I read the transcripts three times to become familiar with each participant's response and two other times for accuracy before conducting the analysis. I used NVivo 12 to conduct thematic analysis, producing 39 codes (see Appendix K). Having identified the 39 codes, I organized them into categories and developed six themes aligned to the RQs. The RQs probed the challenges experience with their teachers utilizing digital tools in the curriculum and the support that is needed to shape instructional practices at the primary level. Table 1 shows the categories and themes gleaned and how they related to the RQs.

Table 1

Research Questions, Categories, and Themes

Research Question	Category	Theme
1. What are the perceived challenges faced by primary school principals in leading their teachers to utilize digital tools in the delivery of the primary curriculum?	Limited use of digital tools in lessons	Teachers lack the technological pedagogical and content knowledge to effectively use digital tools
	Teachers' pedagogical knowledge	
	Teachers' technological knowledge	Teachers' attitudes towards technology integration
	Educators' embrace of digital tools	
	Insufficient resources to provide digital instruction	
2. What do principals perceive as organizational supports needed for the utilization of digital tools in instruction by primary teachers?	In-school support	Required resources to support the effective utilization of digital tools
	Improving staff competencies with digital tools	
	Teachers' needs for effective curriculum delivery	Continuous training and instructional support for teachers
In-service teacher support	Principals' instructional supervision for effective curriculum monitoring	
School leaders' instructional improvement		

The participants believed that given the digital age in which we live, there is an imperative for all school leaders and teachers to embrace and employ digital tools in preparing students for the changing 21st century world that should drive transformational change in education (Kan'An, 2018; O'Neal et al. 2017). Therefore, teaching and learning require that the digital natives be taught using a different approach that will gravitate toward students, equip them, and make them successful to function in the world of work (Göksün & Gürsoy, 2019). There exist varied challenges that prevent the satisfactory realization of this goal in most schools in the QEC. Teachers integrate digital tools, but there are limited resources. The barriers on a larger scale include teachers' TPACK and attitudes. Teachers can be limited when required to make instructional decisions surrounding technology integration because they do not have the requisite skills and knowledge about what to choose, when to use or how to use it (Han & Patterson, 2020). The data also showed that principals lack adequate competencies for technology integration supervision, limited technology resources (Sahin Izmirli & Kirmaci, 2017), and lack of instructional support were barriers across the QEC.

However, the participants believed that many opportunities can be employed to maximize the teaching and learning experience at the primary level by increasing the competencies of school leaders, providing the teachers and principals with the needed instructional support, and equipping the schools with human and material resources. The six themes generated from this research relate to each other, highlighting the challenges faced within the schools and the strategies that can minimize them by providing

necessary and consistent support for teachers, students, and principals. This section is organized according to the RQs and the themes that surfaced respective to each question. The first three themes addressed RQ1, and the fourth to sixth themes addressed RQ2.

Research Question 1

What are the perceived challenges primary school principals face in leading their teachers to utilize digital tools in the delivery of the primary curriculum? The findings show that teachers use digital tools in instruction across the QEC. This is hampered by situations that impact the teachers, the students, and the principals.

Most of the principals have a positive mindset towards integrating technology but experience challenges associated with the limited digital tools used by teachers due to unavailability or access (Theme 1). Prin02 indicated that most teachers use YouTube widely. At the same time, Prin03 said that teachers over-rely on YouTube to develop concepts with the students and do not necessarily expound on the idea to make it relatable to the students' experiences. Many participants cited teachers' attitudes toward technology integration (Theme 2), including teachers' mindset and willingness and the absence of much needed resources and instructional support (Theme 3), were cited by many participants as the main challenges. Table 2 shows the codes, categories, and participants' excerpts generated from RQ1 as analyzed from the interview transcripts.

Table 2*Codes and Categories With Excerpts for Research Question 1*

Open codes	Category	Participants' identifier	Excerpt
Limited tool usage	Limited use of digital tools in lessons	Prin05	“But based on what we are provided, at this time, it is at a minimal use usage.”
		Prin02	“Most teachers would use minimal technology.”
		Prin10	“...Just try out some more of these apps.”
		Prin08	“To find out other ways instead of just video games or watching a video or just carrying out research.”
		Prin07	“More training is needed... even to be knowledgeable of the various digital tools.”
Not student-centered	Teachers' pedagogical knowledge	Prin02	“I have not seen the students actually interacting with these tools.”
		Prin08	"But the children could be engaged more, for example, with STEM like coding and all of those things."
		Prin07	"Lack of knowledge too, not just on the part of teachers where certain things are concerned."
		Prin11	“I have to consider all my teachers being good. And their pedological skill minus the technology aspect of things.”
Teachers' lack of pedagogical	Teachers' technological knowledge	Prin02	“I am not sure if it is being taught in the teachers' colleges.”

Open Codes	Category	Participants' identifier	Excerpt
skills with digital tools		Prin01	"Is a work in progress situation, right? Because their learning, for the most part, was experimental."
		Prin03	"There are times when teachers rely, like too much on the technology, so their explanation behind a video is average."
		Prin07	"There are some of my teachers who are struggling per se. There are some who are very versed at using technology."
Teacher mindset and attitude towards change	Educators' embrace of digital tools	Prin05	"The teacher not able, not open to newness, teacher has a mindset that this is how I do things and I just can't bother with this newness."
		Prin09	"I think it's mindset and that they are not willing to give it a try to explore the prospect of using technology as a means of enhancing teaching and learning."
		Prin03	"...high tech technology would require a mindset change, especially for older teachers or for teachers who are set in their way."
Teachers' willingness to integrate		Prin08	"And the teachers' willingness to learn new ways in which ICT can be integrated in the classroom."
		Prin08	"Where teachers will say that they, "me too old fe the system and dem waan wi to use all of these things."
Unavailable/inconsistent internet	Lack of available resources to provide digital instruction	Prin11	"But it can't be done unless people are willing to admit, say, boy, we have weakness in a certain area."
		Prin06	"If everybody's on the internet at one stage, then it tends to be very slow."

Open Codes	Category	Participants' identifier	Excerpt
Inadequate devices		Prin01	"...but I think the will of the government in terms of embarking on connectivity right across Jamaica."
		Prin04	"Lack of internet connectivity would be one of the barriers..., we have a challenge there in terms of internet connectivity."
		Prin10	"Availability of devices to students."
		Prin03	"Providing the technological gadgets that my teachers would want to use..."
		Prin09	"So, devices on the school's part, devices on students' part. There are no, we hardly have devices; we have two overhead projectors. There may be three laptops, but they are not operating at their optimal level."
Cluster-based IT specialist	In-school support	Prin02	"I'm asking the region to put an IT person in every school, working in clusters...."
		Prin01	"The ministry should be looking at something that they had before in terms of well-trained tech experts in all the schools, right."
		Prin09	"Human resources, persons who are skilled in not just the use of the technology, but persons who will be able to upkeep these devices."
More training needed	Improving staff competencies with digital tools	Prin08	"So, the teachers themselves could do with some more training in that regard."
		Prin09	"Training, training, training, and more training."
		Prin01	"There has to be sustained training for the teachers because there's the assumption that teachers having this technology should be able to."

Theme 1: Limited Digital Tools in Lesson Delivery

The effective use of digital tools in instruction can result in students' heightened and meaningful instructional experiences (Otterborn et al., 2019). The participants embrace the use of digital tools in the curriculum and describe it as a welcomed change. They articulated that the information age in which we live demands a required change in the methodology used in the classroom to make lessons more student-centered to meet students' learning needs (Gunter & Reeves, 2017). Since students are digital natives, which makes them naturally inclined to technology, teachers should take steps to transform their classroom learning and teaching, which calls for new-age learning to develop the 21st century skills among student (Collins & Halverson, 2018). Teachers are expected to use digital tools in the NSC curriculum, but the expectation became a more realistic mandate after the onset of the pandemic, which intensified its use.

Google Classroom is the preferred learning management system used throughout the schools. Many teachers apply digital tools in their lessons such as YouTube, Kahoot, Quizizz, Google Suite, video presentations, PowerPoint presentations, and Whatsapp. Some principals believe that more tools can be incorporated as there are a plethora of available tools and describe the usage as minimal. Some teachers use YouTube to introduce lessons and to show related concepts. Most teachers use games like Kahoot or Quizizz and Google Forms for assessment. Prin02 expressed that the integration of digital tools does not allow for student interaction outside of the Google Classroom. Prin08 said, "I believe that more can be used; there are many tools out there." Prin09 said that following the resumption of face-to-face classes after the pandemic, teachers incorporate

fewer tools into the lessons because there are school-level challenges that prevent use, such as the unavailability and access to technological tools and internet connectivity (Callo & Yazon, 2020; Muslem et al., 2018).

Theme 2: Attitudes, Principals' and Teachers' Skills and Competencies

Though the principals accept and place high importance on digital tools to be used in curriculum delivery and some teachers use them in teaching and learning, the teachers' and principals' lack of certain skill sets, attitudes, and competencies pose a problem for the effective use of digital tools. Some teachers do not exhibit mindsets that embrace technology.

Attitudes. The principals reported that the younger teachers demonstrate a positive attitude and love for technology, as indicated by Prin07, “You see like the younger teachers, they may be quite familiar with most of these things, the older ones who are in the classroom is a big, big challenge for them.” Another participant, Prin06, remarked, “I notice some of the younger ones tend to be computer literate...the vast majority are younger teachers, and they realize the grasp of the computers.” Prin10's statements reinforced that the younger teachers have a more receptive attitude towards technology, “We have some young teachers who come in, just coming from college, they're very technologically inclined.” Younger teachers tend to be more competent in using digital technologies than older teachers, who tend to shy away from them since they are not comfortable using them (Lucas et al., 2020; Mirke et al., 2019). Some teachers have a phobia of using technology, so there is not much effort to utilize the digital tools (Henderson & Corry, 2021; Sinclair & Aho, 2018).

Some teachers are unwilling to explore the options of using technology and will only do the bare minimum even when they are encouraged, mentored, or have accessed training. Teachers' attitudes also influence their mindset and willingness to incorporate technology and play a significant role in their pedagogical adoption of technology (Atabek, 2020; Kao et al., 2020). Teachers' mindset was reported as a barrier by the principals. Prin09 shared, "They would have been exposed to the training, but when it comes on to utilizing it, the mindset is not there that this is something that they can do." Similarly, Prin05 articulated, "Teacher has a mindset that this is how I do things, and I just can't bother with this newness." Prin08 said, "I could hear other principals complaining that the staff willing to learn and to move along with the time was a hindrance." Some participants also expressed that parents' and students' attitudes can present challenges in that they are not aware of the importance of digital tools in instruction. The teachers' unwillingness to accept the evolving change in curriculum delivery and mindset hamper the use of digital tools. Teachers who practice the growth mindset and demonstrate self-efficacy are more willing to engage in technology-related activities such as technology integration (Khlaif, 2018; Tondeur et al., 2019). Teachers' willingness and a generally optimistic attitude will create confidence in learning to use and apply digital tools in teaching (Fadli et al., 2020).

Teachers' Skills and Competencies. The participants describe some teachers as having good TPACK in the classroom. One participant (Prin02) described one teacher from her staff of 13 as exceptional, with less than 50% of the teachers being on par or excellent when using the technology. Prin09 reported that about 50% of the staff master

the use of technology while the others do not utilize it in their practice. At the same time, one participant (Prin04) remarked that all the teachers are more comfortable with delivering their lessons using digital tools since being exposed to COVID-19 teacher training both at school and by the MOEY&I.

Prin05 rated some teaching staff members with 90% digital competence even as one other participant (Prin03) gave the teachers a rating of 80 -100%, describing them as far advanced with a love for using technology, which makes them competent. Prin06 stated that the younger teachers tend to be more computer literate. Most of the staff are competent with using digital tools since they have been utilizing the Google Classroom, Google suite, YouTube, and videos appropriate to their subject areas. Prin07 reported that some staff members are very versed in using technology while others struggle. Prin11 informed that some teachers are more technologically proficient than others and, therefore, on the whole, teachers are just managing.

Within the QEC, some teachers demonstrate a lack of the technological pedagogy to incorporate digital tools into the curriculum effectively. The participants describe the teachers' skills and competencies as a "work in progress" (Prin01), "teachers are struggling" (Prin07), "unwilling to try" (Prin10), and "lack the knowledge" (Prin02). Younger teachers display more proficiency than their more experienced counterparts (Elli & Ricafort, 2020; Rolle-Greenidge & Walcott, 2020).

Prin09 said that some teachers are not so technologically savvy. Prin01 inserted that the teachers learning, for the most part, was experimental, but they became better at it over time, while Prin02 described some of the teachers' skills and competencies as

being basic without the use of tools that will pique the children's interests. There was also the expression that new teachers do not have the requisite skills to integrate technology despite their participation in pre-service teacher training.

In their response, Prin02 and Prin07 said that the lack of teachers' knowledge of the digital tools poses a problem in instruction in conjunction with Prin05, who expressed a lack of understanding on the teachers' part. Prin11 said that the onset of COVID-19 has only highlighted the teachers' deficiencies in using digital tools. So, although the teachers have strong pedagogical skills in teaching the subjects' content, it does not include the technology aspect. Even as several teachers in the QEC use digital tools in instruction, there is a general view that teachers are learning and growing. But at the same time, many more teachers lack the TPACK they need to be effective in instruction, but which can be developed through training (Bakri et al., 2021; Dalal et al., 2021).

Most participants shared that before the COVID-19 pandemic, many teachers were not even aware of the digital tools, and so the increase in technological competence and skill is primarily due to the training received over the course of the pandemic along with the requirement to incorporate the digital tools. Prior to the pandemic, teachers knew that they could use the digital tools, but there was no mandate or requirement for them to utilize them. A few participants expressed that their teachers had access to the tools and received training. Still, they did not integrate them as there is no accountability or requirement for teachers to utilize them.

Principals Skills and Competencies. When the participants were asked to state the struggles, they experienced with being a technology leader, several of them cited

challenges related to their competencies and role as instructional leaders with technology integration. The challenges many principals cited included their own comfort level with technology (Prin02), their level of supervision and guidance offered to teachers (Prin02, Prin04, Prin06), not competent with digital tools (Prin06, Prin11), familiarity and limited knowledge of digital tools (Prin02, Prin04, Prin07), and remaining relevant with current trends in technology (Prin06). Few participants expressed that they are comfortable with their digital competencies and their struggles with leading technology was confined to available resources within the schools (Prin03, Prin08, Prin09). The principals expressed the need to be more knowledgeable about the tools so that they can be more confident as they provide direction, monitoring, and supervision of teachers' technology integration in the classrooms.

Theme 3: Lack of Necessary Structures and Instructional Support

The participants identified the lack of structures such as an accountability framework, established policy guidelines, effective use of the Teacher Resource Center (TRC), building design and construct, and barriers of access such as broadband internet as challenges to the use of digital tools. Instructional supports essential to the utilization of digital tools include teacher training and digital learning support, which are either limited or non-existent within the schools.

Necessary Structures. There are existing structures in the QEC that are used in all the schools to boost the use of digital tools in instruction. These are the 5E model lesson plan format and the teacher appraisal document. One participant identified the existence of a computer lab that was established throughout their initiative in partnership

with an external organization. However, the lab needs to be resourced for it to be functional. Seven participants indicated that their schools have access to internet connectivity, however, the supply is inconsistent with a weak broadband network that is inadequate to accommodate the school's population. It is costly for principals to acquire data for coverage of the schools even though, in some instances, they must do so for administrative purposes. Apart from schools that were equipped with internet access before the pandemic, most schools with access received it during the COVID-19 pandemic through the MOEY&I.

Absence of an accountability framework (Prin09), policy to guide teachers and principals (Prin01), and minimum standards for principals (Prin07) are considered important for technology integration at the primary level. Prin09 and Prin01 stated that without accountability that holds educators to certain standards and policies to guide the implementation of technology, persons will not see the importance of utilizing technology. Schools also need to be equipped with the necessary tools such as projectors, adequate students' and teachers' devices, consistent and reliable internet connection, and other peripheral devices. Although schools have some of these needed tools, they are limited in supply and cannot satisfy the staff demand, such as reported by Prin03 "Teachers try to reach school early to ensure that they first take up the projector." Prin07 and Prin09 both identified that the life of the devices expires over time and can no longer be used. Participants also cited that the school's infrastructure needs upgrading to designated technology/computer rooms from which technology integration can be facilitated. Participants mentioned that classrooms should be designed so that they can be

equipped with essential tools that will enable the seamless implementation of technology integration.

Instructional Support. Many participants shared that they facilitate in-house staff development for their teachers and allow the strong teachers to support the rest of the staff through common planning sessions and to share best practices (Prin04, Prin07, Prin08, Prin09, Prin10, Prin11). However, much more is needed to improve the technological and pedagogical skills of the teachers. Participants shared that while the QEC has a named TRC, it is not being effectively used to support teachers in technology integration, such as through collaboration and training, as even throughout the pandemic, technology training was not offered through the TRC. Prin01 and Prin02 reported that schools do not have resource persons, trained technology personnel, or coach assigned to their teachers to enable continuous guidance throughout curriculum implementation and to facilitate maintenance and upkeep of devices.

Research Question 2

What do principals perceive as organizational supports needed for the utilization of digital tools in instruction by primary teachers? The data revealed that the educators in the QEC require resources to support them in the effective utilization of digital tools. Such support includes the acquisition of digital tools, access to consistent internet supply, and available and high-quality devices (Theme 4). There is a need for teachers to be exposed to consistent training that can afford time for practice and skill development of their technological and pedagogical competencies as well as instructional support from the QEC and the Ministry of Education (Theme 5). The upgrade of principals' skills through training to increase their

supervisory and monitoring capacities to support curriculum delivery (Theme 6) were communicated by the participants as support systems that can enhance the use of digital tools in instruction. Table 3 shows the codes, categories, and participants' excerpts generated from RQ2.

Table 3*Codes and Categories With Excerpts for Research Question 2*

Code	Category	Participants' identifier	Excerpt
Schools need technological tools	Needed teacher supports for effective curriculum delivery	Prin01	"They need devices; they need not to be utilizing their own devices."
		Prin02	"So, if I had the resources, the financial resources, then that is something that I really would like to do for my staff."
School facilities		Prin07	"But the way that the classroom is designed does not lend itself to the use of certain things."
		Prin05	"Oh, we need a separate room for ICT, a separate maybe, maybe a computer lab."
Access to digital tools		Prin09	"Greater access to ICT platforms and systems would make a difference."
Sustained professional development	In-service teacher support	Prin01	"Presenting that curriculum to the teachers for them, they were practically left on their own."
		Prin03	"So, they need a good knowledge of how to bring it across in the classroom...so just continuous training, more training."
More use of Teacher Resource Center		Prin11	"Then at the QEC level, they do the relevant workshops to develop principals' competencies."
		Prin10	"So, we can have some more common planning time, but I believe some more sessions as a QEC could be planned." "For example, the QEC level, there is a resource center or there's supposed to be a Resource Center School."
Minimum standards for principals	School leaders' instructional improvement	Prin07	"I think that the Ministry should set the basic standards at which persons should operate as it relates to technology."
Mandatory principal training		Prin06	"The Ministry might have to do some compulsory courses that the principal will have to do."
		Prin02	"So, I think that we should go beyond the one-day workshop for technology integration. It should really actually be an intense course with assessment. You know, and the practical part of it."
		Prin07	"The ministry would have to come up with probably some sort of a course I'm thinking that each person each principal would have to participate in."

Code	Category	Participants' identifier	Excerpt
		Prin09	"I want to say make it mandatory because some persons, unless they're mandated so to do, they are not going to so."
Accountability		Prin09	"A system of accountability. If there is a system of accountability... But there is no real system in place to track or to ensure that these are being used, that these systems are being utilized."
Policy guideline		Prin01	"Up and down approaches towards the technology. There's no serious policy guideline."

Theme 4: Continuous Training and Instructional Support

For teachers to develop their technological and pedagogical skills, they must be exposed to continuous training and in-school professional development that allows for practice and effectiveness. The principals highlighted these two areas as necessary for developing teacher effectiveness with using digital tools in instruction.

Continuous Teacher Training. The participants echoed the belief that the training offered to teachers, which intensified throughout the pandemic, was inadequate to equip teachers with the necessary skills to facilitate the expected practice (Prin02) to become more comfortable with technology. Teachers tend to shy away from utilization when they are not knowledgeable (Khlaif, 2018). Several participants emphasized that teachers need continuous in-service professional development (Prin01, Prin05, Pri07, Prin09, and Prin11) tailored to individual schools and small groups of teachers and not so much in large groups. Although the MOEY&I, through its training arm, the Jamaica Teaching Council, offered training to teachers throughout the summer of 2020, which were in response to the COVID-19 pandemic, the online modality was not effective as other challenges such as connectivity and poor devices interrupted the sessions (Prin01, Prin02, Prin04, Prin03, Prin06, Prin07). One participant said that their teachers had constant exposure to e-Learning facilitated technology workshops at the local site as part of the Tablet in Schools Project before the pandemic. The participants believe that one measure to address the limited training should be structured ongoing training that allows for adequate practice at the local school's site or QEC level that will enable teachers to practice and apply what they learn (Prin01, Prin02). Professional development for

technology integration should be designed to provide support for using real-world integration so teachers can see the relevance and should incorporate follow-up and support (Castéra et al., 2020; Yurtseven Avci, 2020.)

Instructional Support. Participants believed that provisions should be made to place learning coaches and other resource personnel in each school or within a cluster. Prin02 said that the cluster resource persons could move throughout the QEC as they provide technological support to improve teachers' technological competence. These persons would organize and deliver local training to the teachers as well as help in the maintenance and upkeep of devices. The coaches or integration specialists would be on hand to support teachers with technology integration throughout lessons (Prin04), expose them to available tools, and provide technical support when utilizing the tools (Prin11). Teachers need to know that this kind of support exists and is available when they need it (Prin07). Teachers offer support to their colleagues (Prin03) through sharing best practices (Prin10), common planning (Prin06, Prin08), and modeling (Prin09). The participants expressed that a form of mentorship and coaching of teachers by proficient colleagues would engender confidence to use digital tools and increase teachers' technological and pedagogical content skills through hands-on activities (Liao et al., 2021). They cited modeling (Polly et al., 2020), scaffolding (St. Hilaire & Gallagher, 2020), and effecting transformational change (Sheffield et al., 2018).

The expectation of utilizing technology in instruction is unrealistic, especially in under-resourced and remote area locations. The expectation is not aligned with the availability and access to digital tools. Therefore, the curriculum should be supported by

the necessary tools and structures that will see all schools operating on a level playing field. There are too many inconsistencies where some schools are fully resourced while others are not when all are expected to deliver the same curriculum and yield the same results.

Theme 5: Required Resources to Support the Effective Utilization of Digital tools

Among the much-needed resources that can boost teaching and learning with digital tools within primary schools, the acquisition of connectivity and technological tools is paramount. Participant Prin01 said, “There is a serious technological upgrade that is needed.” The situation is the responsibility of the governing bodies and needs to be addressed for effective technology integration to take place in schools.

Connectivity. Several participants mentioned that connectivity posed a grave challenge in their schools. Where the internet is available it is inconsistent, and some schools are yet to receive internet connectivity. The participants believe that equipping schools across the island with broadband internet should be a priority of the MOEY&I. Principals at the local level have used the rotation model to effectively use the internet. This allows for only certain groups or classes to access the internet so that digital tools can be used more, and students can benefit from the lessons. Schools without internet rely on their own provisions, which too lack the speed and strength to make it reliable. Some schools received internet from the MOEY&I. However, all the schools in the QEC need access. Schools are also provided with an internet grant, and principals have used it to upgrade their existing internet (Prin04), which reaped success in some instances (Prin02).

They believe that much needs to be done for the acquisition of broadband internet, which will require expending billions of dollars into education.

Technological Tools. Having access to digital schools is hindered by internet connectivity, and where teachers can use materials and other downloadable resources, they do (Prin08). The idea of using digital tools increased throughout the schools during COVID-19 when schools were closed (Chandra et al., 2020; Lawrence & Tar, 2018; Oyedemi & Mogano, 2018). At that time, most teachers had access to the internet and were able to engage with some students who were able to join the classes. Once teachers and students resumed face-to-face teaching, they no longer had access to that aspect because of poor or no connectivity. Most participants reported that schools do not have an adequate supply of laptops (Prin04), projectors (Prin02, Prin09), smartboards, digital cameras, tape recorders, document cameras, and so on. These devices are non-existent or depleted in some schools (Prin04). Much needed funding is required to resource the schools with these tools. Many schools do have access to these tools received through their participation in educational programs such as USAID or Tablet in Schools Project. Therefore, the teachers need the proper equipment to carry out their jobs using technological tools (Prin01).

Theme 6: Principals' Instructional Supervision for Curriculum Support

The participants indicated their level of competence, comfort, and support for delivering the curriculum using digital tools. One principal stated that she would not consider herself a technology leader because of her lack of competence. Two principals recounted their participation in technology integration training organized for principals,

while most did not. They indicated they would need support and training to stay relevant and to be able to guide, supervise, and lead digital technology within their schools.

Instructional supervision. The principals articulated the need for them to be able to model what they expect from their teachers (Prin07, Prin11), and so they need support to supervise the delivery of the curriculum with digital tools adequately. The participants highlighted that the principals are expected to guide and supervise their teachers (Prin05, Prin07) but that they never received training to be instructional technology leaders (Prin01, Prin03, Prin04, Prin07, Prin08, Prin10, Prin11), which makes it challenging. In some instances, they seek help from their teachers (Prin04, Prin11). The principals collectively believe that with training, they would be able to give advice and better monitor teachers with the usage of digital tools (Prin08). They would develop greater insight to lead the academic staff along the path of technology integration (Prin09), be better able to monitor lesson planning (Prin10) and know what to look for when conducting walkthroughs (Prin05). To properly provide oversight and direction, principals must access mandatory training that should be provided by the Ministry of Education (Prin02, Prin06, Prin07, Prin09). These training sessions can develop principals' competencies (Prin11) and reduce principals' fear of technology (Prin09). Principals expressed that the National College for Educational Leadership organized technology training for principals in response to the COVID-19 pandemic, and they should organize the continuous training for principals, which should include an assessment component (Prin02, Prin09). Other participants believe that professional development should be mandated for principals (Prin07, Prin08).

Most principals expressed that their supervision of staff is limited to encouragement and ensuring that the teachers observe the mandate of the Ministry by implementing digital tools and attending workshops (Prin11). Principals arrange technology sessions for their teachers with external personnel; they cannot provide direct guidance related to technology integration. They also use common planning sessions for collaboration among staff (Prin10, Prin08) which is important to promoting and creating a teaching and learning atmosphere with the use of digital tools (Håkansson Lindqvist, 2019). Participants acknowledged that to increase their competencies, they attend the sessions convened for teachers so that they can be aware.

Participants expressed that the principals could provide more supervision and support when they are equipped with digital competencies. Participants believe that the MOEY&I should set minimum standards relating to technology integration for principals so that they can operate more efficiently. “I think that the ministry should set the basic standards at which persons should operate related to technology” (Pin07). Standards for education leaders focus on the required knowledge and behaviors that guide how principals empower their teachers and make students’ learning possible. The standards encompass equity, digital citizenship, visioning, team and systems building, continuous improvement, and professional growth (International Society for Technology in Education, 2022).

Evidence of Quality

I used member checking to ensure the accuracy of the interviews. The process of member checking is essential and is sometimes referred to as the gold standard of

qualitative research (Madill & Sullivan, 2018). Throughout the interviews, I routinely rephrased participants' responses to confirm an understanding and accuracy of their responses (see Appendix L). Following the interviews, participants were asked to review a summary of the interview, which aided the process of getting feedback from participants about the data collected (see Appendix M; Lincoln & Guba, 1985). In this study, the participants reviewed summaries of the interviews for accuracy of the content. The participants confirmed the accuracy of the interview summaries. I also logged my interpretations on the interview protocols which aided me as I reread the transcripts and conducted analysis (see Appendix N).

Conclusion

The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica. The sample consisted of 11 primary public-school principals of QEC 64 that met the study's criteria. The school leaders were knowledgeable of the teachers' use of digital tools in instruction, the barriers experienced, and the support needed to enhance the digital technology teaching and learning experience. Table 4 shows the demographic profile of the participants.

Table 4*Demographic Profile of Participants*

Participant	Gender	Years or months of experience	Total academic staff	Total student enrollment
Prin01	Male	13 years	16	335
Prin02	Female	6 years	13	291
Prin03	Female	12 years	10	232
Prin04	Female	4 years	8	204
Prin05	Female	4 years	5	89
Prin06	Male	15 years	17	238
Prin07	Female	11 years	11	166
Prin08	Female	4 years	6	110
Prin09	Female	3 years	24	490
Prin10	Male	5 months	7	104
Prin11	Male	11 years	10	230

As shown in Table 4, of the 11 primary schools in the QEC, seven are led by female principals and four by male principals. Two vice principals and nine principals participated in the research. Ten of the principals have three or more years of leadership, with nine of them having four or more years' experience heading their schools and a little under 50% with ten or more in the capacity of principal. The academic staff ranges from five teachers to 24 and a minimum enrolment of eighty-nine students to a maximum of four hundred ninety.

All data were collected from the 11 participants employing a one-on-one semi-structured interview type. Following analysis of the interview data, I identified codes,

categories, and themes as a result. Section 2 of this paper justified the qualitative research design and methodology.

The first theme was that teachers use limited digital tools in lesson delivery. The participants identified Google Classroom as the only learning management system, YouTube, Kahoot, Quizziz, online worksheets, and projected images as the main digital tools used by teachers throughout their lessons and for extra support for students. Despite the teachers' use of digital tools, there was no mention among the principals about the use of other tools or prominent tools like three-dimensional (3D) printers, microcontrollers, virtual reality devices, smartboards, digital cameras, other technologies. These forms of technology have changed the teaching and learning landscape (Trust, 2018) so that there is no limit to what teachers can use. In the QEC, access to technology and digital tools increased over the past few years, but the lack of technical and instructional support and teachers' competencies and mindset presents a continued challenge (Francom, 2020).

The second theme was teachers' and principals' competencies and teachers' attitudes and skills. Some teachers demonstrate a positive attitude and growth mindset towards technology and relevant technical and TCK. Many teachers do not have a positive attitude and require competencies to integrate digital technologies into their lessons effectively. Principals also lack technical competence, which is needed to effectively lead teachers in utilizing digital tools.

Theme 3 was the lack of necessary structures and instructional support. Certain structures exist in the QEC which are embraced and used by the schools. Accountability, upgraded classrooms, re-designed buildings, and erection of technology rooms are

necessary structures the schools need. Participants support their teachers and students by networking with others to provide necessary tools and training for teachers. However, more assistance is needed to provide appropriate and available digital technologies, and deliberate instructional support through continuous local training and digital coaches is required.

Theme 4 required resources to support the effective utilization of digital tools within the primary schools. These resources include stable and reliable internet, access to digital tools, and technological devices. Some of the schools in the QEC have access to the internet, but it is inconsistent, and there is a shortage of technological tools to support teaching and learning.

Theme 5 was continuous training and instructional support. Principals provide in-school training for their teachers and encourage them to attend virtual professional development sessions. More robust and constant teacher development and instructional support in the form of digital coaches or specialists are essential to developing teacher competencies and skills in using digital tools.

Theme 6 was the principals' instructional supervision for curriculum support. Participants said they needed improvement in their competence and comfort level to effectively support teaching and learning with digital tools. They suggested that leadership training and the establishment of minimum standards would increase their competencies and make them more capable of guiding their teachers in instructional delivery.

Section 3: The Project

Quality education in the 21st century incorporates the effective use of technology integration and is crucial to developing students who will make positive contributions to society (Fraillon et al., 2020). This quality education is promoted worldwide with the goal to achieve quality education that is inclusive and equitable and that promotes lifelong opportunities for all students (United Nations Development Programme, 2021). To achieve this goal, educators must consider several factors, including the teaching and learning experiences offered by teachers. Teachers can offer quality education if they are supported through professional learning communities and continuous professional development. Professional development activities empower teachers to integrate new practices and improve their pedagogical skills especially in digital tools (Koh, 2020; Li et al., 2019).

For teachers to acquire new knowledge and continuously develop their skills in the classroom, they must be exposed to teacher development opportunities. Professional development within schools and districts can equip teachers to grow in their profession and transform their teaching practices (Carter Andrews & Richmond, 2019; Dilsad et al., 2019). There is consensus among researchers that professional development is effective in shaping teachers' skills and the quality of instruction (Prenger et al., 2019; Vangrieken et al., 2017). Teachers are expected to meaningfully use technological tools in their daily teaching and learning activities. They will have to adjust their instructional style to prepare students to be successful in the world of work (Guggemos & Seufert, 2021). Further work in the field has shown that professional learning communities and

professional development strengthen teachers' skills in providing quality technology integration in the classroom (Zhang et al., 2019) and overall TPACK (Koh, 2020).

In this basic qualitative research, I aimed to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers using the technological pedagogical and content knowledge (TPACK) framework. Based on the findings of this study, I designed a 3-day professional development training to address principals' needs at the research study site as one way of supporting the teachers' development of TPACK in technology integration. The professional development project was based on two themes that appeared during data analysis: teachers' lack of continuous professional development and teachers' lack of technological pedagogical and content knowledge to effectively use digital tools. The project was developed to provide training for teachers, who, according to the study, need more knowledge and support with integrating digital tools, and principals, instructional leaders who are charged with supporting their teachers in instructional delivery.

The training focuses on strategies that principals can practice in supporting the teachers in various forms of professional development. It will discuss and illuminate an understanding of TPACK, technological models of instruction, the implications for technology integration, and how principals can develop their teachers' TPACK through continuous professional development, mentorship, and professional learning communities. It will also address the principals' perceptions of teachers' technological and pedagogical content knowledge and their capacity to use digital tools in teaching

effectively and learning at the study site. The training focuses on increasing teachers' knowledge about digital tools and selecting and aligning the tools to classroom practices such as small groups, assessment, differentiation, and the models that guide technology integration. The information and related strategies presented in training may help teachers increase their knowledge about digital tools. The principals who attend may understand strategies they can use to support teachers and to actively promote the use of digital tools in the curriculum. The changes arising from the training may positively influence instructional delivery. In Section 3, I describe the rationale for the project, review the literature I used to guide the development of the project, explain the project, describe the evaluation plan for the project, and consider the project's implications.

Rationale

The study's findings support the development of the 3-day professional development session. The study findings suggest that teachers and principals lack the needed knowledge about different digital tools, how to represent certain concepts with technology, and the appropriateness of tools for specific tasks. The findings also suggest the lack of pedagogical strategies for effective content matching and approaches to support teachers with digitalization. According to Darling-Hammond et al. (2017), there is a need for effective professional development in refining and shaping teachers' repertoire of instructional strategies. When the professional development support is linked to specific aspects and curriculum requirements within the context of their classroom, the effects are more lasting for educators. There is a positive connection between professional development and teachers' pedagogy and student outcomes

(Darling-Hammond et al., 2017; Gore et al., 2017; Phetla & Newman, 2020).

Professional development that deliberately focuses on improving teachers' skills and teaching strategies is an effective way to address the problem highlighted in this research—that is, teachers' underutilization of digital tools at the primary level due to a lack of TCK, TPK, and other related skills and competencies.

Review of the Literature

In procuring and reviewing the literature for this section, I selected peer-reviewed journal articles on effective professional development, continuous professional development, professional learning communities, support for teachers through professional development, the effect of professional development on teacher's TPACK, principals, and professional development and TPACK. I read about 40 journal articles. To conduct the search, I used a combination of terms and phrases to uncover literature published within the last 5 years. The terms include *professional development*, *TPACK*, *technology integration and professional development*, *digital tools and professional development*, *types of professional development support*, *effective professional development*, *organizing effective professional development*, and *professional development outcomes*. I used internet-based search engines and databases such as Education Resource Information Center (ERIC), Education Research Complete, Sage Publications, LearnTechLib, ScienceDirect, Taylor, and Francis Online, and Google Scholar to obtain referenced articles in previously explored articles.

Professional Development

Teachers use professional development as a strategy to improve their practice and teach more effectively (Liao et al., 2021). Technology professional development is focused on sharpening the technological skills of teachers and has become more prevalent in schools to meet the pedagogical needs of teachers (Liao et al., 2021; Voithofer et al., 2019). Dalal et al. (2017) suggested that training workshops should be organized around the needs of teachers to equip them to integrate technology. Professional development is integral for teacher development and should allow teachers to practice their technology skills and reflect on feedback received throughout the process of collaboration and sharing (Spiteri & Rundgren, 2017). Through collaboration in professional development offerings, teachers may experience more positive attitudes (Guggemos & Seufert, 2021) that are pertinent to technology use and TPACK development (Scherer et al., 2018). Every teacher should have access to requested continued professional development to promote their teaching (Ayodele, 2018). With support from school administrations, teachers develop the professional capacities that equip them with the tools and skills needed to teach in various teaching settings (Yamak & Chaaban, 2022). A supportive, professional teaching climate can boost teachers' human capital, which improves student achievement (Belay et al., 2021; Fischer et al., 2018) and should be a key focus for change in developing teachers' individual needs, skills, and knowledge (Hollweck & Doucet, 2020).

Professional Development and TPACK

The TPACK framework is important to teacher success in technology integration. When incorporated into teacher training, it can improve teachers' capacity to use technology by methodically clarifying the bridge between traditional approaches and pedagogical content knowledge (Voithofer et al., 2019). The professional development process is integral to developing teachers' TPACK when used in a professional learning context. Combined with TPACK rubrics, it has been effective in developing teachers' competence in designing goals, redesigning, and implementing lessons (Evans, 2019; Koh et al., 2017). These type of TPACK activities help to transform teachers' lesson activities and create pedagogical change that improve students' outcomes (Chai et al., 2018). Teachers have reported that TPACK professional development has positively affected their ability to meaningfully integrate technology with pedagogy (Oda et al., 2020).

When teachers work in professional teams, the process is more positive, and teachers' confidence increases (Koh et al., 2017). They develop their TCK, related skills, and pedagogical approaches (Kokoç & Karal, 2019). Professional learning must give teachers the opportunity to include the exploration of technology-enhanced and standards-specific lessons and units (Hofer & Harris, 2019) and inquiry-based activities (Philipsen et al., 2019). It equips them with better lesson preparation. Continuous teacher training should incorporate the inclusion of TPACK in planning for and delivery of the curriculum (Abebe et al., 2022). Ottenbreit-Leftwich et al. (2020) observed that professional development that hinges on TPACK would help teachers develop a better

understanding of technology integration and will impact student learning. Where there is continuous training that adopts a design-based approach that incorporates the teachers' input and feedback, it provides teachers with more meaningful opportunities to learn through when their feedback is received and used to strengthen the training program (Zinger et al., 2017).

Supporting Technology Integration Through Professional Development

Teachers need guidance and support to improve their skills in ICT and technology integration (Top et al., 2021). Professional development can provide that guidance and support to enhance teachers' technological pedagogical practices across content (Young et al., 2020). School leadership is responsible for planning the professional development of in-service teachers as they actively guide the overall technology integration process (van Thiel, 2018). Teachers need to have access to support systems so that they can effectively implement technology (Masters, 2018). Many teachers have stated that technology development training is not adequate to impact their competencies (Liao et al., 2017). For this reason, they have advocated for professional development opportunities that are more focused on pedagogy and improvement of technology integration skills (U.S. Department of Education, 2017).

As technology continues to change, so too do the teachers' training needs, and there is a call for professional development that are sustained and continue to support the constant learning of in-service teachers using different modalities (Liao et al., 2017; Philipsen et al., 2019). The support for teachers' technology integration can take many forms. According to Koh (2020) the consultation process that entails modeling,

realignment of pedagogy, and deepening practice can scaffold and strengthen teachers' TPACK pedagogical practices. Sari and Keser (2021) found that teachers do not use digital tools for pedagogical purposes and need to develop their knowledge and skills for TPACK through extensive support that will scaffold the design of teaching with digital tools.

Effective Technology Professional Development

Effective technological professional development has increased teachers' TPACK and reflected changes in teaching practices (Alemdag et al., 2020). Professional development that features practical and hands-on learning experience, pedagogy-focused instruction, content-specific resources, and personalized learning content that focuses on the needs of teachers have been found to be more effective (Aslam et al., 2021; Hobbs & Coiro, 2019; Ottenbreit-Leftwich et al., 2020; Sheveleva et al., 2021; Silva et al., 2020). Liao et al. (2021) and Mirjana et al. (2018) posited that summer-long training sessions and teachers' monthly online collaboration sessions with professional development facilitators are effective approaches that support teacher growth in technology integration. Personalized approaches include mentorship and individual coaching received from experts and colleagues. Through mentorship, there could be a positive shift in teacher skills and expertise that could focus on the practice of innovative approaches to teaching (Mirjana et al., 2017). Sessions in which teachers play an active role and are engaged in discussions about the implementation of tools have been deemed effective (Alemdag et al., 2020).

Coaching has been proposed as a method of professional development that supports teacher technology integration and has a positive effect on teachers' improvement in technology integration (Bakhshaei et al., 2018; Israel et al., 2018; Zimmer & Matthews, 2022). Darling-Hammond et al. (2017) contended that while coaching can be successful in improving teacher competencies in technology integration, it relies on the relationships that are created through collaboration and reflection. Xie et al. (2020) suggested that training teachers to evaluate digital content should also be an aspect of the professional development model as it effectively improves teachers' knowledge base in technology integration. Teachers can also be allowed to explore a tool or technology before using it in the classroom (Young et al., 2019) or given opportunities to create learning materials (Boer & Asino, 2022) which can be facilitated through professional development. According to Ríordain et al. (2017), appropriate and suitable professional development will improve teachers' competencies, and so the provision of professional development should be the highest priority for school administrators. Effective professional development should focus on content, active learning, collaborative support, coaching, addressing specific problems, encouraging follow-up, and models of effective strategies (Darling-Hammond et al., 2017; Mirjana et al., 2018).

Professional learning communities (PLCs) have been used as a method to provide continuous support for teachers in improving their technological and TPACK skills (Cheah et al., 2019). It offers the kind of support, collaboration, and benefits as teachers seek to be innovative and continuously improve lesson design and implementation (Koh et al., 2019). Technology that is used as a platform for professional development allows

teachers to gain experience with the tool while learning about it and promotes greater buy-in from them (Mirjana et al., 2018).

Professional Development and Digital Tools

While certain conditions are considered key to developing the teachers' competencies with technology integration, specific hallmarks of professional development include training to utilize digital tools. Training and professional development that focus on digital tools should include selecting appropriate digital devices, the capabilities and limitations of the tools, and the pedagogical quality (Sheveleva et al., 2021). Other considerations for technology professional development must include the didactics of the training relevant to the analysis of different media and how to transfer the activities and resources from the training to the classroom, the modality, familiarity with platforms and tools, and consistent institutional support (Ranieri et al., 2017). Training should be structured according to the specific needs of groups of teachers, which would be used to determine the content of the training (Top et al., 2021). Where professional development is done on a small scale, it can feature the identification of the participant's skills, provision of time to explore and practice, enabling access to available tools, and knowledge of the teachers' stance towards technology (Woodward & Hutchinson, 2018). It will also involve utilizing different digital pedagogies that are necessary for the training process (Montebello, 2017). Thoma et al. (2017) articulated that using the technology integration planning cycle in the professional learning circle can help include goalsetting the instructional goals and changing the thinking and actions of teachers about using digital tools.

Professional Development and Principals

One of the many challenges faced by today's schools is digital transformation. It is generally anticipated that principals are instructional leaders, even more so in digitalized schools, and are key players in technology integration in schools (Dexter & Richardson, 2020). They have provided professional development for their teachers (Ruloff & Petko, 2022). In this study, principals highlighted the lack of training as a major challenge for themselves and indicated that the need to be supported is crucial to their active support of teachers and in creating digitalized schools. They expressed that such support could come through ongoing professional development, which is important in honing and developing their skills as instructional leaders and expressed that their own learning is crucial to the adoption within the schools (Sterrett & Richardson, 2020). There are few activities in place geared toward assisting the principals in addressing the digital instructional realm (Bitsadze, 2019). District-level leaders now try to support principals in instructional leadership through on-the-job coaching (Bitsadze, 2019). A successful coaching approach in a conducive and supportive environment has helped principals improve their instructional leadership practices (Thessin, 2019). Principals' professional development should not be blanket or take a one-size-fits-all approach but should be organized based on schools' local needs and contexts (Wilkinson et al., 2019) and should be embedded in their roles (Bitsadze, 2019). When principals actively participate in leadership practices within their schools, it can stimulate change and transform their instructional practice. School leaders can develop these practices through professional development to ensure innovativeness and implementation. These forums can be

facilitated by online modalities where leaders share best practices and targeted summits to interact with researchers, policymakers, and practitioners for continuous learning (Christensen et al., 2018).

Project Description

Based on the study's findings highlighted in Section 2, there is a suggested need for continuous professional development among the teachers and principals. Therefore, I used the professional development genre of the project study to address the problem. The literature review suggests that one way to increase teachers' learning is through continuous professional development activities (Borup & Evmenova, 2019; Gubbins & Hayden, 2021; Pharis et al., 2019; Vermunt et al., 2019).

The project is professional development training for the primary teachers and principals of the QEC so that teachers can be more exposed to the utilization of the tools and principals can offer a more deliberate and supportive role as instructional supervisors of technology integration. While the training will seek to develop the skill areas, it is important to highlight that follow-up will be needed beyond the training for ongoing support, increase in efficacy, and effectiveness. I developed the training with a focus on the following areas for principals: strategies for supporting teachers in technology integration, an introduction to models of integrating technology, implications of TPACK for effectively utilizing digital tools, applying TPACK in technology integration, using instructional models to monitor technology integration. The areas for teachers include the selection and appropriateness of digital tools for learning and assessment and applying digital tools to developing lessons.

Resources Needed

To improve the project's efficacy, other stakeholder groups will be involved in the implementation. These groups are MOEY& I administrators, e-Learning teacher training facilitators, the TRC organizer, and lead high school technology teachers. I will collaborate with the administrators to facilitate the scheduling and organization according to their calendar and disseminate the information to the participants. E-learning Jamaica will identify teacher trainers who can collaborate with lead high school teachers in the QEC to facilitate the sessions in small groups of 20. Since there are 127 teachers, they will be assigned to cohorts from 1 to 6 with designated facilitators. I will also meet with the possible presenters to plan the days' activities as per the plan. We will pair each e-learning teacher trainer with a high school lead teacher to conduct the training. Following the schedule will also transition to other rooms as required. We would need access to the TRC, internet, multimedia projectors and other technological devices, printing facilities, bathroom, and cafeteria.

Existing Supports

The study's participants articulated their support for training for teachers and themselves. They will be willing to provide the information regarding the training to the teachers and any resources that they may need. The TRC will be identified as the training venue. I will dialogue with the principal of the TRC. We will collaborate with the convenors to coordinate the logistics of the TRC and gain access to projectors, learning materials, access to the internet, lunch, and other existing facilities. The administrators

will be approached to provide any assistance with facility and other resources that may not be available at the training venue.

Possible Barriers

Some possible barriers may be teachers' unwillingness to participate in the training sessions. There may not be enough resource materials to facilitate six cohorts for the training. Because the internet will be required to model the use of digital tools, there is also a possibility that inconsistent connectivity might hamper the success of the training if the internet connection were to fail. Another barrier could be that individuals identified as presenters may require payment for their services, and there would be required funding to offset such. The presenters may also not be available for three days based on their job commitments, which could affect the quality of the training regarding small groups.

Potential Solution to Barriers

To motivate the teachers and principals to ensure they participate in the training, they could be provided with a certificate of completion of the training. Teachers are usually more responsive to training when they know they will receive a certificate. The principals could be asked to seek buy-in from the teachers and offer their local in-school incentives to boost participation or ask the school boards to express the importance of the training and seek full participation. Suppose there are insufficient resources to facilitate all the participants, the schedule could be adjusted to have three cohorts in one cycle and the others on another so that there can be access to the resources available for the effectiveness of the professional development. The administrators may be approached to

provide funding for the project by providing a stipend for the prospective presenters, failing which then the training would be downscaled to a smaller event so that I can conduct the training over time within the individual schools or in smaller groups.

Proposed Implementation Schedule

The plan will be presented to the regional director of the MOEY&I Region 3 by October 2022. During the same period, once the MOEY&I grants permission to conduct the training, I will contact e-Learning Jamaica training coordinators to identify the teacher trainers from QEC 64 and request two lead teachers from each of the three high school principals in the QEC. I will inform the principals of the training sessions and solicit their support. I will also meet with the QEC 64 TRC convenor to discuss the use of the facility, any available instructional resources, and the logistics. All contacts and meetings will be completed by mid-November 2022. By mid-December, I will meet with the presenters to discuss the plan, schedule, training format, strategies, resource materials, and topics. A follow-up meeting will be conducted in January 2023, closer to the training dates.

Participants will be assigned to cohorts by December 31, 2022, and the information will cascade through their principals. They will be asked to confirm the participation of the teachers so that all the necessary arrangements can be completed. One e-Learning trainer of teachers and a lead high school teacher will be co-presenters of an assigned cohort of about 20 participants. The training sessions will run from February 23 -24, 2023 for teachers and February 28, 2023, for principals. The February dates will sync with National Professional Training Day for teachers, which principals highlighted

should be used since teachers would be out of school and so teaching and learning will be impacted. Teachers will be asked to complete the professional development feedback form by February 24, 2023. Table 5 shows a timeline for the project.

Table 5*Timeline for Project Planning, Execution, and Evaluation*

Task	Responsible person	Year 2022					Year 2023		
		Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Engage in project planning	Researcher	✓	✓						
Present plan to Ministry of Education, Youth, and Information Region 3 director	Researcher			✓					
Request teacher trainers from e-Learning Jamaica	Researcher			✓					
Request lead teachers from high school principals	Researcher			✓					
Communicate professional development information to principals	Administrator			✓					
Meet with convener of Quality Education Circle 64 Teacher Resource Center	Researcher					✓			
Inform principals of their training dates	Researcher					✓			
Have planning meeting with presenters	Researcher and presenters						✓		
Assign cohorts and presenters	Presenters						✓		
Provide teacher professional development	Presenters							✓	
Provide principal professional development	Presenters							✓	✓
Conduct evaluation	Researcher								✓

Roles and Responsibilities

As the chief organizer and lead presenter, I will present the professional development to the principals. I will share the study's findings with the MOEY&I region 3 regional director. After the presentation of the findings, I will request permission and resources to conduct the 3-day professional development with the 127 teachers and 11 school leaders within the QEC. I will also oversee and lead the professional development for some of the teachers' sessions. I will also create and print the participants' completion certificates and ensure that they are presented to the participants on the last day of training. The administrators from the regional office will ensure that all school principals receive notification of the training and are asked to participate. I will collaborate with the TRC convenor to prepare the venue so that all needed resources are available. The presenters will conduct some of the sessions based on their area of expertise and knowledge of the tools and models to be discussed and modeled. The participants are expected to actively participate in the discussions and collaborate with their teams to develop the lesson plans based on the assigned tool. They will also complete the participation feedback form.

Project Evaluation Plan

Project Goals

The general goal of the professional development activity is to increase the teachers' knowledge of available digital tools and the principals' awareness of the instructional models and their role in effective technology integration among teachers,

and how to improve their support for technology integration. The following are the specific goals of the professional development sessions:

Teachers will:

- Understand the SAMR and Triple-E frameworks for technology instruction,
- Develop digital teaching skills for enhancing student learning,
- Model and implement various digital tools,
- Identify digital tools aligned with content areas.

Principals will:

- Gain an understanding of technology instruction models,
- Increase their repertoire of strategies to develop staff competence in using digital tools,
- Develop forms of support for technology integration,
- Apply instructional models to monitoring and supervision of technology instruction.
- Exposed to the ISTE Standards for teachers and principals.

Type of Evaluation

The formative evaluation type matches this professional development project. The professional development plan will afford teachers the opportunities to apply technology integration teaching models to developing lesson plans with digital tools. The formative evaluation would informally gather information about the participants' knowledge and their use of models to develop lessons and incorporate strategies learned throughout the training period. Additionally, it would allow the organizers and presenters to ascertain the

participants' views on the overall effectiveness of the professional development sessions at the end of each day's session. The participants will provide daily feedback on the impact of each session they attended so that the information can be used to monitor the training topics and goals of the training. The evaluation will be gathered using Google Forms, where participants will use a rating scale. Participants will also be required to share written reflections when completing the feedback. The evaluation data will be shared with the regional office so they can gather how the training content may positively affect their approach to technology integration and their pedagogical skills.

Justification for Type of Evaluation

The impact of professional development may not be seen immediately and so adapting a formative approach to evaluation will enable continuous follow-up with teachers and principals (see Shavelson, 2018). The success of the professional development session will depend on what teachers take back with them to their classrooms, the type of support and instruction supervision received, and the general expectations and accountability that will help them to leverage their use of the digital tools. There are also barriers mentioned in the study, which may produce challenges for practice and implementation. The feedback accessed at the end of training may change throughout classroom implementation. Hence the formative approach was best suited to the professional development to gather participants' immediate feedback at the end of the instruction given.

The objectives-based or outcomes-based evaluation type was not considered because we would need to gather data with supporting documents pertinent to current

progress. It would also require assessing areas of improvement after training, evaluating the effectiveness of the training on teacher improvement, and giving recommendations for continued support and growth outside the scope of this project. Since we are assessing the execution of the training and the participants' reflections on the information gleaned and their practice, then the formative approach is more suited. It is geared towards improving the educators' instructional practices and may not yield results as evidenced by student performance, which would need a summative evaluation approach.

Overall Evaluation Goals

The goal of the formative evaluation is to monitor learning teachers' and principals' learning about the use of the tools and to gain additional feedback on their reflections on the training. After a year, there will be a follow-up evaluation with the principals and teachers to see how their reflections may have changed about the training and to evaluate how it may have refined teacher skills and principals' supervision and support (see Erdas Kartal et al., 2018). The formative nature of the evaluation provides the organizers with ongoing feedback and to ascertain how the goals of the training were realized respective to increased teacher knowledge and utilized digital tools (Bacquet, 2020; Shavelson, 2018). It will also provide input on the structured support systems introduced by the principals and how collaboration among the teachers extended beyond the study.

Key Stakeholders

The key stakeholders for this professional development opportunity are administrators, teachers, principals, and presenters. The MOEY&I administrators will

determine if the project will be executed and provide the necessary administrative support to make it successful. The teachers and principals will benefit the most because they will receive the knowledge based on digital tools that they can apply to their instructional practices. The presenters will continue to improve their presentation skills and pedagogical and technical knowledge about digital tools. They also will get the opportunity to interact with colleagues from different schools and might be contacted beyond the training by teachers and principals for continued support. The principals will be more knowledgeable about various types of support and how to better assist teachers who struggle through the initiated systems and hence teacher practice.

Project Implications

Social Change Implications

This project can be used as part of decision-making to plan for continuous teacher and principal development using digital tools. It should form the basis for follow-up with the teachers and principals within a year and provide additional or intermittent support that teachers and principals need. Principals should use the training to also assess continuously the effectiveness of the support they provide to the teachers and conduct evaluations on teachers' application of the concepts. The 3-day professional development for increasing teachers' awareness of digital tools and providing support by principals can augur positive social change. Principals will improve in their instructional supervision of teachers' delivery as per 21st century teaching and learning expectations, which can result in greater student performance and build students who are more prepared for the digital

world, and the facilitation of better-quality digital technology teachers within the primary schools.

Local Implications

The primary teachers and principals of QEC 64 needed to increase their knowledge of the digital tools to integrate them into instruction effectively. Both groups of educators will be exposed to a 3-day professional development session. The teachers' training will be conducted over a 2-day period, including the principals at the first two sessions on Day 1, while the principals' professional development will be on Day 3. Through their participation in the professional development, the teachers will increase their knowledge of selecting and applying digital tools in their classroom teaching. At the same time, the principals will learn how best to support their teachers through ongoing support and follow-up. They will form professional networks through their interaction within the small groups that may extend beyond the project. The teachers will learn about using digital tools in the teaching and learning process with a focus on:

- SAMR and Triple-E models for integrating digital tools
- Applying the models to tool selection and use
- Meeting the needs of students through digital tools

The principals will learn about organizing and sustaining systems of support for teacher competencies and the instructional models that guide the effective use of digital tools.

Their session encompasses:

- Support systems -coaching, mentorship, common planning, professional learning communities

- Instructional models
- Selection and acquisition of digital tools to support instruction.

Summary

In Section 3, I described the professional development project born out of the research findings, which resulted in the development of a 3-day professional development plan for teachers and principals of QEC 64. The project's main goals were to increase teachers' knowledge of digital tools and models for using digital tools in the classroom. The goals for the principals were to design and structure teacher support systems that can help improve teacher knowledge and confidence. The use of professional development is aligned with the study's findings because it seeks to fill gaps in teacher and principal competencies with digital tools.

In Section 4, I provide an outline of the strengths and limitations of the project, offer alternative solutions, and share my reflection on my journey through the doctoral study process regarding my growth as a scholar-practitioner, and the importance of the overall work.

Section 4: Reflections and Conclusions

In this section, I share my reflections and conclusions. I discuss the project's strengths and limitations and the recommendations for further research based on the findings. The project study entailed a 3-day professional development activity designed as a possible solution to the research problem identified at the project site.

Project Strengths and Limitations

The project addressed the study's findings and supported the literature review addressing best practices for professional development and technology integration. The project has strengths and limitations. One strength of the project is that it targets the needs of the primary educators within the QEC, who are required to employ digital tools for meaningful teaching. It also directly addressed those needs based on the research findings and the literature. The content that I will present in the project is necessary to develop teachers' and principals' understanding and knowledge of digital tools. The key components of the project integrated TPACK (Jaipal-Jamani et al., 2018) and the Triple-E framework in its activities; the latter framework is valuable in technology professional development (Chernern & Mitchell, 2021; Sutter & Dirkin, K, 2021). The professional development also incorporated principles of effective teacher training such as customized small groups (Kraft & Blazar, 2018), collaboration, and practice of concepts to apply to teaching (Canaran & Mirici, 2019).

The participants acknowledged that teachers needed to develop their knowledge of digital tools. Exposing teachers to training about content-specific digital tools could expand their knowledge and improve their pedagogy. Another strength of the project is

that the findings shared with the regional office provide them with insight into the professional development needs of teachers within the QEC. They could use this knowledge to guide and expand the professional development offerings for the QECs and other schools in the region to build teacher pedagogy regarding digital tools. Teachers benefit pedagogically from ongoing professional development support, which targets the teachers' mindset and engenders a positive attitude towards technology integration (see Nzarirwehi & Atuhumuze, 2019). Another strength is that the training is proposed for scheduled national professional training days or while school is out on holiday and will not interrupt teaching days. This makes the training more accessible to teachers.

To successfully achieve the goals of the project, there must be buy-in from all the stakeholders involved. One limitation to the project is that teachers may not see the importance or the need to access the training provided; they may not apply the content to their teaching practice. Although the principals support professional development in their schools and the QEC, they cannot force the participation of the teachers; teachers must be motivated to take part based on an individual desire to grow in their profession constantly. The training may not come to fruition as intended because its implementation requires the participation of several stakeholders who may not collaborate on the project, which would demand an assessment of the plan and restructuring for realization.

Recommendations for Alternative Approaches

The problem in this study was principals' challenges with teachers' lack of utilization of digital tools in the primary curriculum. The study's findings support the establishment of professional development to expose educators to aligned subject-based

digital tools and increase their knowledge of how to integrate them into teaching. The results also show a demand for professional development for principals who are eager to achieve digitalization. For continuous learning and change in practice to materialize, professional development, coaching, and mentoring are needed as ongoing support for the educators. Responsibility for organizing this form of support lies with the MOEY&I and by principals.

The professional development will expose teachers to strategies, models, checklists, and selection methods to successfully integrate digital tools. There are other approaches to professional development that could address the issues identified in the research. The training is proposed to involve all the teachers in the QEC over 3 days at the same venue using the face-to-face modality. Another factor to consider is the assembly of large groups given COVID-19 concerns. An alternative could be to accommodate the training in individual and or neighboring schools while embracing and catering to teachers' specific needs, to reduce the number of presenters required, and to adhere to COVID-19 protocols. This model could also extend the professional development approach to involve on-site support organized by the schools using competent teachers or by the MOEY&I curriculum officers. The presenter could also conduct the training in accordance with the project's goals and develop activities to individualized school needs. These on-site strategies could be more organized around coaching and mentoring, which would allow ample time for practice, content, and exposure to the digital tools as a form of continuous support (Bressman et al., 2018; Kraft

& Blazar, 2018). This model could provide more effective teacher efficacy and competence in teaching.

Schools within the QEC have designated professional learning days and common planning times. They could also be used to incorporate the training. Teachers from the schools could be identified as trainers who would access the professional development and then cascade the training to their team members or school-wide. This could increase participation as teachers would be more comfortable taking risks and learning from their colleagues (Coenders & Verhoef, 2019; Yalcin Arslan, 2019).

Scholarship, Project Development, and Leadership and Change

Scholarship

My completion of a master's degree before enrolling in the doctoral program at Walden meant I had engaged in scholarly work, intense literature review, and research. However, the intensity of doctoral study, beginning with the coursework, challenged my thinking and learning, which propelled me to exceptional professional and personal growth. The process of the doctoral journey empowered and equipped me to be more scholarly as I applied the tenets of scholarship to my study. As I engaged in the study's rigorous, challenging, and time-consuming process, I developed a greater understanding of being a social change agent and scholar. The support and guidance received from my advisors and the faculty kept reminding me of the importance of scholarly writing and alignment with social change. So, upholding the principles of the qualitative study taught me the importance of self-reflection on my writing and purpose. I had to develop mechanisms to manage my time, organize my work, and prioritize key tasks. My goal

throughout was to produce high-quality work deserving of the scholarly title with an appeal to the academic audience.

I constantly researched for updated information relevant to my study. The research skills were important in guiding the formulation of the research and the project. Consequently, the literature review informed the study from problem to project completion. I finally understood the meaning of diving into the literature and using it to direct the way. This activity was the most tedious because I had to sieve through hours of data to separate what was important and how to apply it to the study. Throughout the process, I had to rely on the guidance of my committee, especially at times when I was uncertain of how to manage the wealth of information that I would come across. I depended on their knowledge and expertise to analyze the data, write up the results, and develop a meaningful project.

I have grown as a scholar because I have refined my research skills, improved my writing skills, and practiced ethical standards of research. Most importantly, I am comfortable with qualitative research, especially in relation to conducting interviews and engaging in thematic analysis, a time-consuming but rewarding aspect of the doctoral journey. My involvement in this project fulfilled my goal to be a lifelong learner and equipped me to be a more confident scholar-practitioner and researcher.

Project Development and Evaluation and Leadership and Change

I developed a 3-day professional development session for teachers and principals based on the findings of the doctoral study. I used the TPACK conceptual framework and the tenets of effective professional development that I obtained from the literature to

guide the project's development. Throughout the writing of the project, I revisited the literature for clarity and guidance. Collaboration and practice needed to be interwoven into the professional development as these components make them more meaningful for the participants. I investigated a gap in practice; the professional development offering may eliminate that gap as the educators would be interacting with the tools for improved teaching methodology.

I will communicate the feedback from the professional development evaluation to the school leaders and the MOEY&I personnel. The feedback can be used by the principals and the MOEY& I to conduct follow-up support and to organize evolving professional development among the schools. The evaluation from Day 1 could shape the format and activities for the days to come. It could also be used to improve the presenters' style and delivery. As I conduct follow-ups with the schools, I will use additional feedback to determine how teachers' efficacy is enhanced with digital tools.

As an educator with over 14 years of administrative experience, I plan to use the knowledge gained throughout the study to engender social change in education as I help mentor principals and teachers. I hope to develop the digital proficiency of teachers that I will supervise. The wealth of information gained may also empower me to evaluate existing school policies on curriculum and adjust them to meet the learning needs of the students and teachers and to fit 21st century learning standards. I will apply the principles, from the literature, to implement and develop checklists, rubrics, and other supporting materials for instructional monitoring and effective practices and provide constant teacher support.

Reflection on Importance of the Work

This project work targeted a rural QEC with 11 primary schools involving over 100 teachers and 11 school leaders about employing digital tools in instruction. As the study's findings unfolded, I tried to align with the literature despite the winding and arduous journey. However, by staying close to the findings, I could associate the project development with the insights gained from the literature. It was important that both were aligned. I believe that the final project is organized according to the literature and therefore stands to benefit educators; it matches a primary support mechanism identified in the study. The project was developed based on best practices for technology integration professional development and grounded in the TPACK conceptual framework and the literature. The importance of engaging in this project is the new learning that I have gained, especially regarding the qualitative data approach to research. Although many challenges disrupt the teachers' use of digital tools, I feel assured that this project will allow more teachers to understand the basics of identifying and incorporating digital tools in an engaging and supportive atmosphere. As I progressed throughout the study and developed the 3-day professional development project, I remained close to proposing a solution that would produce greater improvement in teacher knowledge. The process has enlightened me and fueled me with confidence in how I can manage curriculum issues in my field of work. The project development stage has brought me closer to the successful end of my doctoral journey.

Implications, Applications, and Directions for Future Research

Implications for Social Change

In researching the challenges faced by primary teachers in utilizing digital tools in instruction, I identified factors related to teachers' TPACK as well as principals and their instructional technological leadership. The 3-day professional development can improve teachers' technological and pedagogical knowledge, positively impacting the classroom and student outcomes. It could also be the beginning of a transformation in classroom practice and school culture that digital tools become commonplace throughout, influencing social change. The identified research-based support systems introduced to the principals can yield competent teachers leading to more equipped teachers within the QEC. The school and regional leaders could use the project data to inform decisions to support teachers in continuously utilizing digital tools in instructional practices.

Implications for Methodology

The data yielded from the study provided rich information obtained from the principals. For that reason, I would still employ the use of qualitative approach for this study. However, if I had to repeat the study, I would include teachers as participants so that I could get their perspective on the challenges and supports needed which could enrich the data and make it more credible. I would collect the teachers' data using a focus group which I think would provide a more insightful and collective response to the data and a deeper understanding of the issues they face. The interviews were conducted virtually. I would choose to conduct the interviews face-to-face to eliminate technical challenges and establish greater rapport with the participants. I am, however, satisfied

that the results would be the same, since similar findings were identified in the literature, and the project was developed according to literature-based findings.

Implications for Research

The research focused on primary teachers in the QEC. The research can be expanded to infant and high schools within the QEC or across the region. It is crucial that teachers and principals at all levels understand the paradigm shift in utilizing digital tools in 21st century education. If there is a consensus or acceptance across the QEC that technology integration is an important component of today's teaching and learning, then there is a greater chance of adaptation. Another possible research could focus on how support can be organized with the QEC to effect changes in the acceptance and use of digital tools among teachers across the QEC. Other research could also focus on how principals and other school leaders are prepared to lead teachers in technology integration. School leaders need to guide changes within their schools, and they must be equipped to do so. Equipping principals is one method of addressing the gap in practice and bringing about positive differences in teacher efficacy in technology integration.

Conclusion

Educators are expected to teach students in a technologically diverse classroom that will prepare them to develop 21st century skills needed for the digital age. The TPACK provided the conceptual framework for this study. The purpose of this study was to explore principals' perceptions about the challenges experienced with using digital tools in curriculum delivery and the organizational supports needed for utilization in instruction by primary teachers in a rural QEC in Jamaica. Six themes emerged related to

challenges and supports. Participants revealed that their competencies as technology leaders could be improved. They also reported that barriers such as teachers' lack of TPACK, lack of necessary structures such as access and availability of tools, and adequate training and support systems, and teachers' negative attitudes towards technology integration prevent the use of digital tools.

Participants shared that exposure to continuous technology professional development and in-school personnel support would aid teachers in increasing their TPACK to use new and existing technology tools with their students. They also acknowledged that principals could benefit from continuous training and support to improve their instructional supervision. Principals would benefit as it would equip them to provide more support for monitoring the curriculum. To increase their self-efficacy and pedagogical and technological knowledge to integrate content effectively, teachers must have access to technology resources, support from school leaders, and continuous training. Any support system must focus on robust professional development to encourage the shift that is needed in the schools so that using digital tools will be the culture. In addition, much needed physical resources was mentioned as required support systems to enable the effective utilization of digital tools in the primary curriculum.

The project resulted in a 3-day professional development plan to train teachers and principals on using digital tools in instruction. The professional development will assist teachers in recognizing and selecting tools based on content, increasing their pedagogy, and applying the tools to lesson development. Principals will benefit from the knowledge of the various supports that can be used to continuously develop teachers'

TPACK and result in teachers using digital tools. This professional development can improve the educators' competencies and skills, improving student outcomes and resulting in positive social change.

References

- Abebe, F. F., Gaskill, M., Hansen, T., & Liu, X. (2022). Investigating K-12 pre-service teacher TPACK in instructional technology learning. *International Journal of Teacher Education and Professional Development (IJTEPD)*, 5(1), Article 4. <https://doi.org/10.4018/IJTEPD.2022010104>
- Acree, L., Gibson, T., Mangum, N., Wolf, M. A., Kellogg, S., & Branon, S. (2017). Supporting school leaders in blended learning with blended learning. *Journal of Online Learning Research*, 3(2), 105-143. <https://files.eric.ed.gov/fulltext/EJ1151090.pdf>
- Alemdag, E., Cevikbas, S. G., & Baran, E. (2020). The design, implementation and evaluation of a professional development programme to support teachers' technology integration in a public education centre. *Studies in Continuing Education*, 42(2), 213–239. <https://doi.org/10.1080/0158037X.2019.1566119>
- Al-Hamad, N., Rathwan, A.M., Rababah, E.Q. (2020). Training needs for kindergarten principals in the light of digital age requirements. *International Journal of Early Childhood Special Education*, 12(2), 125-136. <https://doi.org/10.9756/INT-JECSE/V12I2.201064>
- Almén, L., Bagga-Gupta, S., & Bjursell, C. (2020). Access to and accounts of using digital tools in Swedish secondary grades. An exploratory study. *Journal of Information Technology Education*, 19, 287–314. <https://doi.org/10.28945/4550>
- Amhag, L., Hellström, L., & Stigmar, M. (2019). Teacher educators' use of digital tools and needs for digital competence in higher education. *Journal of Digital Learning*

in *Teacher Education*, 35(4), 203-220.

<https://doi.org/10.1080/21532974.2019.1646169>

Amin, M. E. K., Nørgaard, L. S., Cavaco, A. M., Witry, M. J., Hillman, L., Cernasev, A., & Desselle, S. P. (2020). Establishing trustworthiness and authenticity in

qualitative pharmacy research. *Research in Social and Administrative*

Pharmacy, 16(10), 1472-1482. <https://doi.org/10.1016/j.sapharm.2020.02.005>

Apsorn, A., Sisan, B., & Tungkunan, P. (2019). Information and communication

technology leadership of school administrators in Thailand. *International Journal*

of Instruction, 12(2), 639-650. <https://doi.org/10.29333/iji.2019.12240a>

Archibald, M. M., Ambagtsheer, R. C., Casey, M. G., & Lawless, M. (2019). Using

Zoom videoconferencing for qualitative data collection: Perceptions and

experiences of researchers and participants. *International Journal of Qualitative*

Methods, 18. <https://doi.org/10.1177/1609406919874596>

Aslam, R., Khan, N., Asad, M. M., & Ahmed, U. (2021). Impact of technological

pedagogical content knowledge on teachers' digital proficiency at classroom in

higher education institution of Pakistan. *Interactive Technology and Smart*

Education, 18(1), 119–130. <https://doi.org/10.1108/ITSE-11-2020-0222>

Aspers, P., & Corte, U. (2019). What is qualitative in qualitative research. *Qualitative*

Sociology, 42(2), 139-160. <https://doi.org/10.1007/s11133-019-9413-7>

Azmi, N. (2017). The benefits of using ICT in the EFL classroom: From perceived utility

to potential challenges. *Journal of Educational and Social Research*, 7(1), 111.

<http://dx.doi.org/10.5901/jesr.2017.v7n1p111>

- Atabek, O. (2020). Associations between emotional states, self-efficacy for and attitude towards using educational technology. *International Journal of Progressive Education*, 16(2), 175–194. <https://doi.org/10.29329/ijpe.2020.241.12>
- Ayodele, A. O. (2018). Influence of teachers' professional development on classroom practices in South Africa and Nigeria. *Journal of Alternative Perspectives in the Social Sciences*, 9(2). <https://doi.org/10.5901/jesr.2017.v7n1p111>
- Bacquet, J. N. (2020). Implications of summative and formative assessment in Japan—A review of the current literature. *International Journal of Education and Literacy Studies*, 8(2), 28-35. <http://doi.org/10.7575/aiac.ijels.v.8n.2p.28>
- Bakhshaei, M., Hardy, A., Francisco, A., Noakes, S., & Fusco, J. (2018). *Fostering powerful use of technology through instructional coaching: Results from the pilot year of the Dynamic Learning Project*. Digital Promise. <http://hdl.handle.net/20.500.12265/48>
- Bakri, F., Permana, H., Fitriani, W., Ambarwulan, D., & Mulyati, D. (2021, March). The development of 21st century skills and competence in service teacher through TPACK training workshop. *AIP Conference Proceedings*, 2320(1), Article 020032. <https://doi.org/10.1063/5.0037612>
- Belay, S., Melese, S., & Seifu, A. (2021). Advancing teachers' human capital through effective leadership and institutional safety: Mediating effect of professional learning and teaching climate. *Cogent Education*, 8(1), Article 1912488. <https://doi.org/10.1080/2331186X.2021.1912488>

- Bernard, H. R. (2013). *Social research methods: Qualitative and quantitative approaches* (2nd ed.). Sage.
- Bhardwaj, P. (2019). Types of sampling in research. *Journal of the Practice of Cardiovascular Sciences*, 5(3), 157-163. https://doi.org/10.4103/jpcs.jpcs_62_19
- Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, 26(13), 1802–1811. <https://doi.org/10.1177/1049732316654870>
- Bitsadze, M. (2019). How Georgia may learn from changes in principal support and supervision internationally. *Journal of Educational Administration*, 57(5), 582–590. <https://doi.org/10.1108/JEA-09-2019-226>
- Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies*, 22(3), 769-787. <https://ezproxhttp://dx.doi.org/10.1007/s10639-015-9456-7>
- Boer, P. J., & Asino, T. I. (2022). Learning design experiences of the Namibian teachers during the COVID-19 pandemic: An ethnographic perspective. *TechTrends*, 66(1), 29-38. <https://doi.org/10.1007/s11528-021-00684-8>
- Bogdan, R. C., & Biklen, S. K. (2007). *Qualitative research for education: An introduction to theories and methods*. Pearson Education Press.
- Börnert-Ringleb, M., Casale, G., & Hillenbrand, C. (2021). What predicts teachers' use of digital learning in Germany? Examining the obstacles and conditions of digital

learning in special education. *European Journal of Special Needs*

Education, 36(1), 80-97. <https://doi.org/10.1080/08856257.2021.1872847>

Borup, J., & Evmenova, A. S. (2019). The effectiveness of professional development in overcoming obstacles to effective online instruction in a college of education. *Online Learning*, 23(2), 1-20.

<http://dx.doi.org/10.24059/olj.v23i2.1468>

Bressman, S., Winter, J. S., & Efron, S. E. (2018). Next generation mentoring:

Supporting teachers beyond induction. *Teaching and Teacher Education*, 73, 162-170. <https://doi.org/10.1016/j.tate.2018.04.003>

Buckle-Scott, L. (2022). Jamaica on the cutting edge of curriculum design: The National Standards Curriculum. <https://ncel.gov.jm/content/jamaica-cutting-edge-curriculum-design-national-standards-curriculum>

Burkholder, G. J., Cox, K. A., & Crawford, L. M. (2016). *The scholar-practitioner's guide to research design*. Laureate Publishing.

Burkholder, G. J., Cox, K. A., Crawford, L. M., & Hitchcock, J. H. (2019). *Research design and methods: An applied guide for the scholar practitioner*. SAGE Publications.

Caena, F., & Redecker, C. (2019). Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu). *European Journal of Education*, 54(3), 356-369.

<https://doi.org/10.1111/ejed.12345>

- Callo, E. C., & Yazon, A. D. (2020). Exploring the factors influencing the readiness of faculty and students on online teaching and learning as an alternative delivery mode for the new normal. *Universal Journal of Educational Research*, 8(8), 3509-3518. <http://dx.doi.org/10.13189/ujer.2020.080826>
- Canaran, Ö., & Mirici, İ. H. (2019). An overview of the recent views and practices in teacher professional development. *Eğitimde Kuram ve Uygulama*, 15(4), 350-362. <https://doi.org/10.17244/eku.559281>
- Candela, A. G. (2019). Exploring the function of member checking. *The Qualitative Report*, 24(3), Article 4. <https://nsuworks.nova.edu/tqr/vol24/iss3/14>
- Carter Andrews, D. J., & Richmond, G. (2019). Professional development for equity: What constitutes powerful professional learning? *Journal of Teacher Education*, 70(5), 408–409. <https://doi.org/10.1177/0022487119875098>
- Castéra, J., Marre, C. C., Yok, M. C. K., Sherab, K., Impedovo, M. A., Sarapuu, T., Caukin, N., & Trail, L. (2019). SAMR: A tool for reflection for Ed Tech integration. *International Journal of the Whole Child*, 4(1), 47-54. <https://libjournals.mtsu.edu/index.php/ijwc/article/view/1370>
- Chai, C. S., Koh, J. H. L., & Teo, Y. H. (2018). Enhancing and modeling teachers' design beliefs and efficacy of technological pedagogical content knowledge for 21st century quality learning. *Journal of Educational Computing Research*, 57(2), 360-384. <https://doi.org/10.1177/0735633117752453>.
- Chandra, S., Chang, A., Day, L., Fazlullah, A., Liu, J., McBride, L., Mudalige, T. & Weiss, D. (2020). Closing the K–12 digital divide in the age of distance

learning. *Common Sense and Boston Consulting Group: Boston, MA, USA.*

https://www.bbcmag.com/pub/doc/BBC_Nov20_DigDivide.pdf

Chang, E. (2019). Bridging an engagement gap: towards equitable, community-based technology leadership practice. *International Journal of Leadership in Education*, 22(5), 536–554. <https://doi.org/10.1080/13603124.2018.1492504>

Chauvette, A., Schick-Makaroff, K., & Molzahn, A. E. (2019). Open data in qualitative research. *International Journal of Qualitative Methods*, 18.

<https://doi.org/10.1177/1609406918823863>

Cheah, Y. H., Chai, C. S., & Toh, Y. (2019). Traversing the context of professional learning communities: Development and implementation of Technological Pedagogical Content Knowledge of a primary science teacher. *Research in Science & Technological Education*, 37(2), 147–167.

<https://doi.org/10.1080/02635143.2018.1504765>

Cherner, T., & Mitchell, C. (2021). Deconstructing EdTech frameworks based on their creators, features, and usefulness. *Learning, Media and Technology*, 46(1), 91-116. <https://doi.org/10.1080/17439884.2020.1773852>

Christensen, R., Eichhorn, K., Prestridge, S., Petko, D., Sligte, H., Baker, R., Alayyar, G., & Knezek, G. (2018). Supporting learning leaders for the effective integration of technology into schools. *Technology, Knowledge and Learning*, 23(3), 457–472.

<https://doi.org/10.1007/s10758-018-9385-9>

- Chun Tie, Y., Birks, M., & Francis, K. (2019). Grounded theory research: A design framework for novice researchers. *SAGE open medicine*, 7.
<https://doi.org/10.1177/2050312118822927>
- Clark, V. L. P. (2019). Meaningful integration within mixed methods studies: Identifying why, what, when, and how. *Contemporary Educational Psychology*, 57, 106-111.
<https://doi.org/10.1016/j.cedpsych.2019.01.007>
- Claro, M., Nussbaum, M., López, X., & Contardo, V. (2017). Differences in views of school principals and teachers regarding technology integration. *Journal of Educational Technology & Society*, 20(3), 42-53.
- Clausen, J. M., Finsness, E. S., Borthwick, A. C., Graziano, K. J., Carpenter, J. P., & Herring, M. (2019). TPACK leadership diagnostic tool: Adoption and implementation by teacher education leaders. *Journal of Digital Learning in Teacher Education*, 35(1), 54–72.
<https://doi.org/10.1080/21532974.2018.1537818>
- Coenders, F., & Verhoef, N. (2019). Lesson Study: professional development (PD) for beginning and experienced teachers. *Professional Development in Education*, 45(2), 217-230. <https://doi.org/10.1080/19415257.2018.1430050>
- Collin, S., & Brotcorne, P. (2019). Capturing digital (in) equity in teaching and learning: A sociocritical approach. *The International Journal of Information and Learning Technology*. <https://doi.org/10.1108/IJILT-05-2018-0059>
- Collins, A., Halverson, R. (2018). *Rethinking education in the age of technology. The digital revolution and schooling in America*. Teachers College Press.

- Costa, P., Castaño-Muñoz, J., & Kamyliis, P. (2021). Capturing schools' digital capacity: Psychometric analyses of the SELFIE self-reflection tool. *Computers & Education, 162*. <https://doi.org/10.1016/j.compedu.2020.104080>
- Creswell, J.W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson Educational, Inc.
- Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches*. SAGE.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). SAGE.
- Cypress, B. (2018). Qualitative research methods: A phenomenological focus. *Dimensions of Critical Care Nursing, 37*(6), 302-309.
<http://doi.org/10.1097/DCC.0000000000000322>
- Dalal, M., Archambault, L., & Shelton, C. (2017). Professional development for international teachers: Examining TPACK and technology integration decision making. *Journal of Research on Technology in Education, 49*(3–4), 117–133.
<https://doi.org/10.1080/15391523.2017.1314780>
- Daniel, B. K. (2019). Using the TACT framework to learn the principles of rigour in qualitative research. *Electronic Journal of Business Research Methods, 17*(3), 118-129. <https://doi.org/10.34190/JBRM.17.3.002>
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). Effective teacher professional development. *Research Brief. Learning Policy Institute*.

<https://learningpolicyinstitute.org/product/effective-teacher-professional-development-report>

Davies, R. (2004). Task force on educational reform, Jamaica: A transformed education system.

<https://jis.gov.jm/estp/docs/Reports/JA%20Education%20Reform%20TaskForce%202004.pdf>

Davis, F., & Boudreaux, M. K. (2019). Teacher leaders' perceptions of charter school principals' instructional leadership practices. *Journal of Educational Research and Practice*, 9(1), 7. <https://doi.org/10.5590/JERAP.2019.09.1.07>

De Rossi, M., & Trevisan, O. (2018). Technological Pedagogical Content Knowledge in the literature: How TPCK is defined and implemented in initial teacher education. *Italian Journal of Educational Technology*, 26(1), 7-23. <https://www.learntechlib.org/p/184088/>

Delserieys-Pedregosa, A., Malik, S.K., & Armand, H. (2020). Self-reported TPACK of teacher educators across six countries in Asia and Europe. *Education and Information Technologies*, 25(4), 3003-3019. <https://doi.org/10.1007/s10639-020-10106-6>

Derbel, F. (2017). Technology-capable teachers transitioning to technology-challenged schools. *Electronic Journal of e-Learning*, 15(3), 269-280.

Deterding, N. M., & Waters, M. C. (2021). Flexible coding of in-depth interviews: A Twenty-first-century approach. *Sociological Methods & Research*, 50(2), 708–739. <https://doi.org/10.1177/0049124118799377>

- Dexter, S., & Richardson, J. W. (2020). What does technology integration research tell us about the leadership of technology? *Journal of Research on Technology in Education*, 52(1), 17–36. <https://doi.org/10.1080/15391523.2019.1668316>
- Dias, L. (2017). Teaching and learning with mobile devices in the 21st century digital world: Benefits and challenges. *European Journal of Multidisciplinary Studies*, 2(5), 339-344. <https://doi.org/10.26417/ejms.v5i1.p339-344>
- diGJamaica. (n.d.). Page 729 -Budget 2014 -2015. http://digjamaica.com/app/webroot/edocs/Budget_2014-2015/files/assets/basic-html/page729.html
- Dilsad, M., Hussain, B., & Batool, H. (2019). Continuous professional development of teachers: A case of public universities in Pakistan. *Bulletin of Education and Research*, 41(3), 119-130. <https://files.eric.ed.gov/fulltext/EJ1244673.pdf>
- Dong, Y., Xu, C., Chai, C. S., & Zhai, X. (2020). Exploring the structural relationship among teachers' technostress, Technological Pedagogical Content Knowledge (TPACK), computer self-efficacy and school support. *Asia-Pacific Education Researcher (Springer Science & Business Media B.V.)*, 29(2), 147–157. <https://doi.org/10.1007/s40299-019-00461-5>
- Edwards, L. R., II. (2020). *How principals learn to be technology leaders: A critical incident qualitative study* (Order No. 27997303). [Doctoral dissertation, Old Dominion University]. ProQuest Dissertations & Theses Global.

Eide, P., & Allen, C.B. (2005). Recruiting transcultural qualitative research participants:

A conceptual model. *International Journal of Qualitative Methods*, 4(2), 44-56.

<https://doi.org/10.1177/160940690500400204>

Ekberg, S., & Gao, S. (2018). Understanding challenges of using ICT in secondary

schools in Sweden from teachers' perspective. *The International Journal of Information and Learning Technology*. 35(1), 43-55.

<https://doi.org/10.1108/IJILT-01-2017-0007>

e-Learning Jamaica. (2021). *e-Learning Jamaica presentations*.

<https://www.elearningja.gov.jm/e-ljam-presentations/>

Elistiowati, E., Ahyani, N., & Wardiah, D. (2021, July). Leadership of schools in

improving the quality of education in the digital era. *International Conference on Education Universitas PGRI Palembang (INCoEPP 2021)* (pp. 946-950). Atlantis

Press. <https://doi.org/10.2991/assehr.k.210716.188>

Elli, M. C. A., & Ricafort, J. D. (2020). Competencies of grade VI teachers in technology and livelihood education (TLE). *Online Submission*, 10(4), 25425–25434.

<https://files.eric.ed.gov/fulltext/ED607222.pdf>

Emmel, N. (2014). Theoretical or purposive sampling In: *Sampling and choosing cases in qualitative research: A realist approach*. Sage Publications.

Emre, D. İ. N. C. (2019). Prospective teachers' perceptions of barriers to technology

integration in education. *Contemporary Educational Technology*, 10(4), 381-398.

<https://doi.org/10.30935/cet.634187>

- Erdas Kartal, E., Cobern, W. W., Dogan, N., Irez, S., Cakmakci, G., & Yalaki, Y. (2018). Improving science teachers' nature of science views through an innovative continuing professional development program. *International Journal of STEM education*, 5(1), 1-10. <https://doi.org/10.1186/s40594-018-0125-4>
- Evans, J. (2019). Digital learning: Peril or promise for our K-12 students. Project Tomorrow. https://tomorrow.org/Speakup/downloads/2018_19-Speak-Up-National-Congressional-Briefing-Paper.pdf
- Fadli, F., Astuti D., S. I., & Rukiyati, R. (2020). Techno - resilience for teachers: Concepts and action. *TEM Journal*, 9(2), 820–825. <https://doi.org/10.18421/tem92-53>
- Faruk Islim, O., Ozudogru, G., & Sevim-Cirak, N. (2018). The use of digital storytelling in elementary Math teachers' education. *Educational Media International*, 55(2), 107–122. <https://doi.org/10.1080/09523987.2018.1484045>
- Fauzi, I., & Khusuma, I. H. S. (2020). Teachers' elementary school in online learning of COVID-19 pandemic conditions. *Jurnal Iqra': Kajian Ilmu Pendidikan*, 5(1), 58-70. <https://doi.org/10.25217/ji.v5i1.914>
- Fischer, C., Fishman, B., Dede, C., Eisenkraft, A., Frumin, K., Foster, B., Lawrenz, F., Levy, A. J., & Mccoy, A. (2018). Investigating relationships between school context, teacher professional development, teaching practices, and student achievement in response to a nationwide science reform. *Teaching and Teacher Education*, 72, 107–121. <https://doi.org/10.1016/j.tate.2018.02.011>

- Fletcher, J., Everatt, J., Mackey, J., & Fickel, L. H. (2020). Digital technologies and innovative learning environments in schooling: A New Zealand experience. *New Zealand Journal of Educational Studies*, 55(1), 91–112.
<https://doi.org/10.1007/s40841-020-00156-2>
- Forssell, K. S., & Brazer, S. D. (2019). Principals and teachers empowering teaching with technology. *Technologies to lead schools: Key concepts to enhance student Success, 1*.
- Frailon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2020). *Preparing for life in a digital world: IEA International computer and information literacy study 2018 international report*. Springer Nature.
- Francom, G. M. (2020). Barriers to technology integration: A time-series survey study. *Journal of Research on Technology in Education*, 52(1), 1–16.
<https://doi.org/10.1080/15391523.2019.1679055>
- García-Martín, S., & Cantón-Mayo, I. (2019). Teachers 3.0: Patterns of use of five digital tools. *Digital Education Review*, 35, 202–215.
<http://dx.doi.org/10.1344/der.2019.35.202-215>
- Gill, P., & Baillie, J. (2018). Interviews and focus groups in qualitative research: an update for the digital age. *British Dental Journal*, 225(7), 668-672.
<https://doi.org/10.1038/sj.bdj.2018.815>
- Gill, S. L. (2020). Qualitative sampling methods. *Journal of Human Lactation*, 36(4), 579-581. <https://doi.org/10.1177/0890334420949218>

- Gleason, N. W. (Ed.). (2018). *Higher education in the era of the fourth industrial revolution*. Palgrave Macmillan.
- Glegg, S. M. (2019). Facilitating interviews in qualitative research with visual tools: A typology. *Qualitative health research*, 29(2), 301-310.
<https://doi.org/10.1177/1049732318786485>
- Göksün, D. O., & Gürsoy, G. (2019). Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz. *Computers & Education*, 135, 15-29. <https://doi.org/10.1016/j.compedu.2019.02.015>
- Gonzales, M. M. (2019). School technology leadership vision and challenges: Perspectives from American school administrators. *International Journal of Educational Management*. <https://doi.org/10.1108/IJEM-02-2019-0075>
- Gore, J., Lloyd, A., Smith, M., Bowe, J., Ellis, H., & Lubans, D. (2017). Effects of professional development on the quality of teaching: Results from a randomised controlled trial of quality teaching rounds. *Teaching and teacher education*, 68, 99-113. <https://doi.org/10.1016/j.tate.2017.08.007>
- Gray, L. M., Wong-Wylie, G., Rempel, G. R., & Cook, K. (2020). Expanding qualitative research interviewing strategies: Zoom video communications. *The Qualitative Report*, 25(5), 1292-1301. <https://www.iths.org/wp-content/uploads/2.-Expanding-Qualitative-Research-Interviewing-Strategies.pdf>
- Guba, E. G., & Lincoln, Y. S. (1998). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The landscape of qualitative research*. Sage.

- Gubbins, E. J., & Hayden, S. M. (2021). Professional development. In *Critical issues and practices in gifted education* (pp. 349-360). Routledge.
- Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence: Implications for teacher education. *European Journal of Teacher Education*, 41(2), 214–231.
<https://doi.org/10.1080/02619768.2017.1416085>
- Guest, G., Namey, E., & Chen, M. (2020). A simple method to assess and report thematic saturation in qualitative research. *PLoS One*, 15(5).
<https://doi.org/10.1371/journal.pone.0232076>
- Guest, G., Namey, E., Taylor, J., Eley, N., & McKenna, K. (2017). Comparing focus groups and individual interviews: findings from a randomized study. *International Journal of Social Research Methodology*, 20(6), 693-708.
<https://doi.org/10.1080/13645579.2017.1281601>
- Guggemos, J., & Seufert, S. (2021). Teaching with and teaching about technology – Evidence for professional development of in-service teachers. *Computers in Human Behavior*, 115, N.PAG. <https://doi.org/10.1016/j.chb.2020.106613>
- Gunter, G. A., & Reeves, J. L. (2017). Online professional development embedded with mobile learning: An examination of teachers' attitudes, engagement and dispositions. *British Journal of Educational Technology*, 48(6), 1305–1317.
<https://doi.org/10.1111/bjet.12490>

- Håkansson Lindqvist, M. (2019). School leaders' practices for innovative use of digital technologies in schools. *British Journal of Educational Technology*, 50(3), 1226–1240. <https://doi.org/10.1111/bjet.12782>
- Hall, J., Roman, C., Jovel-Arias, C., & Young, C. (2020). Pre-service teachers examine digital equity amidst schools' COVID-19 responses. *Journal of Technology and Teacher Education*, 28(2), 435-442.
<https://www.learntechlib.org/primary/p/216180/>.
- Hamill, L., (2018). *Organizational support for well-being senior leadership and managerial support required*. <https://hero-health.org/blog/organizational-support-well-senior-leadership-managerial-support-required/>
- Hamzah, N. H., Nasir, M. K. M., & Wahab, J. A. (2021). The effects of principals' digital leadership on teachers' digital teaching during the COVID-19 pandemic in Malaysia. *Journal of Education and e-Learning Research*, 8(2), 216-221.
<http://dx.doi.org/10.20448/journal.509.2021.82.216.221>
- Han, I., & Patterson, T. (2020). Teacher learning through technology-enhanced curriculum design using virtual reality. *Teachers College Record*, 122(7), 1–34.
<https://doi.org/10.1177/016146812012200706>
- Harris, J. B., & Hofer, M. J. (2017). “TPACK stories”: Schools and school districts repurposing a theoretical construct for technology-related professional development. *Journal of Research on Technology in Education*, 49(1-2), 1-15.
<https://doi.org/10.1080/15391523.2017.1295408>

- Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 18(1).
<https://doi.org/10.17169/fqs-18.1.2655>
- Hashim, A. K. (2020). Coaching and districtwide improvement: Exploring the systemic leadership practices of instructional coaches. *Teachers College Record*, 122(10), 1-44. <https://doi.org/10.1177/016146812012201005>
- Heflin, H., Shewmaker, J., & Nguyen, J. (2017). Impact of mobile technology on student attitudes, engagement, and learning. *Computers & Education*, 107, 91-99.
<https://doi.org/10.1016/j.compedu.2017.01.006>
- Henderson, J., & Corry, M. (2021). Teacher anxiety and technology change: A review of the literature. *Technology, Pedagogy & Education*, 30(4), 573–587.
<https://doi.org/10.1080/1475939X.2021.1931426>
- Hennink, M. M., & Kaiser, B. N. (2020). *Saturation in qualitative research*. SAGE Publications Limited.
- Heslop, C., Burns, S., & Lobo, R. (2018). Managing qualitative research as insider-research in small rural communities. *Rural & Remote Health*, 18(3).
<https://doi.org/10.1016/j.compedu.2017.01.006>
- Hill, J.E. & Uribe-Florez, L. (2020). Understanding secondary school teachers' TPACK and technology implementation in mathematics classrooms. *International Journal of Technology in Education (IJTE)*, 3(1), 1-13. <https://eric.ed.gov/?id=EJ1264156>

- Hillmayr, D., Ziernwald, L., Reinhold, F., Hofer, S. I., & Reiss, K. M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education, 153*. <https://doi.org/10.1016/j.compedu.2020.103897>
- Hobbs, R., & Coiro, J. (2019). Design features of a professional development program in digital literacy. *Journal of Adolescent & Adult Literacy, 62*(4), 401–409. <https://doi.org/10.1002/jaal.907>
- Hofer, M., & Harris, J. (2019). Topics & sequences in experienced teachers' instructional planning for technology integration. *Research Highlights in Technology and Teacher Education, 35*. <https://www.learntechlib.org/primary/p/207993/>
- Hollweck, T., & Doucet, A. (2020). Pracademics in the pandemic: Pedagogies and professionalism. *Journal of Professional Capital and Community*. <https://doi.org/10.1108/JPC-06-2020-0038>
- Hsu, C. Y., Tsai, M. J., Chang, Y. H., & Liang, J. C. (2017). Surveying in-service teachers' beliefs about game-based learning and perceptions of technological pedagogical and content knowledge of games. *Educational Technology and Society, 20*(1), 134–143. <https://www.jstor.org/stable/jeductechsoci.20.1.134>
- Hughes, J. E., & Read, M. F. (2018). Student experiences of technology integration in school subjects: A comparison across four middle schools. *Middle Grades Review, 4*(1), n1. <https://scholarworks.uvm.edu/mgreview/vol4/iss1/6>
- Hylton, K., & Hylton-Fraser, K. (2022). An evaluation of the “every child can learn, every child must learn” mantra’s alignment with educational policies in Jamaica.

Equity in Education & Society, 1(1), 163–181.

<https://doi.org/10.1177/27526461211066497>

- Ilomäki, L., & Lakkala, M. (2018). Digital technology and practices for school improvement: Innovative digital school model. *Research and Practice in Technology Enhanced Learning*, 13(1), 1-32. <https://doi.org/10.1186/s41039-018-0094-8>
- Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education*, 67, 37-45. <https://doi.org/10.1016/j.tate.2017.05.016>
- International Society for Technology in Education (ISTE). (2022). *ISTE standards: Education leaders*. <https://www.iste.org/standards/iste-standards-for-education-leaders>
- Ismail, S. A. M. M., Jomezai, N. A., & Baloch, F. A. (2020). Hindering and enabling factors towards ICT integration in schools: A developing country perspective. *Ilkogretim Online - Elementary Education Online*, 19 (3),1537-1547. <http://dx.doi.org/10.17051/ilkonline.2020.733176>
- Israel, M., Ray, M. J., Maa, W. C., Jeong, G. K., eun Lee, C., Lash, T., & Do, V. (2018). School-embedded and district-wide instructional coaching in K-8 computer science: Implications for including students with disabilities. *Journal of Technology and Teacher Education*, 26(3). <https://www.learntechlib.org/primary/p/181938/>.

- Jaipal-Jamani, K., Figg, C., Collier, D., Gallagher, T., Winters, K. L., & Ciampa, K. (2018). Developing TPACK of university faculty through technology leadership roles. *Italian Journal of Educational Technology*, 26(1), 39-55. <https://www.learntechlib.org/p/184086/>.
- Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A review of the quality indicators of rigor in qualitative research. *American Journal of Pharmaceutical Education*, 84(1). <https://doi.org/10.5688/ajpe7120>
- Kahlke, R. (2018). Reflection/Commentary on a past article: “Generic qualitative approaches: Pitfalls and benefits of methodological mixology.” *International Journal of Qualitative Methods*, 17(1), <https://doi.org/10.1177/1609406918788193>
- Kalonde, G. (2017). Rural school math and science teachers' technology integration familiarization. *International Journal of Educational Technology*, 4(1), 17-26. <https://files.eric.ed.gov/fulltext/EJ1167312.pdf>
- Kan’An, A. (2018). The relationship between Jordanian students’ 21st Century skills (Cs21) and academic achievement in science. *Journal of Turkish Science Education (TUSED)*, 15(2), 82–94. <https://doi.org/10.12973/tused.10232a>
- Kao, C.-P., Wu, Y.-T., Chang, Y.-Y., Chien, H.-M., & Mou, T.-Y. (2020). Understanding web-based professional development in education: The role of attitudes and self-efficacy in predicting teachers’ technology-teaching integration. *Asia-Pacific Education Researcher (Springer Science & Business Media B.V.)*, 29(5), 405–415. <https://doi.org/10.1007/s40299-019-00493-x>

- Kelly-Williams, S., Berson, I. R., & Berson, M. J. (2017). Tablet nuff but life still rough: Technology for early childhood sustainable development in Jamaica. *Discourse and Communication for Sustainable Education*, 8(1), 5.
<http://dx.doi.org/10.1515/dcse-2017-0001>
- Khlaif, Z. N. (2018). Factors influencing teachers' attitudes toward mobile technology integration in K-12. *Technology, Knowledge and Learning*, 23(1), 161-175.
<http://dx.doi.org/10.1007/s10758-017-9311-6>
- Kim, H. J., Yi, P., & Hong, J. I. (2021). Are schools digitally inclusive for all? Profiles of school digital inclusion using PISA 2018. *Computers & Education*, 170.
<https://doi.org/10.1016/j.compedu.2021.104226>
- Kimmons, R. (2018). Technology integration: Effectively integrating technology in educational settings. In A. Ottenbreit-Leftwich & R. Kimmons, *The K-12 educational technology handbook*. EdTech Books.
https://edtechbooks.org/k12handbook/technology_integration
- Kirikçılar, R. G. & Yildiz, A. (2018). Technological pedagogical content knowledge (TPACK) craft: Utilization of the TPACK when designing the GeoGebra activities. *Acta Didactica Napocensia*, 11(1), 101-116.
<http://dx.doi.org/10.24193/adn.11.1.8>.
- Knowles, M., Holton, E., & Swanson, R. (2011). *The adult learner: The definitive classic in adult education and human resource development*. Butterworth-Heinemann, Elsevier.

- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1) 60–70. <https://www.learntechlib.org/primary/p/29544/>.
- Koh, J. H. L. (2020). Three approaches for supporting faculty technological pedagogical content knowledge (TPACK) creation through instructional consultation. *British Journal of Educational Technology*, 51(6), 2529–2543. <https://doi.org/10.1111/bjet.12930>
- Koh, J. H. L., Chai, C. S., & Lim, W. Y. (2017). Teacher professional development for TPACK-21CL: Effects on teacher ICT integration and student outcomes. *Journal of Educational Computing Research*, 55(2), 172-196. <https://doi.org/10.1177/0735633116656848>
- Kokoç, M., & Karal, H. (2019). A study on technological pedagogical content knowledge experiences of primary school teachers throughout blended professional development programs. In *Handbook of Research on TPACK in the Digital Age* (pp. 302-327). IGI Global. <http://dx.doi.org/10.4018/978-1-5225-7001-1.ch014>
- Kotok, S., & Kryst, E. L. (2017). Digital technology: A double-edged sword for a school principal in rural Pennsylvania. *Journal of Cases in Educational Leadership*, 20(4), 3-16. <https://doi.org/10.1177/1555458916685748>
- Kozleski, E. B. (2017). The uses of qualitative research. *Research & Practice for Persons with Severe Disabilities*, 42(1), 19–32. <https://doi.org/10.1177/1540796916683710>

- Kraft, M. A., & Blazar, D. (2018). Taking teacher coaching to scale: Can personalized training become standard practice? *Education Next*, 18(4), 68-75.
<https://www.proquest.com/scholarly-journals/taking-teacher-coaching-scale/docview/2231469873/se-2>
- Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of Educational Research*, 88(4), 547–588.
<https://doi.org/10.3102/0034654318759268>
- Kreijns, K., Vermeulen, M., Buuren, H. V., & Acker, F. V. (2017). Does successful use of digital learning materials predict teachers' intention to use them again in the future? *International Review of Research in Open and Distributed Learning*, 18(7). <https://doi.org/10.19173/irrodl.v18i7.2895>
- Kuzel, A.J. (1999). Sampling in qualitative research. In B. F Crabtree & W. L. Miller (Eds.). *Doing qualitative research*, (2nd ed., pp. 33–45). Sage.
- Lavonen, J., & Salmela-Aro, K. (2022). Experiences of moving quickly to distance teaching and learning at all levels of education in Finland. In *Primary and Secondary Education During Covid-19* (pp. 105-123). Springer, Cham.
https://doi.org/10.1007/978-3-030-81500-4_4
- Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, 55(1), 79-105. <http://dx.doi.org/10.1080/09523987.2018.1439712>

- Lew, S., Yang, A. H., & Harklau, L. (2018). Qualitative methodology. In *The Palgrave handbook of applied linguistics research methodology* (pp. 79-101). Palgrave Macmillan.
- Li, G., Sun, Z., & Jee, Y. (2019). The more technology the better? A comparison of teacher-student interaction in high and low technology use elementary EFL classrooms in China. *System*, 84, 24-40.
<https://doi.org/10.1016/j.system.2019.05.003>
- Li, S., Yamaguchi, S., Sukhbaatar, J., & Takada, J. (2019). The influence of teachers' professional development activities on the factors promoting ICT integration in primary schools in Mongolia. *Education Sciences*, 9.
<https://doi.org/10.3390/educsci9020078>
- Liao, Y. C., Ottenbreit-Leftwich, A., Glazewski, K., & Karlin, M. (2021). Coaching to support teacher technology integration in elementary classrooms: A multiple case study. *Teaching and Teacher Education*, 104, 103384.
<https://doi.org/10.1016/j.tate.2021.103384>
- Liao, Y-C., Ottenbreit-Leftwich, A., Karlin, M., Glazewski, K., & Brush, T. (2017). Supporting change in teacher practice: Examining shifts of teachers' professional development preferences and needs for technology integration. *Contemporary Issues in Technology and Teacher Education*, 17(4), 522-548.
<https://www.learntechlib.org/primary/p/178710/>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.

- Lindell, T. L. (2020). Teachers calling for organizational support to digitalize teaching. *International Journal of Information & Learning Technology*, 37(5), 323–339. <https://doi.org/10.1108/IJILT-02-2020-0017>
- Linton, L. (April 8, 2014). *\$1.2 Billion to be spent on e-Learning project*. <https://jis.gov.jm/1-2-billion-spent-e-learning-project/>.
- Lindqvist, M.H, & Pettersson, F. (2019). Digitalization and school leadership: On the complexity of leading for digitalization in school. *The International Journal of Information and Learning Technology*, 36(3), 218–230. <https://doi.org/10.1108/IJILT-11-2018-0126>
- Lindqvist, M.H. (2019). School leaders practices for innovative use of digital technologies in schools. *British Journal of Educational Technology*, 50(3), 1225-1240. <https://doi.org/10.1111/bjet.12782>
- Lucas, M., Bem-Haja, P., Siddiq, F., Moreira, A., & Redecker, C. (2021). The relation between in-service teachers' digital competence and personal and contextual factors: What matters most? *Computers & Education*, 160, 104052. <https://doi.org/10.1016/j.compedu.2020.104052>
- Madill, A., & Sullivan, P. (2018). Mirrors, portraits, and member checking: Managing difficult moments of knowledge exchange in the social sciences. *Qualitative Psychology*, 5(3), 321–339. <http://dx.doi.org/10.1037/qup0000089>
- Makki, T. W., O'Neal, L. J., Cotten, S. R., & Rikard, R. V. (2018). When first-order barriers are high: A comparison of second-and third-order barriers to classroom

computing integration. *Computers & Education*, 120, 90-97.

<https://doi.org/10.1016/j.compedu.2018.01.005>

Martin, J. (2019). Pre-service TVET teachers' perceptions of their readiness to integrate ICT in the curriculum. *International Journal of Sociology and Social Policy* 1(2): 1-15. https://www.researchgate.net/publication/339149628_Pre-Service_TVET_Teachers'_Perceptions_of_their_Readiness_to_Integrate_ICT_in_the_Curriculum

Martín, S. G., & Cantón-Mayo, I. (2019). Teachers 3.0: Patterns of use of five digital tools. *Digital Education Review*, (35), 202-215. <http://orcid.org/0000-0003-1298-8549>

Masters, J. (2018, October). Trends in the digitalization of K-12 Schools: The Australian perspective. In *Seminar. net* 14(2), 120-131). <https://doi.org/10.7577/seminar.2975>

Maxwell, J. A. (2013). *Qualitative research design: An interactive approach* (3rd ed.). Sage.

McGrath, C., Palmgren, P. J., & Liljedahl, M. (2019). Twelve tips for conducting qualitative research interviews. *Medical teacher*, 41(9), 1002-1006. <https://doi.org/10.1080/0142159X.2018.1497149>

McKim, C. A. (2017). The value of mixed methods research: A mixed methods study. *Journal of Mixed Methods Research*, 11(2), 202-222. <https://doi.org/10.1177/1558689815607096>

- Mei, X. Y., Aas, E., & Medgard, M. (2019). Teachers' use of digital learning tool for teaching in higher education: Exploring teaching practice and sharing culture. *Journal of Applied Research in Higher Education*, Vol. 11 No. 3, pp. 522-537. <https://doi.org/10.1108/JARHE-10-2018-0202>
- Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- Mertler, C. A. (Ed.). (2019). *The Wiley handbook of action research in education*. John Wiley & Sons.
- Ministry of Education, Youth and Information. (2017). Full implementation of National Standard Curriculum this year. <https://moey.gov.jm/full-implementation-of-national-standard-curriculum-this-year/>
- Ministry of Education of Education, Youth, and Information. (2018). *The National Standards Curriculum NSC*. <https://pep.moey.gov.jm/the-national-standards-curriculum-nsc/>
- Ministry or Education, Youth, and Information. (2019). National Standards Curriculum (NSC). <https://pep.moey.gov.jm/the-national-standards-curriculum-nsc/#>
- Ministry of Education, Youth, and Information. (2021). *Full implementation of National Standard Curriculum this year*. <https://moey.gov.jm/full-implementation-national-standard-curriculum-year>
- Mirick, R. G., & Wladkowski, S. P. (2019). Skype in qualitative interviews: Participant and researcher perspectives. *The Qualitative Report*, 24(12), Article 2.

<https://www.proquest.com/scholarly-journals/skype-qualitative-interviews-participant/docview/2331238835/se-2>

Mirjana Joksimović, Ashlee Robertson, Borivoje Đokić, & Lazar Dražeta. (2018).

Technology-based professional development: The case of elementary school teachers in Belgrade. *Management*, 24(1), 1–11.

<https://doi.org/10.7595/management.fon.2018.0029>

Mirke, E., Cakula, S., & Tzivian, L. (2019). Measuring teachers-as-learners' digital skills

and readiness to study online for successful e-learning experience. *Journal of*

Teacher Education for Sustainability, 21(2), 5-16. [http://dx.doi.org/10.2478/jtes-](http://dx.doi.org/10.2478/jtes-2019-0013)

[2019-0013](http://dx.doi.org/10.2478/jtes-2019-0013)

Mishra, P. (2012, October). *TPACK newsletter, issue #12*.

<https://www.punyamishra.com/2012/10/10/tpack-newsletter-issue-12-october-2012/>

Mishra, P. (2019). Considering contextual knowledge: The TPACK diagram gets an

upgrade. *Journal of Digital Learning in Teacher Education*, 35:2, 76-78,

<http://dx.doi.org/10.1080/21532974.2019.1588611>

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A

new framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–

1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>

Mohajan, H. K. (2018). Qualitative research methodology in social sciences and related

subjects. *Journal of Economic Development, Environment and People*, 7(1), 23-

48. <https://mpa.ub.uni-muenchen.de/85654/>

- Montebello, M. (2017). Digital pedagogies for teachers' CPD. *International Association for Development of the Information Society*. <https://eric.ed.gov/?id=ED579307>
- Morse, J. M. (2000). Determining sample size. *Qualitative Health Research*, 10(1), 3-5. <https://doi.org/10.1177/104973200129118183>
- Moser, A., & Korstjens, I. (2018). Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. *European Journal of General Practice*, 24(1), 9-18. <https://doi.org/10.1080/13814788.2017.1375091>
- Muhaimin, M., Habibi, A., Mukminin, A., Saudagar, F., Pratama, R., Wahyuni, S., Sadikin, A., & Indrayana, B. (2019). A sequential explanatory investigation of TPACK: Indonesian science teachers' survey and perspective. *Journal of Technology and Science Education*, 9(3), 269-281. <https://doi.org/10.3926/jotse.662>
- Muslem, A., Yusuf, Y. Q., & Juliana, R. (2018). Perceptions and barriers to ICT use among English teachers in Indonesia. *Teaching English with Technology*, 18(1), 3-23. https://www.researchgate.net/publication/323164666_Perceptions_and_barriers_to_ICT_use_among_english_teachers_in_Indonesia
- Napal, M., Mendióroz-Lacambra, A. M., & Penalva, A. (2020). Sustainability teaching tools in the digital age. *Sustainability*, 12(8), 3366. <https://doi.org/10.3390/su12083366>

- Nasreen, A., & Odhiambo, G. (2018). The continuous professional development of school principals: Current practices in Pakistan. *Bulletin of Education and Research*, 40(1), 245-266. <https://files.eric.ed.gov/fulltext/EJ1209698.pdf>
- Navaridas-Nalda, F., Clavel-San Emeterio, M., Fernández-Ortiz, R., & Arias-Oliva, M. (2020). The strategic influence of school principal leadership in the digital transformation of schools. *Computers in Human Behavior*, 112. <https://doi.org/10.1016/j.chb.2020.106481>
- Nelson, M. J., Voithofer, R., & Cheng, S. L. (2019). Mediating factors that influence the technology integration practices of teacher educators. *Computers & Education*, 128, 330-344. <https://doi.org/10.1016/j.compedu.2018.09.023>
- Niemi, R. (2019). Five approaches to pedagogical action research. *Educational Action Research*, 27(5), 651–666. <https://doi.org/10.1080/09650792.2018.1528876>
- Niess, M.L. (2018). Introduction to teachers' knowledge-of-practice for teaching with digital technologies: A Technological Pedagogical Content Knowledge (TPACK) Framework. In *Teacher training and professional development: Concepts, methodologies, tools, and applications* (pp. 1595-1622). IGI Global. <http://dx.doi.org/10.4018/978-1-5225-5631-2.ch007>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1). <http://dx.doi.org/1609406917733847>

- Nzarirwehi, J., & Atuhumuze, F. (2019). In-service teacher training and professional development of primary school teachers in Uganda. *IAFOR Journal of Education*, 7(1), 19-36. <https://files.eric.ed.gov/fulltext/EJ1217948.pdf>
- O'Neal, L. J., Gibson, P., & Cotten, S. R. (2017). Elementary school teachers' beliefs about the role of technology in 21st-Century teaching and learning. *Computers in the Schools*, 34(3), 192–206. <https://doi.org/10.1080/07380569.2017.1347443>
- Oda, K., Herman, T., & Hasan, A. (2020). Properties and impacts of TPACK-based GIS professional development for in-service teachers. *International Research in Geographical and Environmental Education*, 29(1), 40–54. <https://doi.org/10.1080/10382046.2019.1657675>
- Oneyfulu, C., Hughes, G., Hamile, S. (2019). A situational analysis report of e-Learning Tablets in Schools Pilot Project in Jamaica. <https://www.elearningja.gov.jm/tablets-in-schools-project-2/>
- Ottenbreit-Leftwich, A., Liao, Y. C., Karlin, M., Lu, Y. H., Ding, A. C. E., & Guo, M. (2020). Year-long implementation of a research-based technology integration professional development coaching model in an elementary school. *Journal of Digital Learning in Teacher Education*, 36(4), 206-220. <https://doi.org/10.1080/21532974.2020.1804494>
- Otterborn, A., Schönborn, K., & Hultén, M. (2019). Surveying preschool teachers' use of digital tablets: general and technology education related findings. *International Journal of Technology and Design Education*, 29(4), 717-737. <https://doi.org/10.1007/s10798-018-9469-9>

- Owen, S., White, G., Palekahelu, D. T., Sumakul, D. T. Y. G., & Sekiyono, E. (2020). Integrating online learning in schools: Issues and ways forward for developing countries. *Journal of Information Technology Education: Research*, 19, 571-614.
<https://doi.org/10.28945/4625>
- Oyedemi, T., & Mogano, S. (2018). The digitally disadvantaged: Access to digital communication technologies among first year students at a rural South African University. *Africa Education Review*, 15(1), 175-191.
<https://doi.org/10.1080/18146627.2016.1264866>
- Palaganas, E. C., Sanchez, M. C., Molintas, V. P., & Caricativo, R. D. (2017). Reflexivity in qualitative research: A journey of learning. *Qualitative Report*, 22(2).
<https://doi.org/10.46743/2160-3715/2017.2552>
- Pareja Roblin, N., Tondeur, J., Voogt, J., Bruggeman, B., Mathieu, G., & van Braak, J. (2018). Practical considerations informing teachers' technology integration decisions: the case of tablet PCs. *Technology, Pedagogy and Education*, 27(2), 165-181.
<https://doi.org/10.1080/1475939X.2017.1414714>
- Pareto, L., & Willermark, S. (2019). TPACK In Situ: A design-based approach supporting professional development in practice. *Journal of Educational Computing Research*, 57(5), 1186–1226.
<https://doi.org/10.1177/0735633118783180>
- Patton, M. (1990). *Qualitative evaluation and research methods*. Sage.

- Patton, M. Q. (2015). Chapter 5, Module 30: *Purposeful sampling and case selection: Overview of strategies and options*. In *Qualitative research and evaluation methods* (4th ed., pp. 264–315). Sage Publications.
- Payne, C. (2017). *Basic qualitative methodology: Capturing first patient care experiences of baccalaureate nursing students*. SAGE Publications Ltd.
- Peled, Y., & Perzon, S. (2022). Systemic model for technology integration in teaching. *Education and Information Technologies*, 27, 2661–2675.
<https://doi.org/10.1007/s10639-021-10694-x>
- Persaud, B. (2006). *School administrators' perspective on their leadership role in technology integration* (Order No. 3210010). [Doctoral dissertation, Walden University]. Available from Dissertations & Theses @ Walden University.
- Pettersson, F. (2018). Digitally competent school organizations - Developing supportive organizational infrastructures. *Seminar.Net: Media, Technology & Life-Long Learning*, 14(2), 1–12. <https://doi.org/10.7577/seminar.2976>
- Pharis, T. J., Wu, E., Sullivan, S., & Moore, L. (2019). Improving teacher quality: Professional development implications from teacher professional growth and effectiveness system implementation in rural Kentucky high schools. *Educational Research Quarterly*, 42(3), 29-48. <http://doi.org/10.22230/ijep1.2018v13n5a740>
- Phetla, D., & Newman, W. (2020). Effectiveness of teacher professional development programmes: Literature review. *Journal of Entrepreneurship Education*, 23, 1-9.
<https://files.eric.ed.gov/fulltext/ED606741.pdf>

- Philipsen, B., Tondeur, J., McKenney, S., & Zhu, C. (2019). Supporting teacher reflection during online professional development: a logic modelling approach. *Technology, pedagogy and education*, 28(2), 237-253.
<https://doi.org/10.1080/1475939X.2019.1602077>
- Polly, D., Byker, E. J., Putman, S. M., & Handler, L. K. (2020). Preparing elementary education teacher candidates to teach with technology: The role of modeling. *Journal of Digital Learning in Teacher Education*, 36(4), 250–265.
<https://doi.org/10.1080/21532974.2020.1795953>
- Porras-Hernandez, L. H., & Salinas-Amescua, B. (2013). Strengthening TPACK: A broader notion of context and the use of teacher's narratives to reveal knowledge construction. *Journal of Educational Computing Research*, 48, 223–244.
<https://doi.org/10.2190/EC.48.2.f>
- Prasojo, L. D., Habibi, A., Yaakob, M. F. M., Mukminin, A., Haswindy, S., & Sofwan, M. (2019). An explanatory sequential study on Indonesian principals' perceptions on ICT integration barriers. *Electronic Journal of e-Learning*, 17(1), 1-10.
<https://www.proquest.com/trade-journals/explanatory-sequential-study-on-indonesian/docview/2208617089/se-2>
- Prenger, R., Poortman, C. L., & Handelzalts, A. (2019). The effects of networked professional learning communities. *Journal of Teacher Education*, 70(5), 441–452. <https://doi.org/10.1177/0022487117753574>

- Presby, B. (2017). *Barriers to reducing the digital-use divide as perceived by middle school principals* (Order No. 1026827) [Doctoral dissertation, Brandman University]. ProQuest Central; ProQuest Dissertations & Theses Global.
- Project Tomorrow. (2021). *Education leadership brief: Examining the evolving digital responsibilities of school principals findings and insights from the Speak Up research project*. <https://tomorrow.org/speakup/evolving-digital-leadership.html>
- Raman, A., & Thannimalai, R. (2019). Importance of technology leadership for technology integration: Gender and professional development perspective. *SAGE Open*, 9(4). <https://doi.org/10.1177/2158244019893707>
- Ranieri, M., Bruni, I., & Orban de Xivry, A. (2017). Teachers' Professional Development on Digital and Media Literacy. Findings and recommendations from a European project. *Research on Education and Media*, 10(2), 10-19. <http://dx.doi.org/10.1515/rem-2017-0009>
- Ravitch, S. M., & Carl, N. M. (2021). *Qualitative research: Bridging the conceptual, theoretical, and methodological* (2nd ed.). Sage Publications.
- Razak, N., Ab Jalil, H., & Ismail, I. (2019). Challenges in ICT integration among Malaysian public primary education teachers: The roles of leaders and stakeholders. *International Journal of Emerging Technologies in Learning (iJET)*, 14(24), 184-205. <https://doi.org/10.3991/ijet.v14i24.12101>
- Reid, A. M., Brown, J. M., Smith, J. M., Cope, A. C., & Jamieson, S. (2018). Ethical dilemmas and reflexivity in qualitative research. *Perspectives on medical education*, 7(2), 69-75. <https://doi.org/10.1007/s40037-018-0412-2>

- Reimers, F. M., & Schleicher, A. (2020). *A framework to guide an education response to the COVID-19 pandemic of 2020*. OECD. <https://www.aforges.org/wp-content/uploads/2020/04/framework.pdf>
- Richardson, J. W., & Sterrett, W. L. (2018). District technology leadership then and now: A comparative study of district technology leadership from 2001 to 2014. *Educational Administration Quarterly*, *54*(4), 589–616. <https://doi.org/10.1177/0013161X18769046>
- Ríordain, M. N., Paolucci, C., & Dwyer, L. M. O. (2017). An examination of the professional development needs of out-of-field mathematics teachers. *Teaching and Teacher Education*, *64*, 162–174. <https://doi.org/10.1016/j.tate.2017.02.001>
- Rodwin, M.A. (2019). ARTICLE: Conflicts of interest in human subject research: The insufficiency of U.S. and international standards. *American Journal of Law & Medicine*, *45*, 303. <https://doi.org/10.1177/0098858819892743>
- Rolle-Greenidge, G., & Walcott, P. (2020). Assessing the attitudes of Dominican primary school teachers toward the integration of ICT in the classroom. *International Journal of Education and Development Using Information and Communication Technology*, *16*(2), 84–96. <https://files.eric.ed.gov/fulltext/EJ1268808.pdf>
- Roller, M. R. & Lavrakas, P. J. (2015). *Applied qualitative research design: A total quality framework approach*. Guilford Press.
- Rosenberg, J. M., & Koehler, M. J. (2015). Context and technological pedagogical content knowledge (TPACK): A systematic review. *Journal of Research on*

Technology in Education, 47(3), 186–210.

<https://doi.org/10.1080/15391523.2015.1052663>

Rosenberg, J. M., & Koehler, M. J. (2018). Context and teaching with technology in the digital age. In *Teacher training and professional development: Concepts, methodologies, tools, and applications* (pp. 1595-1622). IGI Global.

<http://doi.org/10.4018/978-1-4666-8403-4.ch017>

Ross, M. W., Iguchi, M. Y., & Panicker, S. (2018). Ethical aspects of data sharing and research participant protections. *American Psychologist*, 73(2), 138.

<https://doi.org/10.1037/amp0000240>

Ross, S. M. (2020). Technology infusion in K-12 classrooms: a retrospective look at three decades of challenges and advancements in research and practice. *Educational Technology Research & Development*, 68(5).

<http://doi.org/10.1007/s11423-020-09756-7>

Rossman, G. & Rallis, S. (2017). Major qualitative research genres. In *An introduction to qualitative research* (pp. 77-99). SAGE Publications.

<https://dx.doi.org/10.4135/9781071802694.n3>

Roulston, K., & Choi, M. (2018). *Qualitative interviews*. The SAGE Handbook of Qualitative Data Collection, 233-249.

Roussinos, D., & Jimoyiannis, A. (2019). Examining primary education teachers' perceptions of TPACK and the related educational context factors. *Journal of Research on Technology in Education*, 51(4), 377-397.

<https://doi.org/10.1080/15391523.2019.1666323>

- Rubin H. J., & Rubin I. S. (2011). *Qualitative interviewing: The art of hearing data*. Sage Publications, Inc.
- Ruloff, M., & Petko, D. (2022). School principals' educational goals and leadership styles for digital transformation: results from case studies in upper secondary schools. *International Journal of Leadership in Education*, 1-19.
<https://doi.org/10.1080/13603124.2021.2014979>
- Sahin Izmirli, O., & Kirmaci, Ö. (2017). New barriers to technology integration. *Eurasian Journal of Educational Research*, 72, 147–166.
<http://doi.org/10.14689/ejer.2017.72.8>
- Saldana, J. (2015). *The coding manual for qualitative researchers*. Sage Publications, Ltd.
- Sandelowski, M. (1995). Sample size in qualitative research. *Research in Nursing & Health*. Vol. 18. No. 2, pp. 179-183. <https://doi.org/10.1002/nur.4770180211>
- Sari, M. H., & Keser, H. (2021). Classroom teachers' online teaching experiences during the COVID-19 pandemic: The perspective of technological pedagogical content knowledge. *Journal of Pedagogical Research*, 5(4).
<https://doi.org/10.33902/JPR.2021474706>
- Scherer, R., Tondeur, J., Siddiq, F., & Baran, E. (2018). The importance of attitudes toward technology for pre-service teachers' technological, pedagogical, and content knowledge: Comparing structural equation modeling approaches. *Computers in Human Behavior*, 80, 67–80.
<https://doi.org/10.1016/j.chb.2017.11.003>

- Schwab, K. (2017). *The fourth industrial revolution*. Random House
- Schwandt, T. A. (2015). *The SAGE dictionary of qualitative inquiry* (4th ed.). SAGE.
- Scott, J. (2020, April 27). *New contracts to boost Jamaica's Tablets in Schools programme*. <https://caribbeanbusinessreport.com/news/new-contracts-to-boost-jamaicas-tablets-in-schools-programme/>
- Sen, C., & Ay, Z. S. (2017). The views of middle school mathematics teachers on the integration of science and technology in mathematics instruction. *International Journal of Research in Education and Science*, 3(1), 151-170.
<https://files.eric.ed.gov/fulltext/EJ1126712.pdf>
- Seraji, F., Kasani, H. A., Abedi, H., & Sajedifard, M. (2020). Smart school project in Iran: Potentials and barriers. *Education and Information Technologies*, 25(5), 4211-4230. <https://doi.org/10.1007/s10639-020-10173-9>
- Shaheen, M., & Pradhan, S. (2019). Sampling in qualitative research. In *Qualitative techniques for workplace data analysis* (pp. 25-51). IGI Global.
<http://doi.org/10.4018/978-1-5225-5366-3.ch002>
- Shamir-Inbal, T., & Blau, I. (2017). Which pedagogical parameters predict the general quality of ICT integration from the perspective of elementary school leaders? *Computers in the Schools*, 34(3), 168–191.
<http://dx.doi.org/10.1080/07380569.2017.1347427>
- Shatrid, Z. G. (2020). Advantages and disadvantages of using information technology in learning process of students. *Journal of Turkish Science Education*, 17(3), 420-428. <http://doi.org/10.1080/07380569.2017.1347427>

- Shavelson, R. J. (2018). Methodological Perspectives: Standardized (Summative) or Contextualized (Formative) Evaluation?. *Education Policy Analysis Archives*, 26(48). <http://dx.doi.org/10.14507/epaa.26.3813>
- Sheffield, R., Blackley, S., & Moro, P. (2018). A professional learning model supporting teachers to integrate digital technologies. *Issues in Educational Research*, 28(2), 487–510. <http://www.iier.org.au/iier28/sheffield.pdf>
- Shemshack, A. (2021). What supports do teachers need on effective instructional technology integration? *Journal of Literacy & Technology*, 22(1), 22–51. <https://files.eric.ed.gov/fulltext/ED577147.pdf>
- Sheveleva, N., Mahotin, D., Lesin, S., & Curteva, O. (2021). Preparing teachers for the use of digital technologies in educational activities. In *SHS Web of Conferences (Vol. 98)*. EDP Sciences. <http://doi.org/10.1051/shsconf/20219805016>
- Shulman, L. (1986). Paradigms and research programs in the study of teaching: A contemporary perspective. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.; pp. 3– 36). MacMillan.
- Siefert, B., Kelly, K., Yearta, L., & Oliveira, T. (2019). Teacher perceptions and use of technology across content areas with linguistically diverse middle school students. *Journal of Digital Learning in Teacher Education*, 35(2), 107-121. <https://doi.org/10.1080/21532974.2019.1568327>

- Silva, J. B., Nardi Silva, I., & Biessimo, S. (2020). Technological structure for technology integration in the classroom, inspired by the maker culture. *Journal of Information Technology Education: Research*, 19, 167-204.
<https://doi.org/10.28945/4532>
- Sinclair, J., & Aho, A. M. (2018). Experts on super innovators: understanding staff adoption of learning management systems. *Higher Education Research & Development*, 37(1), 158-172. <https://doi.org/10.1080/07294360.2017.1342609>
- Spiteri, M., & Rundgren, S.-N. C. (2017). Maltese primary teachers' digital competence: implications for continuing professional development. *European Journal of Teacher Education*, 40(4), 521–534.
<https://doi.org/10.1080/02619768.2017.1342242>
- St. Hilaire, R., & Gallagher, T. L. (2020). Coaching kindergarten educators through design-based research to enact technology-enhanced reading instruction. *International Journal of E-Learning & Distance Education*, 35(1), 1–29. <https://www.ijede.ca/index.php/jde/article/view/1157>
- Sterrett, W., & Richardson, J. W. (2020). Supporting professional development through digital principal leadership. *Journal of Organizational and Educational Leadership*, 5(2). <https://digitalcommons.gardner-webb.edu/joel/vol5/iss2/4>
- Supemaw, C., & Reindorf, S. H. (2021). Effect of technology adoption on the quality of education among schools in Switzerland. *Journal of Education*, 4(2), 59-67.
<https://stratfordjournals.org/journals/index.php/journal-of-education/article/view/775>

- Sutter, T. & Dirkin, K. (2021). The convergence of Triple E Framework components and Michigan secondary teachers' perceptions of technology affordances. In E. Langran & L. Archambault (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 1336-1345). Online, United States: Association for the Advancement of Computing in Education (AACE). <https://www.learntechlib.org/primary/p/219290/>.
- Tarman, B. and Chigisheva, O. (2017). Transformation of educational policy, theory and practice in post-soviet social studies education. *Journal of Social Studies Education Research*, 8(2).
<https://dergipark.org.tr/en/pub/jsser/issue/32450/360860>
- The Auditor General's Department, Jamaica. (2021). Follow-up audit report auditor general of Jamaica. <https://auditorgeneral.gov.jm/auditor-generals-department-follow-up-audit-report-e-learning-jamaica-company-limited-tablet-in-schools-tis/>
- The Gleaner. (2019, October 22). Education officers' roles being revamped.
<https://jamaica-gleaner.com/article/news/20191022/education-officers-roles-being-revamped>
- Thessin, R.A. (2019). Establishing productive principal/principal supervisor partnerships for instructional leadership. *Journal of Educational Administration*, 57(5), 463-483. <https://doi.org/10.1108/JEA-09-2018-0184>
- Thoma, J., Hutchison, A., Johnson, D., Johnson, K., & Stromer, E. (2017). Planning for technology integration in a professional learning community. *The Reading Teacher*, 71(2), 167. <https://doi.org/10.1002/trtr.1604>

- Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education. *British Journal of Educational Technology*, 50(3), 1189-1209. <http://dx.doi.org/10.1111/bjet.12748>
- Top, E., Baser, D., Akkus, R., Akayoglu, S., & Gurer, M. D. (2021). Secondary school teachers' preferences in the process of individual technology mentoring. *Computers & Education*, 160. <https://doi.org/10.1016/j.compedu.2020.104030>
- Trust, T. (2018). 2017 ISTE standards for educators: From teaching with technology to using technology to empower learners. *Journal of Digital Learning in Teacher Education*, 34(1), 1-3. <https://doi.org/10.1080/21532974.2017.1398980>
- Tufford, L., & Newman, P. (2010). Bracketing in qualitative research. *Qualitative Social Work*, 11(1), 80–96. <http://doi.org/10.1177/1473325010368316>
- Tusiime, W. E., Johannesen, M., & Gudmundsdottir, G. B. (2020). Teaching art and design in a digital age: Challenges facing Ugandan teacher educators. *Journal of Vocational Education & Training*, 1-21. <https://doi.org/10.1080/13636820.2020.1786439>
- United Nations Development Programme. (2021). *Goal 4: Quality education*. <https://www.ps.undp.org/content/papp/en/home/post-2015/sdg-overview/goal-4.html>
- U.S. Agency for International Development & Educational Quality Improvement Program I. (2011, December). *First principles: Designing effective education*

programs using information and communication technology (ICT) compendium.

<https://www.edu-links.org/index.php/resources/first-principles-designing-effective-education-programs>

U.S. Department of Education. (2017). Reimagining the role of technology in education:

2017 national education technology plan update. Office of Educational

Technology. <https://tech.ed.gov/files/2017/01/NETP17.pdf>.

Van de Wiel, M. W. (2017). Examining expertise using interviews and verbal

protocols. *Frontline Learning Research*, 5(3), 112-

140. <https://doi.org/10.14786/flr.v5i3.257>

van Thiel, L. (2018). Professional learning design framework: Supporting technology

integration in Alberta. *Research in Learning Technology*, 26, 1-24.

<https://doi.org/10.25304/rlt.v26.1989>

Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2017). Teacher communities as a

context for professional development: A systematic review. *Teaching and*

Teacher Education, 61, 47–59. <https://doi.org/10.1016/j.tate.2016.10.001>

Vermunt, J. D., Vrikki, M., van Halem, N., Warwick, P., & Mercer, N. (2019). The

impact of Lesson Study professional development on the quality of teacher

learning. *Teaching and Teacher Education*, 81, 61-73.

<https://doi.org/10.1016/j.tate.2019.02.009>

Vlasopoulou, M., Kalogiannakis, M., & Sifaki, E. (2021). Investigating teachers' attitudes

and behavioral intentions for the impending integration of STEM education in

primary schools. In *Handbook of Research on Using Educational Robotics to Facilitate Student Learning* (pp. 235-256). IGI Global.

<http://doi.org/10.4018/978-1-7998-6717-3.ch009>

Vogel, L. R. (2018). Learning outside the classroom: How principals define and prepare to be instructional leaders. *Education Research International*, 2018.

<http://doi.org/10.1155/2018/8034270>

Voithofer, R., Nelson, M. J., Han, G., & Caines, A. (2019). Factors that influence TPACK adoption by teacher educators in the US. *Educational Technology Research and Development*, 67(6), 1427–1453. [http://doi.org/10.1007/s11423-](http://doi.org/10.1007/s11423-019-09652-9)

[019-09652-9](http://doi.org/10.1007/s11423-019-09652-9)

Vongkulluksn, V. W., Xie, K., & Bowman, M. A. (2018). The role of value on teachers' internalization of external barriers and externalization of personal beliefs for classroom technology integration. *Computers & Education*, 118, 70-81.

<https://doi.org/10.1016/j.compedu.2017.11.009>

Walan, S. (2020). Embracing digital technology in science classrooms-Secondary school teachers' enacted teaching and reflections on practice. *Journal of Science Education and Technology*, 29(3), 431–441. [https://doi.org/10.1007/s10956-020-](https://doi.org/10.1007/s10956-020-09828-6)

[09828-6](https://doi.org/10.1007/s10956-020-09828-6)

Webster, M. D. (2017). Philosophy of technology assumptions in educational technology leadership. *Journal of Educational Technology & Society*, 20(1), 25–36.

<https://eric.ed.gov/?id=EJ1125857>

- Wilkinson, J., Edwards-Groves, C., Grootenboer, P. & Kemmis, S. (2019). District offices fostering educational change through instructional leadership practices in Australian Catholic secondary schools. *Journal of Educational Administration*, 57(5), 501-518. <https://doi.org/10.1108/JEA-09-2018-0179>
- Woodward, L., & Hutchinson, A. (2018). The STAK model: Exploring personalized professional development for technology integration into instruction. *Journal of Technology & Teacher Education*, 26(4), 613–644.
<https://www.learntechlib.org/primary/p/182165/>
- Woulfin, S. L., & Rigby, J. (2017). Coaching for coherence: How instructional coaches lead change in the evaluation era. *Educational Researcher*, 46(6), 323–328.
<https://doi.org/10.3102/0013189X17725525>
- Xie, K., Kim, M. K., Cheng, S.-L., & Luthy, N. C. (2017). Teacher professional development through digital content evaluation. *Educational Technology Research and Development*, 65(4), 1067–1103. <https://doi.org/10.1007/s11423-017-9519-0>
- Xie, K., Nelson, M. J., Cheng, S. L., & Jiang, Z. (2021). Examining changes in teachers' perceptions of external and internal barriers in their integration of educational digital resources in K-12 classrooms. *Journal of Research on Technology in Education*, 1-26. <https://doi.org/10.1080/15391523.2021.1951404>
- Yalcin Arslan, F. (2019). The role of lesson study in teacher learning and professional development of EFL teachers in Turkey: A case study. *TESOL Journal*, 10(2).
<https://doi.org/10.1002/tesj.409>

- Yamak, M., & Chaaban, Y. (2022). Capitalising on professional capital in Lebanese schools post-pandemic. *International Journal of Educational Research Open*, 3. <http://doi.org/10.1016/j.ijedro.2022.100125>
- Young, D. S., & Casey, E. A. (2019). An examination of the sufficiency of small qualitative samples. *Social Work Research*, 43(1), 53–58. <http://doi.org/10.1093/swr/svy026>
- Young, J. R., Young, J., Hamilton, C., & Pratt, S. S. (2019). Evaluating the effects of professional development on urban mathematics teachers TPACK using confidence intervals. *REDIMAT - Journal of Research in Mathematics Education*, 8(3), 312–338. <http://doi.org/10.17583/redimat.2019.3065>
- Yu, C. & Franz, D.P. (2018). Visiting Technological Pedagogical and Content Knowledge (TPACK): Issues and challenges for teachers' professional development. In *Teacher training and professional development: Concepts, methodologies, tools, and applications* (pp. 1595-1622). IGI Global. <http://doi.org/10.4018/978-1-5225-5631-2.ch050>
- Yurtseven Avci, Z., O'Dwyer, L. M., & Lawson, J. (2020). Designing effective professional development for technology integration in schools. *Journal of Computer Assisted Learning*, 36(2), 160-177. <https://doi.org/10.1111/jcal.12394>
- Zarabanda, D. E. B. (2019). ICT and its purpose in the pedagogical practice. *Research in social sciences and technology*, 4(2), 83-95. <https://doi.org/10.46303/ressat.04.02.6>

- Zhang, S., Liu, Q., & Cai, Z. (2019). Exploring primary school teachers' technological pedagogical content knowledge (TPACK) in online collaborative discourse: An epistemic network analysis. *British Journal of Educational Technology*, 50(6), 3437–3455. <https://doi.org/10.1111/bjet.12751>
- Zhong, L. (2017). Indicators of digital leadership in the context of K-12 education. *Journal of Educational Technology Development and Exchange (JETDE)*, 10(1), 3. <http://doi.org/10.18785/jetde.1001.03>
- Zimmer, W. K., & Matthews, S. D. (2022). A virtual coaching model of professional development to increase teachers' digital learning competencies. *Teaching and Teacher Education*, 109. <https://doi.org/10.1016/j.tate.2021.103544>
- Zinger, D., Naranjo, A., Amador, I., Gilbertson, N., & Warschauer, M. (2017). A design-based research approach to improving professional development and teacher knowledge: The case of the Smithsonian learning lab. *Contemporary Issues in Technology and Teacher Education (CITE Journal)*, 17(3). <https://www.learntechlib.org/primary/p/178235/>.

Appendix A: The Project

Professional Development for Primary Teachers of QEC 64
Title: Technology Integration Models for Effective Lesson Delivery
Day 1

- 8:30 Registration and Introductions
- Table assignments
 - Resource packets: sticky notes, anchor charts, engage, enhance, and extend cards, Triple E Framework lesson plan rubric, Symbaloo with available links to sites used, anchor charts.
- 8:45 Icebreaker: Using Padlet, share two things they hope to accomplish by participating in the training sessions.
- 9:00 Session objectives shared via Google Slides
- Understand the SAMR and Triple-E frameworks for technology instruction.
 - Develop digital teaching skills for enhancing student learning.
 - Model and implement various digital tools in lesson planning.
 - Identify suitable digital tools aligned with content areas.
- 10:00 **Session 1: Models for Technology Instruction and Integration**
- Question for discussion: How do you know when you are integrating technology effectively in your lessons? Document responses on sticky notes. Post under 'tech models anchor chart.'
 - Watch the YouTube video on the SAMR model
<https://www.youtube.com/watch?v=ZQTx2UQQvbU>
 - Share how they may apply the SAMR to improve an existing activity or develop an activity of their choice at their tables. Be prepared to present the activity ideas to the whole group.
- 10: 15 Snack and Bathroom Break
- 10: 30 **Session 1: Models for Technology Instruction and Integration Cont'd**
- Present their activity developed to reflect the prongs of the SAMR model. Discuss how the activity matches the prongs of SAMR.
 - Using the words 'engage,' 'enhance,' 'extend,' how would you describe the learning goals presented in the activity earlier?
 - Watch Triple E Framework
<https://www.youtube.com/watch?v=ySAhSuSQItE>
 - Using the Triple E Framework lesson plan rubric (Kolb, 2020), go back to the SAMR activity presented and assess how the learning goals align with the Triple E Framework. Adjust to match the framework. Small group discussion on the adjustment and whole group sharing.

11:30 Session 2: ISTE Standards for Teachers

- Watch the ISTE standards for teachers
<https://www.youtube.com/watch?v=Bc-CyIUv2IA>
 - Self-reflection: Use the ISTE standards document to guide your reflection.
 - How do you compare to the ISTE standards for teachers?
 - What are you already doing?
 - What do you need to change?
 - Write two standards under ISTE Standards “Keep” and “Adapt” using mentee.com link provided.

12: 00 Lunch**1:00 Session 3: Technology and the Mathematics Classroom**

- Teachers will share digital tools that they use in the mathematics classroom.
- Introduce free mathematics sites/tools with video embedded mathematics lessons
 - Zearn
 - Khan Academy
 - Active Inspire
 - ABCYa math tools and games
 - EdPuzzle
 - Cognition math
 - Teachley
 - CK-12
- Discuss the benefits to teachers and students
 - Self-paced
 - Facilitate differentiation
 - Assessment
 - Whole group
- At your table, explore the assigned tool and say how you could use it to develop a mathematics concept. Remember to apply SAMR and the Triple E Framework to develop the lesson.
- Present activity to the whole group.

2:45 Plenary and Evaluation

Day 2
8:30 Registration

- Resource packets: sticky notes, anchor charts, engage, enhance, and extend cards, Triple E Framework lesson plan rubric, Symbaloo with available links to sites used.

- 8:45 Icebreaker: Quick survey via Poll Everywhere, “What resonated the most about yesterday’s sessions: math tools, Triple E, SAMR, ISTE, nothing. Discuss the results.
- 9:00 Review the session objectives shared via Google Slides
- Understand the SAMR and Triple-E frameworks for technology instruction.
 - Develop digital teaching skills for enhancing student learning.
 - Model and implement various digital tools in lesson planning.
 - Identify appropriate digital tools aligned with content areas.
- 10:00 **Session 4: Technology Tools in the Language Arts Classroom**
- Teachers will share digital tools that they use for the language arts classroom.
 - Introduce free language arts sites/tools for reading and language development
 - Flocabulary
 - Active Inspire
 - Freckle
 - PearDeck
 - Listenwise
 - Readworks
 - NearPod
 - Epic
 - Sora
 - Discuss the benefits to teachers and students
 - Self-paced
 - Small groups
 - Teacher-directed
 - Facilitate differentiation
 - Assessment
 - Whole group
 - At your table, explore the assigned tool. Explain how you would use it to facilitate a self-paced differentiated lesson for your class on a particular topic. Remember to apply SAMR and the Triple E Framework to develop the activity.
 - Present activity to the whole group.
- 11:00 **Session 5: Technology Tools in the Science and Social Studies Classroom**
- Teachers will share digital tools that they use for the science/social studies classroom.
 - Introduce free social studies/science sites/tools for reading and language development.
 - Flocabulary
 - Mystery Science
 - Ed Puzzle

- CK-12
 - NearPod
 - Legends of Learning
 - National Geographic
 - Newsela
- Discuss the benefits to teachers and students
 - Self-paced
 - Small groups
 - Teacher-directed
 - Facilitate differentiation
 - Assessment
 - Whole group
 - Independent work
- At your table, explore the assigned tool. Explain how you would use it to facilitate a whole group lesson for your class on a particular topic. Remember to apply SAMR and the Triple E Framework to develop the activity.
- Present their activities to the whole group.

12:00 Lunch Break

1: 00 **Session 6: Technology Tools for Students' Assessment**

- Teachers will share digital tools that they use for student assessment in the classroom.
- Introduce free assessment sites/tools
 - Kami
 - Edulastic
 - Quizalize
 - Goformative
 - Poll Everywhere
 - Class Flow
 - FlipGrid
 - Padlet
 - GradeCam
- Discuss the benefits to teachers and students
 - Immediate feedback
 - Self-paced
 - Teacher-directed
 - Formative assessment
 - Whole group
 - Written responses

- At your table, explore the assigned tool. Develop an assessment activity for a lesson activity completed today. Be prepared to share the link for other participants to participate. Quickly complete analysis of the results and next steps.

2: 00 Session 7: Technology Tools for Communication and Classroom Management and Teacher Resources

- Teachers will share digital tools that they use for stakeholder communication and classroom management.
- Introduce free tools for communication and classroom management.
 - ClassDojo
 - KiNVO
 - ClassCraft
 - PBS.org
 - Remind
- Discuss the benefits to teachers and students
 - Classroom management
 - Parent and school-wide communication
 - Facilitate positive behavior
 - Easy access to teachers and parents
- Networking and Teacher Resources
 - Symbaloo
 - Open up resources
 - Digipals
 - EdCite
 - Cube for teachers
 - Edufied LMS for teachers
 - Google Drive
 - Microsoft Teams

3: 00 Plenary and Evaluation

Professional Development for Primary Principals of QEC 64

Title: Principal Leadership in a Digital School

Day 3

- 8: 30 Registration and Introductions**
- Table assignments
 - Resource packets: pens, notepads, TPACK checklist, TPACK examples cards, stick notes, lesson plan, Symbaloo with all resources used in the session, tool selection checklist, lesson checklist, ISTE standards for teachers and principals.
- 8:45 Icebreaker: Check-in via Quizziz – How do you feel about today's PD?**

Five Question check in with principals on how they are feeling about the sessions today.

A quick discussion of overall feelings

9:00 Objectives shared via Google Slide

- Increased repertoire of strategies to develop staff competence in using digital tools
- Develop forms of support for technology integration
- Apply instructional models to monitoring and supervision of technology instruction.
- Conduct self-assessment using ISTE Standards for principals.
- Utilize appropriate checklists for lesson observation and digital tool selection.

9:15 **Session 1: TPACK and its implications for teaching and learning**

- Watch video about TPACK via YouTube
https://www.youtube.com/watch?v=7dtj91L_wq4
- Small group discussion – what does TPACK mean to you?
 - Share out loud
- Sort the card descriptions into their groups: CK, TK, PK, PCK, TPK, TCK. Share.
- TPACK in action: https://www.youtube.com/watch?v=_a90EvWfoLU
- How do you rate your teachers' TPACK? Using the checklist, principals will rate their teachers' TPACK and reflect (Rosenberg, 2012).
- Whole group discussion? How can principals develop their teachers' TPACK?

10: 00 Snack and Bathroom Break

10: 15 **Session 2: Establishing a Supportive Learning Environment for Teachers**

- Share with your group how you support your teachers' technology integration skills. Write your answers on sticky notes and stick them to the support wall.
- Best practices for teacher support: *Quick Reads and Watch*
You will read the two assigned articles at your table and then share how they can use each strategy to develop more robust support for your teachers.
 - Grade/School-level Professional Learning Communities (PLCs) (DuFour, 2004)
 - Digital Learning Coaches (DLCs) (Hockenberry, 2021).
<https://www.youtube.com/watch?v=JXH8af2C5UU> (Start at 18:13)
 - Digital Mentors (Schuler, 2019).
 - Peer Coaching <https://betterlesson.com/learning-experiences/instructional-coaching>

- In-House PDs <https://www.iacet.org/news/iacet-blog/blog-articles/7-elements-of-effective-professional-development1/>
- Modeling
- Teacher Collaboration <https://betterlesson.com/professional-development/instructional-leadership/collaborative-professional-learning>
- Explore a tool
- Common Planning
- Which of the supports do you plan to use? Why?
 - The way forward: How will teachers develop skills for effective teaching with digital technology?
 - What PDs have you provided, and what additional will be done to support technology integration?
 - Have you identified a plan? What models will it include?
 - What resources will you need to support ongoing professional PD among your teachers? (Digital Promise, n.d.).

11:00 Session 3: Identifying Tools and Resources to Support Teaching with Digital Tools

- Reflection on the digital tools used within your school. Share with your colleagues your reflection.
 - What digital tools do your teachers use?
 - How were they selected?
 - Are they standardized across the school?
 - What is your school policy about selecting and acquiring digital tools?
 - Watch – Using needs assessment and data to identify digital needs https://youtu.be/y4dusYuqSK0?list=PL_0qMZxvbX5pd5dgbSXXLo9OjQEfX0e2f
- Needs Assessment: Find products that will fill that need <https://youtu.be/HHdlSyU7hUk>
- Use the needs assessment checklist to see where you are and your priority for tool selection for school-wide use (Lindberg et al., 2019).

11: 45 Lunch Break

12: 45 Session 4: The ISTE Guidelines for Teachers and Principals

- Watch the ISTE standards for teachers <https://www.youtube.com/watch?v=Bc-CylUv2lA>
 - Turn and talk; how are your teachers doing? Use the ISTE standards document to guide your discussion
- Watch the ISTE standards for administrators <https://www.youtube.com/watch?v=99qORAUcXLE>

- Read the ISTE Standards document.
 - Self-reflection how are you doing? Use the ISTE standards document to guide your reflection. What are you already doing? What can you improve?
 - Write your strength and area of improvement on a sticky note and stick them to our ISTE wall.
 - How do you plan to adopt the standards?
- Whole group discussion on the ISTE standards and how they can be used to develop digital proficiency among teachers and principals.

1: 45 **Session 5: What do you look for in a lesson plan/delivery?**

- Quick review of the SAMR and Triple E Framework models
- Putting it into practice: Discuss this tech integration tool checklist (Robb et al., 2013).
- Can you identify elements of the SAMR/Triple E Framework?
- Applying what you learned about the models and with the checklist provided:
 - Examine this lesson plan and say how it may or may not match up to any models.
 - How would you guide a teacher who presents this lesson plan?
 - Share your evaluation of the lesson plan and next steps for teacher consultation.

2:45 Plenary and Evaluation Form

Follow-Up Plan to QEC 64 Teachers and Principals PDs

The presenters will follow up with each of the 11 schools with participating teachers and principals. The main goal of the follow-up is to ensure the knowledge is transferred to teaching practices and implementation of teacher support is successful (Hiew & Murray, 2021) and to foster a supportive environment as a follow-up to teacher training (Edwards et al., 2019).

There will be two follow-up visits conducted; one will be within six months and the other at the end of the first year. Other follow-up visits will be determined by needs as assessed through the first two follow-up visits (Edwards et al., 2019).

The follow-up strategies will serve three functions, supportive, formative evaluation, and continuous training to see how well teachers are applying the strategy (Arslan et al., 2020). Each visit will be guided by the activities organized according to the functions highlighted.

▪ **Supportive**

- Lesson observation and support: Observe teacher lesson delivery in selected classes to use the tools and offer support to use them where needed.

- Progress meetings: meet with grade-level chairs/principals for progress on implementing the tools and any other required supports.
- Demonstration lessons: conduct demonstration lessons with an existing lesson plan and incorporate the tools as listed.
- **Formative evaluation**
 - Self-evaluation forms: ask teachers to complete a self-evaluation form on their progress with the digital tools following the PD
 - Lesson observations: gather if knowledge is applied to using the tools.
 - Teacher feedback: conversations with teachers about their use of tools.
 - Principal feedback: what forms of support are employed in the school
- **Training**
 - Lesson observations: identify additional areas for training
 - Modeling: model the use of a tool through PLC or grade-level meeting
 - Coaching: provide individual support to selected teachers in delivering a lesson using the tools highlighted in the lesson plan.

References

- Arslan, S., Mirici, İ. H., & Öz, H. (2020). Implementation and evaluation of an EFL teacher training program for non-formal education settings. *Ilkogretim Online*, 19(3).
- Better Lesson. (2022). *Collaborative professional learning* [Video file].
<https://betterlesson.com/professional-development/instructional-leadership/collaborative-professional-learning>
- Better Lesson. (2022). *Instructional and executive coaching from education professionals*. <https://betterlesson.com/learning-experiences/instructional-coaching>
- Common Sense Education. (2015, July 12). *How to apply the SAMR model with Ruben Puentedura* [Video file]. YouTube.
<https://www.youtube.com/watch?v=ZQTx2UQQvbU>

Digital Promise. (2017, August 11). *Edtech pilot framework: Identify need 3*

[Video file]. YouTube.

https://youtu.be/y4dusYuqSK0?list=PL_0qMZxvbX5pd5dgbSXXLo9OjQEfX0e2f

Digital Promise. (2018, July 17). *Edtech pilot framework: Discover & select*

[Video file]. YouTube. <https://youtu.be/HHdlSyU7hUk>

Digital Promise. (n.d.). Providing professional development for teachers.

<https://digitalpromise.org/online-learning/digital-learning-playbook/providing-professional-development-for-teachers/>

DuFour, R. (2004). “What is a professional learning community”?

<https://www.ascd.org/el/articles/what-is-a-professional-learning-community>

Dyknow. (n.d.). *10 ways coaches can support teachers with tech integration* [Video

file]. YouTube. <https://www.youtube.com/watch?v=JXH8af2C5UU>

Edwards, L. C., Bryant, A. S., Morgan, K., Cooper, S. M., Jones, A. M., & Keegan,

R. J. (2019). A professional development program to enhance primary

school teachers’ knowledge and operationalization of physical

literacy. *Journal of Teaching in Physical Education*, 38(2), 126-135.

<https://doi.org/10.1123/jtpe.2018-0275>

Flores, A. (2013, June 23). *TPACK example* [Video file]. YouTube.

<https://www.youtube.com/watch?v=a90EvWfoLU>

Granowsky, E. (2017, Sept. 18). *7 Elements of effective professional development*.

<https://www.iacet.org/news/iacet-blog/blog-articles/7-elements-of-effective-professional-development1/>

Hiew, W., & Murray, J. (2021). Enhancing Huber's evaluation framework for teacher professional development programme. *Professional Development in Education*, 1-15.

Hockenberry, L. (2021). The role of a digital learning coach.

<https://blog.teachboost.com/the-role-of-a-digital-learning-coach>

ISTE. (2022). *ISTE standards: Education leaders*.

<https://www.iste.org/standards/iste-standards-for-education-leaders>

ISTE. (n.d.). *ISTE standards for education leaders / Foster a culture of innovation*.

[Video file]. YouTube.

<https://www.youtube.com/watch?v=99qORAUcXLE>

Kolb, L. (2017, April 19). *Triple E Framework introduction* [Video file]. YouTube.

<https://www.youtube.com/watch?v=ySAhSuSQItE>

Kolb, L. (2020). Triple E printable rubric.

<https://www.tripleeframework.com/triple-e-printable-rubric-for-lesson-evaluation.html>.

Lee, K. (2018, March 25). *ISTE for educators* [Video file]. YouTube.

<https://www.youtube.com/watch?v=Bc-CyIUv2IA>

Lindberg, S., Strong, J., Lefeber, J. Gould, K., & Hodgett, J. (2019). Digital tool selection checklist and evaluation rubric.

<https://wiresources.dpi.wi.gov/authoring/450-digital-tool-selection-checklist-and-evaluation-ru>

Robb, M., Catalano, R., Smith, T., Polojac, S., Figlar, M., Minzenberg, B., & Schomburg, R. (2013). Checklist for identifying exemplary uses of technology and interactive media for early learning.

https://static.virtuallabschool.org/atmt/learning-env/TC.Len_4.Materials_A4.Checklist-Exemplary-Uses.pdf

Rosenberg, R. (2012). Assessing teachers TPACK. <https://matt-koehler.com/tpack2/assessing-teachers-tpack/>

Schuler, J. (2019). The benefits of mentors in instructional coaching.

<https://digitalpromise.org/2019/04/24/the-benefits-of-mentors-in-instructional-coaching/>

Updated. (2021, April 19). *TPACK: Technological Pedagogical Content*

Knowledge framework [Video file]. YouTube.

https://www.youtube.com/watch?v=7dtj91L_wq4

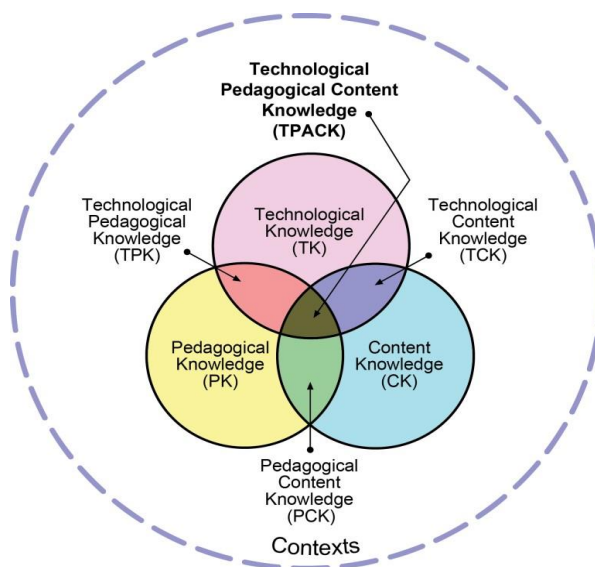
Appendix B: Permission to Use TPACK Image

(<http://matt-koehler.com/tpack2/>)



Using the TPACK Image

Published on May 11, 2011 (<http://matt-koehler.com/tpack2/using-the-tpack-image/>) by mkoehler (<http://mattkoehler.com/tpack2/author/mkoehler/>)



(<http://matt-koehler.com/tpack2/wp-content/uploads/2013/08/TPACK-new.png>)

The TPACK Image (rights free). Read below to learn how to use the image in your own works. Right click to download the high-resolution version of this image.

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If those conditions are met, there is no need to contact tpack.org, Matthew Koehler, or Punya Mishra. We hereby grant permission to use the image under the above stipulations.

Appendix C: Letter Seeking Approval to Conduct Study

Letter to the Ministry of Education

Mrs. Vivienne Johnson
 Senior Director Planning & Development Division
 The Ministry of Education Youth & Information
 2-4 Heroes Circle
 Central Kingston.

Dear Mrs. Johnson,

Re: Request to Conduct Doctoral Study in [REDACTED]

I am Audrea Samuels, a doctoral candidate at Walden University in the Education Doctorate Degree program in Curriculum, Instruction, and Assessment. I hereby seek your approval to conduct my doctoral study on “Principals’ perspectives on integrating digital tools in the Jamaican primary curriculum.” The purpose of the qualitative study is to explore the principals’ perceptions about leading teachers to use digital tools in curriculum delivery. I will seek to understand what the perceived challenges are and supports leading their teachers to utilize digital tools and the organizational supports needed for the utilization of digital tools in instruction by primary teachers towards adoption.

I would recruit primary school principals as participants from Quality Education Circle [REDACTED]. The study will be conducted between January – March 2022. I will conduct individual semistructured interviews with the participants that will last for approximately 60 minutes and will be scheduled outside of non-instructional hours.

I will abide by Walden University IRB protocols to maintain confidentiality and use pseudonyms for the participants, the QEC, and the schools throughout data collection and analysis. Additionally, I will use the informed consent process with the participants, safeguard all data collected in a locked safe and on a password-protected device. No participant will be identified in the results as only pooled results will be published. There is no foreseeable harm that will arise from being involved in the study, and there will be costs accrued on the part of the Ministry of Education, the participants, or from the school.

Your permission to conduct this study will be greatly appreciated. If you have any questions concerning this project study, please contact me at [REDACTED] or call me at [REDACTED]. In addition, you can contact Walden University at irb@mail.waldenu.edu.

Thank you,
 Audrea - Principal researcher

Appendix D: Approval From the Ministry of Education Youth & Information to Conduct
Study



MINISTRY OF EDUCATION,
YOUTH & INFORMATION

Reply or subsequent reference to this communication should be made to the Permanent Secretary and the following reference quoted:

2-4 National Heroes Circle
Kingston 4, Jamaica
Tel. 876-612-5840
Fax: 876-948-7755
www.moe.gov.jm

January 4, 2022

Ms. Audrea Samuels
Principal Researcher
Walden University
100 S Washington Ave Suite 1210,
Minneapolis, MN 55401, USA

Dear Ms. Samuels:

Re: Permission to Conduct Research

This serves to acknowledge receipt of your correspondence requesting permission to conduct a research project on "*Principals Perspectives on Integrating Digital Tools in the Jamaica Curriculum.*" The Ministry has approved this request on the condition that the administration of the selected school is in agreement. Approval is also granted with the understanding that confidentiality and anonymity are maintained.

The Ministry will be notifying the administration of the institution of its approval for the research to be conducted and henceforth you will be treating with the institution.

Kindly acquaint yourself with the guidelines for conducting research in the Ministry's institutions which can be found at www.moey.gov.jm under "Information Resources".

Sincerely,

Vivienne Johnson (Mrs.)
Senior Director
Planning and Development Division
for Permanent Secretary

Appendix E: Principal/Vice Principal Invitation Letter

Principal Invitation to Participate Letter

Dear Principal/Vice-principal,

My name is Audrea Samuels, a doctoral candidate at Walden University in the Education Doctorate Degree program in Curriculum, Instruction, and Assessment. I am conducting research on the “Principals’ perspectives on integrating digital tools in the Jamaican primary curriculum.” I would like to invite you to participate in my project study, given your connection as a principal [REDACTED] who could provide insights into the challenges and supports needed for the utilization of digital tools.

The purpose of the qualitative study is to explore the principals’ perceptions about leading teachers to use digital tools in curriculum delivery. I will seek to understand what the perceived challenges are and supports leading their teachers to utilize digital tools and the resources required to support teachers towards adoption.

Since you may know me, please understand that you are not obligated to participate in my study. However, I would be appreciative if you consider being part of my study that will provide information about technological practices and is important to provide an in-depth understanding of the utilization of digital tools in instruction. Your responses will be treated with the strictest of confidence.

Should you choose to participate, you will be asked to:

- sign and return the consent form and complete the participant information sheet that asks for your name, school, years of principalship, and gender;
- participate in a one-on-one interview lasting no longer than 60-minutes via Zoom during a non-instructional time that will focus on your views about the utilization of digital tools at the primary level;
- spend an hour, if you choose, to read a copy of the summarized interview to confirm that the document accurately depicts your comments and if not, provide me with the corrections or clarifications;
- spend an hour to read the draft of the 1-2-page summary report to provide feedback on the analysis and accuracy of your data.

If you have any questions concerning this project study, please contact me at [REDACTED] or call me at [REDACTED] or via Whatsapp text or call at [REDACTED]. In addition, you can contact Walden University at irb@mail.waldenu.edu.

If you would like to participate, please respond to this email within the next 48 hours.

Thank you,

Audrea Samuels- Principal researcher

Appendix F: Participant Information Sheet

Principal's Information Sheet

Dear Principal/Vice-principal:

Thank you for taking the first step towards participating in my research study.

This form collects data about you and your school. Please complete and return it within 48 hours. Thank you.

Name: _____

Gender: _____

School: _____

Years being a principal/vice-principal: _____

Student enrolment: _____

Teacher enrolment: _____

Contact number: _____

Email contact: _____

Appendix G: Certificate of Completion of Ethics Training



Completion Date 22-Dec-2021
Expiration Date N/A
Record ID 46415700

This is to certify that:

Audrea Samuels

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Student's
(Curriculum Group)
Doctoral Student Researchers
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Walden University



Verify at www.citiprogram.org/verify/?w14a3b8e9-6ea6-46fd-b6c8-2852ebade5f8-46415700

Appendix H: Semistructured Interview Protocol

Principals' Interview Protocol

Date _____

School/Principal ID _____

Opening Remarks

Thank you for volunteering to be part of my project study. I am Audrea Samuels, and I have worked in this QEC for about eight years. I am living in the USA and working on my Doctorate in Curriculum, Instruction, and Assessment at Walden University. This interview should last about 60 minutes, and I will, with your permission, be recording it so that your exact words can be transcribed verbatim after this interview is over.

The purpose of this study is to explore how you perceive the principals' perceptions about the utilization of digital tools at the primary level, the challenges experienced, and the support systems in place.

The findings will be published, and a 1-2-page summary will be presented to you and other stakeholder groups.

You have already signed the consent form to participate in this study. I would like to go over a few important points before we begin:

- You may excuse yourself from this interview at any time and for any reason.
- You may withdraw from this study at any time.
- I will not use your name or any identifying characteristics in my notes, conversations, or publications related to this study. You will be identified by a pseudonym.
- I will provide you with a draft of the 1-2-page summary so that you can let me know if you have any comments on the content and accuracy.
- Do you have any questions before we get started?

I would now like to start the actual interview, and if it is OK with you, I would like to start the recording. Do I have your permission to record the interview?

Research Question 1: What are the perceived challenges faced by primary school principals in leading their teachers to utilize digital tools in the delivery of the primary curriculum?		
Principals' Interview Questions		
	Author	
1	How do you view the use of technology for instruction? Probe: In what ways are ways is technology integration used in instruction in your school? Probe: How would you describe your teachers' TPACK in the classroom?	Persaud (2006)

2	What do you believe are barriers to integration Information Communication Technology (ICT) or technology into the classroom? Probe: Why do you believe _____ is a barrier, or can you give some examples? Probe: What would you say are the top three barriers to the use of technology in the classroom?	Presby (2017)
3	Have you found any particular strategies helpful in reducing these barriers? Probe: Tell me more about that strategy? Probe: Are these strategies you found helpful for increasing tech areas?	Presby (2017)
4	When you think of your job as a principal, what are some problems you have encountered with being a technology leader? Probe: What support do you need to lead technology integration in your school?	Edwards (2020)
5	What do you believe is the hardest struggle of being a technology leader? Probe: What obstacles exist that prevent support for the implementation of instructional technology?	Edwards (2020)
Research Question 2: What do principals perceive as organizational supports needed for the utilization of digital tools in instruction by primary teachers?		
6	In what ways do you believe you support the integration of technology in your school/district? That is, using technology as a tool to support instruction, rather than the teaching of the technology as a separate subject? Probe: Please give an example of how you support teachers in integration? Probe: How do you use the knowledge of TPACK to support your teachers?	Persaud (2006)
7	What kind of support do teachers need when integrating technology into their teaching?	Persaud (2006)
8	What structures at the building and district levels are necessary for teachers to effectively integrate technology into teaching? Probe: What specifically does the district do to support teachers in technology integration?	Persaud (2006)
9	What are some of the most effective strategies for reducing barriers to ICT integration and/or increasing active learning? Probe: Why do you think these strategies were effective?	Presby (2017)
10	What would be the most effective way to make sure a principal acquires the needed training to be an effective technology leader?	Edwards (2020)

Closing

Do you have any additional information that you would like to share or any questions?
Thank you for volunteering to be a participant in my study. You have been very helpful.

Appendix I: Permission to Use Edwards's (2020) Questions for Interview Protocol

From: Leon Edwards
Sent: Monday, October 4, 2021 8:43 AM
To: Audrea Samuels
Subject: Re: Permission to Use Interview Instrument in Doctoral Research

Good morning,

Yes, of course you can use some of the questions. Your topic sounds very interesting. I will be looking forward to seeing you have completed your research for me to read your study. Are you teaching or an administrator in Jamaica?

On Sat, Oct 2, 2021 at 12:42 PM Audrea Samuels [REDACTED] wrote:

Mr. Edwards,

I hope that this email finds you well. I am Audrea Samuels, a doctoral student at Walden University enrolled in the Curriculum, Instruction, and Assessment program. I will be researching the principals' perspectives on Integrating digital tools in the Jamaican primary curriculum to understand the challenges experienced and the supports required to have greater levels of integration. During my research, I found your dissertation, "How Principals Learn to Be Technology Leaders: A Critical Incident Qualitative Study," which contains an interview instrument you used with principals.

I want to select some questions from your instrument to complete the interview protocol for my study. Would you please let me know how I can get permission to use the instrument? Also, let me know if you have any questions or comments. Your research positively added to the knowledge base in technological leadership, and I will be following your work.

Sincerely yours,

[Audrea J. Samuels](#)

"There is no way of knowing what lies ahead unless you truly take a step forward."

Sent from [Mail for Windows](#)

Appendix J: Permission to Use Presby's (2017) Questions for Interview Protocol

From: Bob Presby
Sent: Tuesday, October 5, 2021 7:25 PM
To: Audrea Samuels
Subject: Re: Permission to Use Interview Instrument

Hi Audrea

It was nice to speak with you today. Yes, please feel free to use any part of the instrument. Wishing you good luck in your research.

Bob

On Tue, Oct 5, 2021 at 4:58 PM Audrea Samuels <[REDACTED]> wrote:

Dr. Presby,

It was great connecting with you this evening. Again, I am Audrea Samuels, a doctoral student at Walden University enrolled in the Curriculum, Instruction, and Assessment program. I will be researching the principals' perspectives on Integrating digital tools in the Jamaican primary curriculum to understand the challenges experienced and the supports required to have greater levels of integration. During my research, I found your dissertation "Barriers to Reducing the Digital-Use Divide as Perceived by Middle School Principals," which contains an interview instrument you used with principals.

I want to select some questions from your instrument to complete the interview protocol in my study. I therefore, seek your permission to use the instrument. Let me know if you have any questions or comments. Your research has undoubtedly added to the body of literature in the field of technology integration and leadership.

I look forward to reading more of your work contribution.

Audrea J. Samuels

"There is no way of knowing what lies ahead unless you truly take a step forward."

Appendix K: Permission to Use Persaud's (2006) Questions for Interview Protocol

Sent: Monday, October 18, 2021 5:52 PM
To: Audrea Samuels
Subject: Re: Permission to Use Interview Protocol

On October 16, 2021 at 10:49 AM Audrea Samuels <[REDACTED]> wrote:

Hi Dr. Persaud,

I hope that you are well. I am Audrea Samuels, a doctoral student at Walden University enrolled in the Curriculum, Instruction, and Assessment program. I will be researching the principals' perspectives on integrating digital tools in the Jamaican primary curriculum to understand the challenges experienced and the supports required to have greater levels of integration. During my research, I found your dissertation "School Administrators' Perspective on Their Leadership Role in Technology Integration," which contains the interview instrument you used with principals.

I want to select some questions from your instrument to complete the interview protocol in my study. I therefore, seek your permission to use some of the questions from the instrument. Let me know if you have any questions or comments. I learned a lot from reading your research.

I look forward to favorable response.

Audrea J. Samuels

"There is no way of knowing what lies ahead unless you truly take a step forward."

Sent from Mail for Windows

From: Bheam
Persaud

Sent: October 18,

2021

To: Audrea

Samuels

Subject: Re: Permission

You have permission to use the questions developed for the study, School Administrator's Perspective on their Leadership Role in Technology Integration, for your interview protocol.

Good luck with your dissertation.

Dr. Bheam Persaud

Appendix L: Sample Transcript Member Checking

344 the teacher has 20 students on Google Meet right. And they are there and they talk about X, Y, Z,
 345 and probably go on the Jam Board and do something akin to what they do in a Audrea Samuels: I
 346 understand. be normal classroom. How can a teacher quickly float in from another app? What
 347 can be there with it to enhance teaching learning? Right? These are the things that needs to be
 348 looked at. Right one teacher can do it you know. But I would have to find that teacher and say
 349 come we are doing a workshop. But this is in only my school what is being done in school X?
 350 Do they have one and two teachers there who can do the same thing but that is still a weakness
 351 because it's dependent on individual schools, to find nothing is wrong with that. But is there a
 352 plan from central office from regional office within the QEC to say all of this must be done like
 353 this? Because the technological space where teaching learning is concerned is supposed to be a
 354 fully organized one. Ethics and all, you understand me that should govern the space so that
 355 whatever outcome that you're looking for, it can be realized and you can tick off say, this is what
 356 is expected, not just an ad hoc understanding of oh that's what we get from it. Yeah.

357 **Audrea Samuels:** So if I, if I may just say so basically, you're saying specifically, the regional
 358 office needs to provide resources for the schools, and there has to be sustained training for the
 359 teachers because there's the assumption that teachers having this technology should be able to,
 360 but they need, you have teachers who need a better strengthening of how to integrate technology.

361 **Prin01:** Yes, yes, definitely.

362 **Audrea Samuels:** All right, um, what would be the most effective way to make sure that our
 363 principal acquires?

364 **Prin01:** What?

365

10

366 **Audrea Samuels:** What would be the most effective way to make sure that a principal acquires
 367 the needed training to be an effective technology leader? You mentioned you mentioned training
 368 before for teacher but I've never heard you mention training for principals. Have you ever had
 369 training for principals that would make you an effective leader?

370 **Prin01:** Hahahahaha Yes, within the technology area you are speaking, because because the train
 371 training for principals, in the use of technology, if I remember correctly, I hope I'm not wrong.
 372 During the periods of time, unless the principals themselves within their own qualification has
 373 been exposed to those trainings, that's what they depend on. But I cannot remember more than
 374 one that there was any specific efforts to say incorporate principals in a continuous technical,
 375 technological training program. I cannot remember that. There you go again, the assumption is
 376 made, that the leader supposed to know all things and be an expert in all the things, right. These
 377 are things that are foisted up with expectation and you cannot continue like this. I'm sorry to be
 378 getting a little kicks. You understand me? It doesn't make sense. Because you're going to have
 379 some schools in a certain area and then at the end of the year, you're going to certain schools will
 380 be put up because they excel. Right. I think that there should be a little level, at least a near
 381 leveling of the playing field with that policy guideline, that those who are supposed to be trained
 382 within the system, the implementers, the principal, the teachers, even the parents also, all the
 383 stakeholders there are. Because this is what exists now, and it will not change. Whatever format
 384 they want to come up with. That's their job. They are getting paid for it already.

385

386 **Audrea Samuels:** All right, so understanding your answer to this question, you're basically
 387 saying that there has not been any targeted training for principals. The only training most of you
 388 are you have been exposed is within your own training your own personal certification. Right?

Appendix M: Sample Transcript Summary

Principal's/Vice-Principal's Interview Summary

Study-Principals' Perspectives on Integrating Digital Tools in the Jamaican Primary Curriculum

Participant: 11

Interview Date: February 20, 2022.

View on the use of technology for instruction?

The world itself is being run by technology. At the end of the day, it is not a bad thing when that same technology starts at the schools, start with students. That is what they are going to interact with, right through their lifetime, so technology inside the classroom here is a big plus.

Ways technology integration used in instruction in your school.

YouTube is one such content, one such medium, so is the Google Classroom which has become critical. The ministry has provided a number of sites and stuff that teachers can go into to access this information.

Teachers' Technological, Pedagogical, and Content Knowledge (TPACK) in the classroom? Some teachers are more technologically proficient than others, especially the younger set. I have to consider all my teachers being good. And their pedagogical skill minus the technology aspect of things. As it relates to integrating the technological aspect things, I think they need or most of them need a lot more training; they are just managing.

Barriers to integration Information Communication Technology (ICT) or technology into the classroom.

Accessibility to the internet, lack of devices, the competencies of some of the teachers.

Top three barriers to the use of technology in the classroom

Connectivity, devices, and teachers' competencies.

Strategies helpful in reducing barriers.

Workshops have been very helpful with the competencies, ensure that teachers attend ministry workshop, managed to get internet at school but it is slow, sought sponsorship for students' tablets.

Helpful for increasing tech areas.

now the workshops and everything it has made the teachers dem more active, more rounded, students now able to access the Google classroom because they have devices.

Problems encountered with being a technology leader

You see, I am not technologically inclined at all especially before Covid and would ask someone to do technology related tasks, but COVID forced me to learn.

Support needed to lead technology integration in your school

I am aware of the things that they need to know or they need to do as it relates to technology, but if they have problems accessing something or to use something I wouldn't be able to help them in that aspect of things.

Hardest struggle of being a technology leader

Being competent, so that they can know what is required of their staff, and so they too can be able to model it or know how to do it.

How you support the integration of technology in your school/QEC/Region.

Provided training for teachers and ensuring that the mandate of the ministry is followed. Ensured that the integration of the technology is always present in the lessons and attended the ministry workshops.

Use of the knowledge of TPACK to support teachers.

When teachers have particular strengths in particular areas, the teachers knowledge of whatever area of technology they are good, I use the teachers to have a development session.

Support that teachers need when integrating technology into their teaching.

If teacher knows the thing and know how to deliver the thing, physical equipment, and more digital tools.

Structures at the building and regional levels necessary for teachers to effectively integrate technology into teaching.

The internet is necessary, the physical tools are necessary, the buy-in from stakeholders, in this case, the parents.

Specific QEC/District support of teachers in technology integration.

The region has had their virtual workshops to help in the competencies in subjects such as mathematics or language arts.

Effective strategies for reducing barriers to ICT integration and/or increasing active learning?

Competencies of teachers, teachers must be comfortable using technology, the buy-in of the parents

Most effective way to make sure a principal acquires the needed training to be an effective technology leader

Required relevant workshops from a QEC level to develop principals' competencies.

Appendix N: Researcher Notes

*TMT - Students + train
Role -
Plan lessons for teacher
Keep going
Trust the school*

See your staff (not equipped with tools to drive teaching + learning? Tools, skills, mindset)

5	What do you believe is the hardest struggle of being a technology leader? Probe: What obstacles exist that prevent support for the implementation of instructional technology? <i>Yes -> report?</i>
Research Question 2: What do principals perceive as organizational supports needed for the utilization of digital tools in instruction by primary teachers? <i>REC</i>	
6	In what ways do you believe you support the integration of technology in your school/district? That is, using technology as a tool to support instruction, rather than the teaching of the technology as a separate subject? Probe: Please give an example of how you support teachers in integration? <i>Workshops are held, highlight areas of strength, share their colleagues</i>
7	What kind of support do teachers need when integrating technology into their teaching? <i>Training - can be effectively integrated</i>
8	What structures at the building and district levels are necessary for teachers to effectively integrate technology into teaching? Probe: What specifically does the district do to support teachers in technology integration? <i>Acceptability -> track, ensure utilization, REC</i>
9	What are some of the most effective strategies for reducing barriers to ICT integration and/or increasing active learning? Probe: Why do you think these strategies were effective? <i>training, greater access to ICT platform + systems</i>
10	What would be the most effective way to make sure a principal acquires the needed training to be an effective technology leader?

School - Personal use I encourage, (empower) school, starting the relationship to make for parent, students, teachers or could be more effective. Mandatory training

Closing
Do you have any additional information that you would like to share or any questions?
Thank you for volunteering to be a participant in my study. You have been very helpful.

Embrace the use of technology

Mandatory training for principals

- Training - No
- No
- If Yes
- What

NCEL in response to the pandemic - seminar - AIS - VIL - emerging from COVID - wealth of information, relate to staff, psychosocial...

What benefit?
Develop greater insight, lead those staffs afraid of technology - assist their staffs

Can describe you Instructional leadership as it regards technology integration?
- Instructional roles (allowed to manage instructional leadership)

Describe your principals IL in Tech Int.
- Encouraging and not utilizing (actually embracing it for herself) *mindset problem*

Appendix O: Codebook Generated From NVivo 12

	Code Name	Code	Description
1.	Barriers	Ba	Challenges experienced with using digital tools, lack of teacher knowledge, age, teacher competencies, lack of training
2.	Curriculum no support	CRNSu	No support for how the curriculum should be delivered using digital tools and technology integration. Teachers left on their own
3.	Inadequate devices	ID	Not enough resources, not enough access to devices, Outdated devices
4.	Unavailable/ inconsistent internet	UI	Located in remote or rural area seen as an impediment to internet access, reliable Internet supply, no internet connectivity
5.	Teacher mindset and attitude towards change	TM	Mindset change for teachers, students
6.	Digital tools usage	DTU	How are digital tools used in the schools, intensified with COVID, minimal use, digital tools are used minimally even after the pandemic, subject based
7.	Before pandemic	BCV	Little to no use of technology was used before the pandemic.
8.	Access to digital tools	ADT	Tools available at school include projectors, DVD and are used, school tools
9.	Since pandemic	SCV	How technology is used since the pandemic, tools used since after the pandemic. Kahoot, Quizziz, YouTube, Google suite, Google classroom
10	Not student-centered	SDU	Students are not given the opportunity to interact much with the tools outside of google classroom.

Code Name	Code	Description
11 Teacher lack devices	TLD	Teachers use their personal devices to facilitate the use of digital tools in the classroom. They are not provided by school or the ministry
12 Effective strategies by principals	ESP	Build teacher competence, parents buy-in, sensitization, seek sponsorship, raise awareness
13 More training needed	MTN	Teachers need time to carry through with practice using tools, lack of training and practice
14 Effective technology leader	ETL	What principals need to be effective technology leaders; VP not active in instructional leadership
15 Mandatory training for principals	MTrP	Increase principal competencies, benefits of training, NCEL Training,
16 Embraced	Em	Positive view of technology integration in the schools
17 Principal problems	PP	Comfort Level, getting all teachers onboard, ill-equipped staff, limited knowledge
18 Principal struggles	PStr	Struggles that principal face in leading technology in their schools, keeping current, not able to model or do, not competent, remaining relevant, supervision and guidance, no principal training, lack of supervision, must know what they require of staff, monitoring and assistance
19 Principal support required	PSuR	Supports that principal need to lead technology, computerize and digitalize schools, financial, administrative tools, connectivity
20 Cluster-based IT specialist	CBITS	Resource persons come into schools, IT Persons, expertise needed by principals to support the teachers in IT use

Code Name	Code	Description
21 MOE support	MOESu	Ensure teachers attend workshop, JTC online training
22 Principal for School	PFS	Encourage teachers, ensure mandate is followed, how principals support their schools for technology integration
23 Common planning	CP	Share best practices, teacher led sharing, teachers support teachers, Team for LMS transition, TMT
24 Lesson planning instrument and appraisal rating	LP	Based on 5E model template
25 Required new teaching	RNT	21st Century, changing methodology, Information age, new age learning, 21st century skills, lessons more student-centered, digital age, information age, Students are natural at technology
26 MOE workshops	MOEW	In school training organized by principals and delivered by external or internal persons, MOE encourage attendance
27 Principal support of tech integration	PSTI	Networking and sponsorship, solution for internet, network with other principals, internet and device rotation, in school training, lab institution
28 Accountability	ACC	No system of accountability
29 School facilities	BDA	Facilities in place that support teachers' integration of technology, ICT Room, computer labs, building adjustment
30 More use of TRC	MTRC	Combined QEC training, PDs, QEC meetings, support for schools, no QEC support, support for QEC, no QEC training
31 Teachers/school technological needs	TSTN	Tech tools, MOE workshops, how to use tools, resource persons, more

Code Name	Code	Description
		technological tools, monitoring students, devices
32 Teachers' pedagogical skills with digital tools	TLP	Better younger teachers, average TPACK skills, good use of computers and other tools, just managing, percentage of staff, Good TPACK skills using digital tools and other hardware, not utilized with some teachers, Teachers lack knowledge, struggling teachers, phobia, some more proficient than others, work in progress, unwilling to try, unfamiliar with tools
33 Thrust into online learning	TOL	Shows up deficiencies
34 Inadequate training/ Limited	LTr	Teachers are learning throughout the process, Covid intensified training
35 No principal training	NPTr	Not enough technology training received by teachers at the primary level. Most since the pandemic and facilitated online.
36 Training before COVID	TrBCV	Online trainings without certification and impacted by internet connectivity and other challenges
37 Minimum standards	MS	Minimum standards for principals
38 Policy guidelines	PG	Technology integration policies needed for schools
39 Teachers' willingness to integrate	TWI	Some teachers are not willing to integrate

Appendix P: Coding Summary Chart

Prin11 Coding Summary Chart

Teachers TPACK			Effective strategies		Principal Problems		Barriers	
Thrust into onl...	Shows u...	Not muc...	Build teacher ...	Internet	Not applicable		Teacher ...	Remote...
Teachers lack ...	Need m...	Just ma...		Devices			Lack of...	Connec...
Some more pr...			Parents buy-in		Principal4School		Principal struggles	
Strategies			Support for schools		Principal4School		Principal struggles	
SM help	MOE wors...	INternet a...	Respurce persons...	MOE w...	Share best...	En...	not able to...	Mu...
Networki...	In school tr...	Helpful	No QEC support		Ensure teac...	Not compe...		
Digital Tools Usage			Structures		Teachers Needs		Effective Technol...	
Unfamiliar ...	School tools	Digital tools	Required new teaching		How to u...	Devices	increase princi...	
Subjects	LMS	Before pa...			Students are natur...	21st C...	Principal Support Required	
			Changing metho...		not a tea...	Not a w...	Embraced	